



**Thienes Engineering, Inc.**  
CIVIL ENGINEERING • LAND SURVEYING

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

FOR:

PEN21-0123 / LWQ23-0013

**BAY AND DAY INDUSTRIAL BUILDING**

SOUTHWEST CORNER OF BAY AVENUE AND DAY STREET  
MORENO VALLEY, CA 92553

APNs: 263-230-001, 263-230-003, 263-230-004 AND 263-230-025

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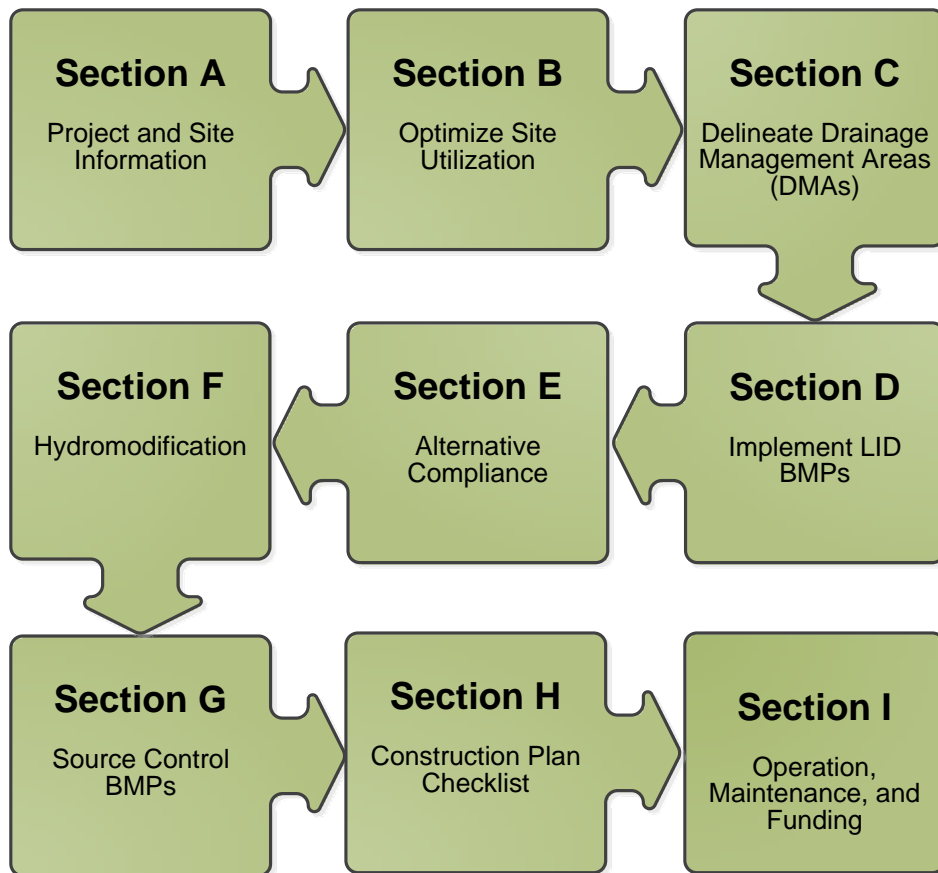
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## A Brief Introduction

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.



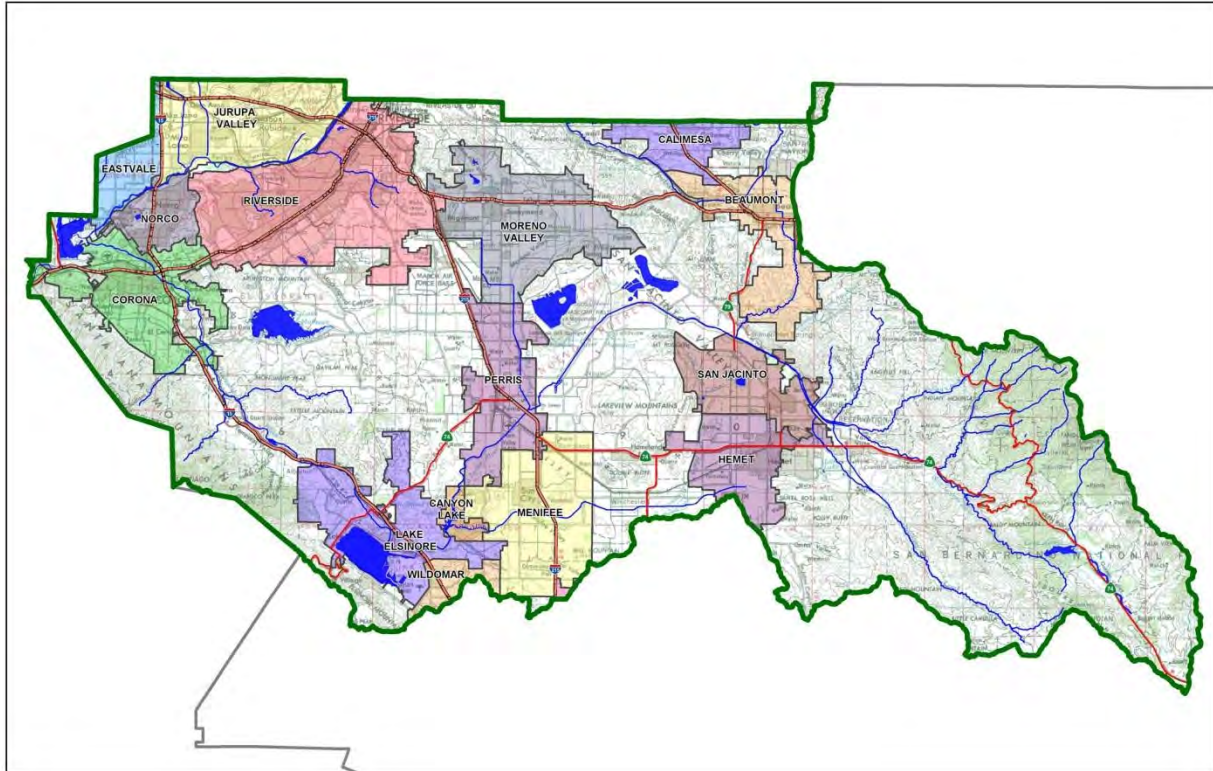
# Project Specific Water Quality Management Plan

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

**Project Title:** Bay and Day Industrial Building

**Development No:** 263-230-001, 263-230-003 263-230-004 and 263-230-025

**Design Review/Case No:** PEN21-0123 / LWQ23-0013



- Preliminary
- Final

**Original Date Prepared:** April 20, 2023

**Revision Date(s):** October 11, 2023

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

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## OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for **LDC Molto Edgemont, LLC** by Thienes Engineering, Inc. for the **Bay and Day Industrial Building** project.

This WQMP is intended to comply with the requirements of Moreno Valley for Riverside County Ordinance No. 827 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 **Moreno Valley** Water Quality Ordinance (Municipal Code Section 8.10).

"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

Nathan Mead  
Owner's Printed Name

\_\_\_\_\_  
Date

Director of Operations  
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

Reinhard Stenzel  
Preparer's Printed Name

\_\_\_\_\_  
Date

Director of Engineering  
Preparer's Title/Position

Preparer's Licensure:

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## Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Light Industrial
Planning Area:	Industrial/Business Park
Community Name:	N/A
Development Name:	Bay and Day Industrial Building
PROJECT LOCATION	
Latitude & Longitude (DMS): 33.919674, -117.280040	
Project Watershed and Sub-Watershed: Santa Ana River	
APN(s): 263-230-001, 263-230-003, 263-230-004 and 263-230-025	
Map Book and Page No.: MB 12/19 Edgemont No. 2	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Light Industrial
Proposed or Potential SIC Code(s)	4225
Area of Impervious Project Footprint (SF)	472,626 (10.85 acres)
Total Area of <u>proposed</u> Impervious Surfaces within the Project Limits (SF)/or Replacement	433,879 (9.96 acres)
Does the project consist of offsite road improvements?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
Does the project propose to construct unpaved roads?	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
Is the project part of a larger common plan of development (phased project)?	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
EXISTING SITE CHARACTERISTICS	
Total area of <u>existing</u> Impervious Surfaces within the project limits (SF)	0
Is the project located within any MSHCP Criteria Cell?	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
If so, identify the Cell number:	Not A Part
Are there any natural hydrologic features on the project site?	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
Is a Geotechnical Report attached?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	Type C
What is the Water Quality Design Storm Depth for the project?	0.62
PROJECT DESCRIPTION	
<p>The project site encompasses approximately 10.85 acres of improvements, which includes 9.57 acres of onsite work and 1.28 acres of offsite work along Bay Avenue and Day Street. Proposed improvements to the project will consist of the construction of one warehouse-type building with an area of 190,745 square feet. Loading docks along with trailer parking will be located west of the building. Vehicle parking will be located east of the building. The remainder of the site will be reserved for landscaping.</p> <p>Per the infiltration report, infiltration rates resulted in less than 0.3 inches per hour; therefore, the project proposes to use underground detention systems and proprietary biotreatment systems (MWS) to treat runoff produced by the 85th percentile storm rainfall depth. Certified full trash capture catch basin filters will also be provided in order to pre-treat runoff prior to entering the water quality features.</p> <p>In addition, the disturbed area along Bay Avenue and Day Street will drain to six bioretention facilities located along the public right-of-ways. The bioretention's treated flows will be conveyed via proposed storm drains back to the proposed onsite storm drain.</p>	

### **Existing Conditions**

The majority of the site is undeveloped and drains southwesterly towards Linda Court. Flows appear to continue southerly and will eventually drain to Alessandro Boulevard.

The project site receives offsite run-on that is conveyed by an existing 24-inch pipe, Lateral GG-2 Interim Storm Drain, and discharges at the surface via an existing headwall. Flows from Day Street and from the existing residential east of the project site discharge onto the site via this existing storm drain. This offsite flow will be intercepted in a proposed storm drain in Day Street with improvements to the project site.

The site is part of the Line G-G of the Master Plan Project No. 02-8928002, dated December 30, 2004, prepared by AEI-CASC Engineering. There are four alternatives for Line G-G. However, Line G-G has not been constructed and does not seem likely in the future. Line G-G drains to an existing system in Old 215 Frontage Road. Instead the City requested the site to flow to the proposed storm drain system in Day Street.

Previous hydrology report and storm drain plans prepared by Thienes Engineering (PEN21-0079 / LST21-0039) tabled a portion of the project site to the storm drain in Day Street.

### **Proposed Conditions**

Off-site run-on that enters the easterly portion of the site from the northeast will be intercepted by a proposed catch basin at Day Street. The existing headwall and existing public catch basin on the west side of Day Street will be removed. A proposed public storm drain, along with a public catch basin, will be constructed along the west side of Day Street in the proposed low spot. This storm drain will connect to the existing lateral from the catch basin along the east side of Day Street. The public storm drain will continue southerly in Day Street and will join the future storm drain in Day Street (PEN21-0079/LST21-0039).

Runoff from the easterly vehicle parking, and a portion of the building roof, will drain to catch basins in the parking lot via overland flow. The proposed onsite storm drain will convey flows to the north, turn west around the building, and continue south toward the building's truck yard. The same onsite storm drain will collect runoff from the building roof, truck yard, and southerly drive aisle along the west side of the building. Stormwater from these areas will surface drain to the several catch basins located in the truck yard. The same onsite storm drain then continues south and turns east along the south of the building to connect with a future storm drain in Day Street. Runoff from the northerly driveway and landscaping will surface drain towards Bay Avenue.

A proposed diversion manhole structure, located at the southwest corner of the site, will direct the Vbmp to the underground detention system and MWS. Sump pumps will be utilized to pump the Vbmp into the MWS and to pump treated flows back into the public storm drain system. A separate sump pump will be utilized to limit the 2-year, 24-hour flowrate for HCOC purposes.



## 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, 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
Tequesquite Arroyo (Sycamore Creek)	None	GWR, REC1, REC2, WARM, WILD, SPWN	Not classified as a RARE waterbody.
Santa Ana River, Reach 3	Copper, Indicator Bacteria and Lead	MUN, AGR, GWR, REC1, REC2, WARM, WILD, RARE, SPWN	50 miles
The Prado Basin Management Zone	pH	MUN, REC1, REC2, WARM, WILD, RARE	50 miles
Santa Ana River, Reach 2	None	MUN, AGR, GWR, REC1, REC2, WARM, WILD, RARE	55 miles
Santa Ana River, Reach 1	None	MUN, REC1, REC2, WARM, WILD	Not classified as a RARE waterbody.
Tidal Prism of Santa Ana River and Newport Slough	Indicator Bacteria	MUN, REC1, REC2, COMM, WILD, RARE, MAR	81 miles
Pacific Ocean Near shore Zone	None	MUN, IND, NAV, REC1, REC2, COMM, WILD, RARE, SPWN, MAR, SHEL	81 miles
Pacific Ocean Offshore Zone	None	MUN, IND, NAV, REC1, REC2, COMM, WILD, RARE, SPWN, MAR	82 miles

### 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	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N
US Army Corps of Engineers, CWA Section 404 Permit	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N
Statewide Construction General Permit Coverage	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N
Statewide Industrial General Permit Coverage	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N
Other <i>(please list in the space below as required)</i>	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N
City of Moreno Valley Grading Permit	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N
Other <i>(please list in the space below as required)</i>	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N
City of Moreno Valley Building Permit	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> 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 southwesterly towards Linda Court. Proposed condition drainage patterns mimic pre-developments conditions to Sycamore Creek by use of piping rather than sheet flow.*

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

- *Not applicable, there are no sensitive areas.*
- *Ground surface cover consists of exposed soils with sparse to moderate amounts of native weed and grass growth.*

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

- *Per the infiltration reports, infiltration rates resulted below 0.3 inches per hour. Therefore, the project site will utilize underground detention systems and proprietary biotreatment systems to treat runoff produced by the 85th percentile storm rainfall depth.*

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 V-bmp is handled by the underground detention systems and proprietary biotreatment systems. Permeable pavement is not needed to meet the V-bmp.*

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

- *Roof runoff is directed to the proposed underground detention system and proprietary biotreatment system for treatment.*
- *The site is not on a hillside.*
- *All stormwater runoff will be piped or sheet flow into the underground detention systems and proprietary biotreatment systems; therefore, curb-cuts into landscaped areas are not utilized onsite.*

## 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) <sup>1</sup>	Area (Sq. Ft.)	Area (Acres)	DMA Type
1A	Roofs/Conc/Asphalt	382,457	8.78	Type D
1B	Ornamental Landscaping	20,038	0.46	Type D
2A-ONSITE	Roofs/Conc/Asphalt	771	0.0177	Type D
2B-ONSITE	Ornamental Landscaping	5,327	0.1223	Type D
2A-OFFSITE	Roofs/Conc/Asphalt	11,204	0.2572	Type D
2B-OFFSITE	Ornamental Landscaping	993	0.0228	Type D
3A-ONSITE	Roofs/Conc/Asphalt	166	0.0038	Type D
3B-ONSITE	Ornamental Landscaping	5,062	0.1162	Type D
3A-OFFSITE	Roofs/Conc/Asphalt	8,507	0.1953	Type D
3B-OFFSITE	Ornamental Landscaping	1,076	0.0247	Type D
4A-ONSITE	Roofs/Conc/Asphalt	287	0.0066	Type D
4B-ONSITE	Ornamental Landscaping	2,762	0.0634	Type D
4A-OFFSITE	Roofs/Conc/Asphalt	8,651	0.1986	Type D
4B-OFFSITE	Ornamental Landscaping	932	0.0214	Type D
5A-OFFSITE	Concrete or Asphalt	7,802	0.1791	Type D
5B-OFFSITE	Ornamental Landscaping	910	0.0209	Type D
6A-OFFSITE	Concrete or Asphalt	5,619	0.1290	Type D
6B-OFFSITE	Ornamental Landscaping	479	0.0110	Type D
7A-OFFSITE	Concrete or Asphalt	8,416	0.1932	Type D
7B-OFFSITE	Ornamental Landscaping	1,167	0.0268	Type D
	<b>TOTAL</b>	<b>472,626</b>	<b>10.85</b>	

<sup>1</sup>Reference Table 2-1 in the WQMP Guidance Document to populate this column

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

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
N/A	N/A	N/A	N/A

**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 ID	DMA Name [C]	[C] from Table C.4 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)	Post-project surface type	Runoff factor	Product	DMA name /ID	Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]		[D]	[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
1A	MWS & STC #1
1B	MWS & STC #1
2A-ONSITE	STREET BIO #2
2B-ONSITE	STREET BIO #2
2A-OFFSITE	STREET BIO #2
2B-OFFSITE	STREET BIO #2
3A-ONSITE	STREET BIO #3
3B-ONSITE	STREET BIO #3
3A-OFFSITE	STREET BIO #3
3B-OFFSITE	STREET BIO #3
4A-ONSITE	STREET BIO #4
4B-ONSITE	STREET BIO #4
4A-OFFSITE	STREET BIO #4
4B-OFFSITE	STREET BIO #4
5A-OFFSITE	STREET BIO #5
5B-OFFSITE	STREET BIO #5
6A-OFFSITE	STREET BIO #6
6B-OFFSITE	STREET BIO #6
7A-OFFSITE	STREET BIO #7
7B-OFFSITE	STREET BIO #7

*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 Copermitttee 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**

<b>Does the project site...</b>	<b>YES</b>	<b>NO</b>
...have any DMAs with a seasonal high groundwater mark shallower than 10 feet? If Yes, list affected DMAs:		X
...have any DMAs located within 100 feet of a water supply well? If Yes, list affected DMAs:		X
...have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact? If Yes, list affected DMAs:		X
...have measured in-situ infiltration rates of less than 1.6 inches / hour? If Yes, list affected DMAs: Per the infiltration report, infiltration rates resulted in less than 0.3 inches per hour; therefore, the project proposes to use underground detention systems and proprietary biotreatment systems (MWS) to treat runoff produced by the 85th percentile storm rainfall depth.	X	
...have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface? If Yes, list affected DMAs:		X
...geotechnical report identifies other site-specific factors that would preclude effective and safe infiltration? Describe here:		X
...have areas of known soil or groundwater contamination (unless with written authorization from the Regional Board Executive Officer) If yes, list affected DMAs:		X

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.

## 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.
- None of the above

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: 0.76 (onsite only)*

*Type of Landscaping (Conservation Design or Active Turf): Conservation design*

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: 8.81 (onsite only)*

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: 0.79*

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: 6.96*

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)
6.96	0.76

## 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: 151 (# of parking stalls)*

*Project Type: Industrial*

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: 8.81 (onsite only)*

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 of toilet users per tributary impervious acre (TUTIA).

*Enter your TUTIA factor: 172*

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: 1,515*

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).

<b>Minimum required Toilet Users (Step 4)</b>	<b>Projected number of toilet users (Step 1)</b>
1,515	151

### 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).

<b>Minimum required non-potable use (Step 4)</b>	<b>Projected average daily use (Step 1)</b>
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 (Type A, B, C)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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]			
1A	382,457	Roofs/Conc/Asphalt	1.00	0.89	341,151.5	0.62	17626.2	19,015
1B	20,038	Ornamental Landscaping	0.10	0.11	2,213.3	0.62	114.4	
2A-ONSITE	771	Roofs/Conc/Asphalt	1.00	0.89	687.7	0.62	35.5	597
2B-ONSITE	5,327	Ornamental Landscaping	0.10	0.11	588.5	0.62	30.4	
2A-OFFSITE	11,204	Roofs/Conc/Asphalt	1.00	0.89	9,993.6	0.62	516.3	
2B-OFFSITE	993	Ornamental Landscaping	0.10	0.11	109.7	0.62	5.7	
3A-ONSITE	166	Roofs/Conc/Asphalt	1.00	0.89	147.7	0.62	7.6	448
3B-ONSITE	5,062	Ornamental Landscaping	0.10	0.11	559.1	0.62	28.9	
3A-OFFSITE	8,507	Roofs/Conc/Asphalt	1.00	0.89	7,588.5	0.62	392.1	
3B-OFFSITE	1,076	Ornamental Landscaping	0.10	0.11	118.8	0.62	6.1	
4A-ONSITE	287	Roofs/Conc/Asphalt	1.00	0.89	256.4	0.62	13.2	448
4B-ONSITE	2,762	Ornamental Landscaping	0.10	0.11	305.1	0.62	15.8	
4A-OFFSITE	8,651	Roofs/Conc/Asphalt	1.00	0.89	7,716.7	0.62	398.7	
4B-OFFSITE	932	Ornamental Landscaping	0.10	0.11	103.0	0.62	5.3	
5A-OFFSITE	7,802	Concrete or Asphalt	1.00	0.89	6,959.0	0.62	359.5	415
5B-OFFSITE	910	Ornamental Landscaping	0.10	0.11	100.6	0.62	5.2	265
6A-OFFSITE	5,619	Concrete or Asphalt	1.00	0.89	5,012.4	0.62	259	
6B-OFFSITE	479	Ornamental Landscaping	0.10	0.11	52.9	0.62	2.7	415
7A-OFFSITE	8,416	Concrete or Asphalt	1.00	0.89	7,506.9	0.62	387.9	
7B-OFFSITE	1,167	Ornamental Landscaping	0.10	0.11	128.9	0.62	6.7	
	472,626				391,300	0.62	20,217.2	21,603

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

P = Potential

N = Not Potential

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

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

<sup>(3)</sup> A potential Pollutant is land use involving animal waste

<sup>(4)</sup> Specifically petroleum hydrocarbons

<sup>(5)</sup> Specifically solvents

<sup>(6)</sup> 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 <sup>2</sup>
N/A	
<b>Total Credit Percentage<sup>1</sup></b>	

<sup>1</sup>Cannot Exceed 50%

<sup>2</sup>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 <sup>1</sup>	Priority Pollutant(s) of Concern to Mitigate <sup>2</sup>	Removal Efficiency Percentage <sup>3</sup>
N/A	N/A	N/A

<sup>1</sup> 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.

<sup>2</sup> Cross Reference Table E.1 above to populate this column.

<sup>3</sup> 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 Copermitttee 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<sup>1</sup> 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
<b>Time of Concentration (min)</b>			
<b>Volume (Cubit Feet)</b>			

<sup>1</sup> 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:

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

Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

	2 year – 24 hour			
	Pre-condition	Post-condition	Difference	Difference (as % of pre-condition)
<b>Flowrate (cfs)</b>	0.223	0.245	0.022	10%

Since the excess volume cannot be infiltrated or captured and reused, the discharge from the underground detention chambers has been limited to a flowrate that’s approximately 110% more than the pre-development 2 year peak flow. See hydrograph calculations 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 1.7
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	<ul style="list-style-type: none"> <li>Mark all inlets with the words “Only Rain Down the Storm Drain” or similar.</li> </ul>	<ul style="list-style-type: none"> <li>Maintain and periodically repaint or replace inlet markings annually.</li> <li>Provide stormwater pollution prevention information to new site owners, lessees, or operators upon occupancy and annually thereafter.</li> <li>See CASQA fact sheet SC-44 for “Drainage System Maintenance,” included in Appendix of this document.</li> <li>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.”</li> </ul>

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
<b>B.</b> Interior floor drains and elevator shaft sump pumps	<ul style="list-style-type: none"> <li>Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.</li> </ul>	<ul style="list-style-type: none"> <li>Inspect and maintain drains semi-annually to prevent blockages and overflow.</li> </ul>
<b>D2.</b> Landscape / Outdoor Pesticide Use	<ul style="list-style-type: none"> <li>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.</li> <li>Pest-resistant plants will be used adjacent to hardscape.</li> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>Maintain landscaping only using minimum pesticides, when needed.</li> <li>See Appendix 10 for “Landscape and Gardening” brochure by RCFlood.</li> <li>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.</li> </ul>
<b>G.</b> Refuse Areas	<ul style="list-style-type: none"> <li>Site refuse will be handled by contractor on a weekly basis.</li> <li>Signs will be posted on or near dumpsters with the words “Do not dump hazardous materials here” or similar.</li> </ul>	<ul style="list-style-type: none"> <li>A minimum of two receptacles will be provided and locate 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.”</li> </ul>
<b>H.</b> Industrial processes	<ul style="list-style-type: none"> <li>All process activities to be performed indoors. No processes to drain to exterior or to storm drain system.</li> </ul>	<ul style="list-style-type: none"> <li>See Appendix 10 for CASQA fact sheet SC-10 for “Non-Stormwater Discharges”</li> </ul>
<b>M.</b> Loading Docks	<ul style="list-style-type: none"> <li>Spills will be cleaned up immediately and disposed of properly.</li> </ul>	<ul style="list-style-type: none"> <li>Move loaded and unloaded items indoors as soon as possible.</li> <li>See Appendix 10 for CASQA fact sheet SC-30 for “Outdoor Loading and Unloading”</li> </ul>
<b>O.</b> Miscellaneous Drain or Wash Water or Other Sources (A/C units)	<ul style="list-style-type: none"> <li>A drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.</li> <li>Roofing and gutters will not be made of unprotected metals.</li> <li>A/C condensation drain lines goes to sewer.</li> </ul>	
<b>P.</b> Plazas, sidewalks, and parking lots		<ul style="list-style-type: none"> <li>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.</li> </ul>

## 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 (indoors, if any)	---	---
M	Loading Docks	WQMP Site Map	---	---
O	Miscellaneous Drain or Wash Water or Other Sources	Architectural Plans	---	---
P	Plazas, sidewalks, and parking lots	N/A	---	---
MWS & STC #1	Proprietary Biotreatment & Underground Detention Chambers	WQMP Site Map	MWS 33.918855 STC 33.919474	MWS -117.280154 STC -117.280701
STREET BIO #2	Bioretention	WQMP Site Map	33.920421	-117.28133
STREET BIO #3	Bioretention	WQMP Site Map	33.920424	-117.280394
STREET BIO #4	Bioretention	WQMP Site Map	33.920429	-117.279600
STREET BIO #5	Bioretention	WQMP Site Map	33.920027	-117.278953
STREET BIO #6	Bioretention	WQMP Site Map	33.91967	-117.278953
STREET BIO #7	Bioretention	WQMP Site Map	33.919458	-117.278953

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 Moreno Valley:

STORMWATER TREATMENT DEVICE AND CONTROL MEASURE ACCESS AND MAINTENANCE COVENANT

The maintenance mechanism mentioned above will be executed by the owner and will be tied to the property. The maintenance mechanism will ensure that all structural BMPs and other control measures specified in this WQMP receive periodic and continuous maintenance as per the Operation and Maintenance Plan (O&M Plan) included in Appendix 9-3. Funding required to maintain the BMPs will be provided by the owner stated below.

Owner:

**LDC Molto Edgemont, LLC**

One Lincoln Centre

18W140 Butterfield Road, #750

Oakbrook Terrance, IL 60181

Phone: (949) 226-4601

Contact: Nathan Mead, Director of Operations

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*



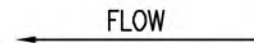


**TEI** Thienes Engineering, Inc.  
CIVIL ENGINEERING • LAND SURVEYING  
14349 FIRESTONE BOULEVARD  
LA MIRADA, CALIFORNIA 90638  
PH.(714)521-4811 FAX(714)521-4173

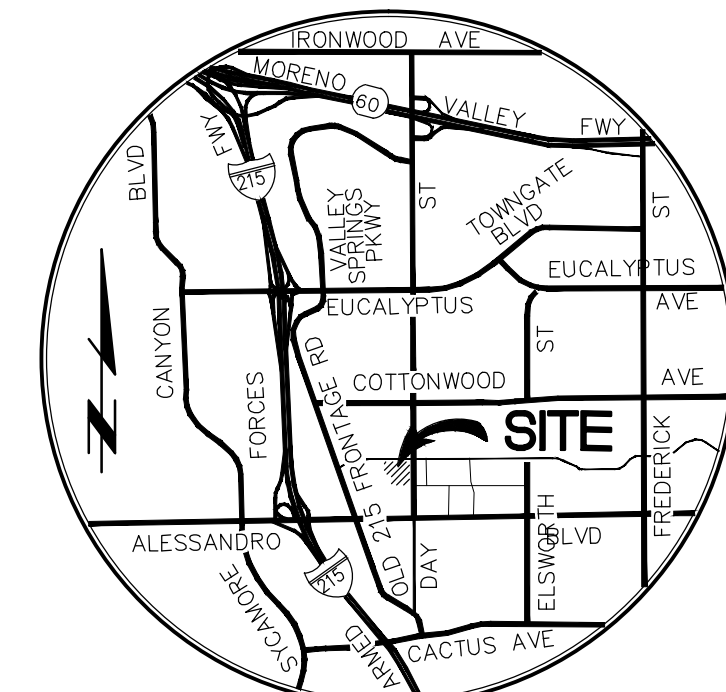
**"RECEIVING WATERS MAP"**

FOR

**SOUTHWEST CORNER OF  
BAY AVENUE AND DAY STREET**



BAY AVENUE



VICINITY MAP  
N.T.S.

BUILDING AREA  
190,745 S.F.

DMA 1A  
8.78 AC.

**LEGEND**

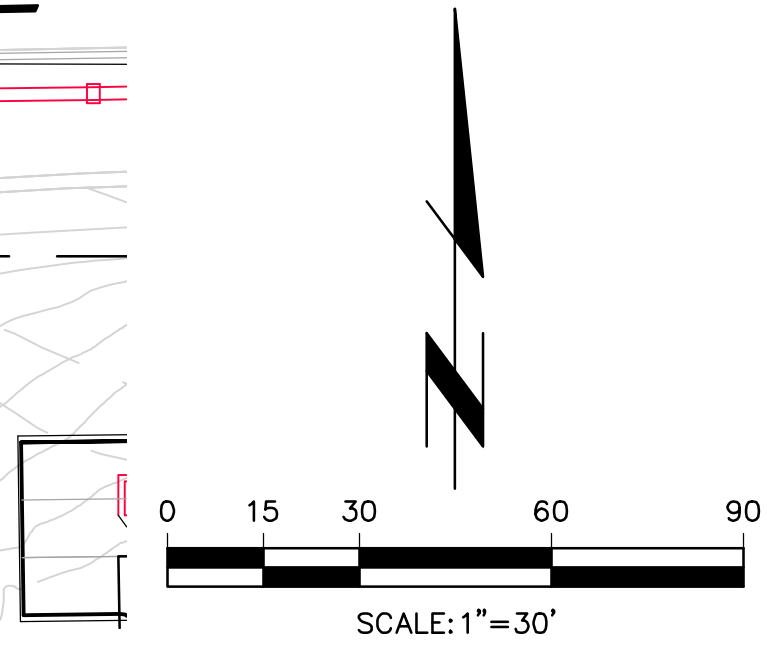
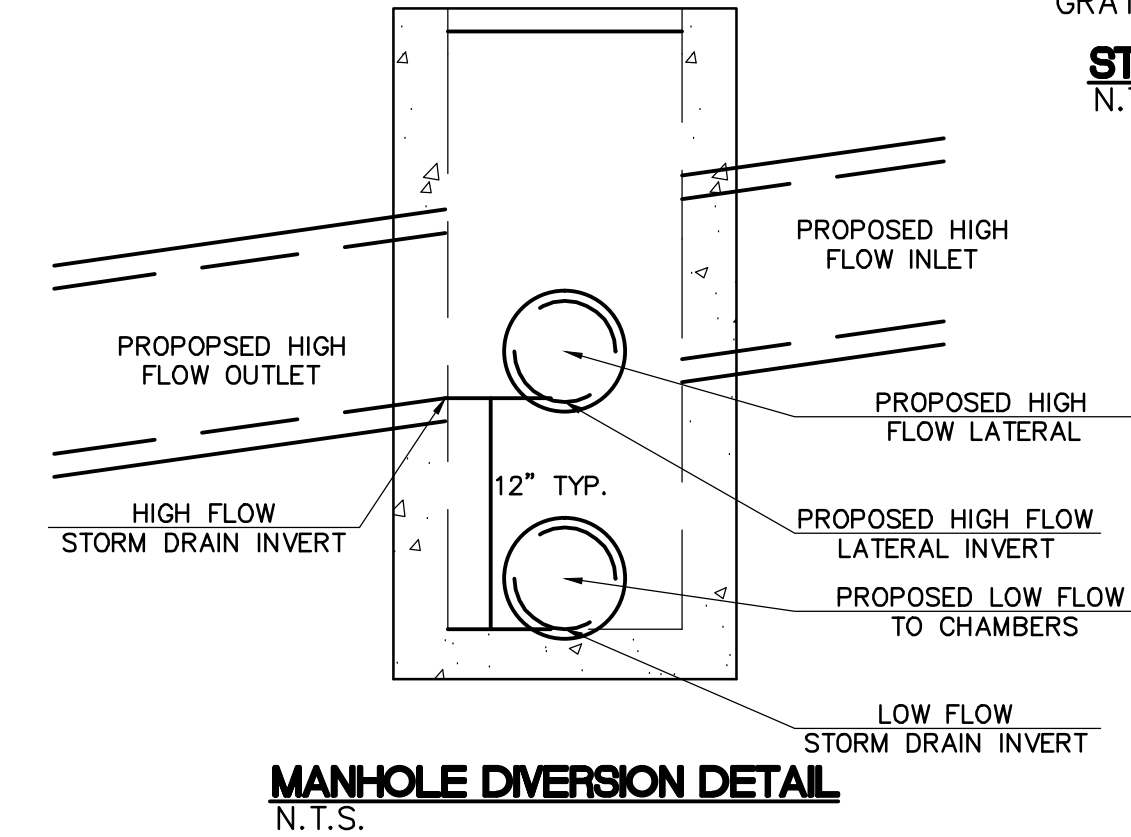
- 1 SC-M: LOADING DOCKS
- 2 SC-O2: LANDSCAPE/OUTDOOR PESTICIDE USE
- 3 SC-A: ON-SITE STORM DRAIN INLETS MARKED WITH "ONLY RAIN DOWN THE STORM DRAIN"
- 4 MC-3500 STORMTECH CHAMBERS - DETENTION
- 5 SC-F: REFUSE AREAS
- 6 STREET BMP - BIORETENTION
- 7 DRAIN INSERT(S)
- 8 MANHOLE WITH DIVERSION
- 9 SC-P: PLAZAS, SIDEWALKS AND PARKING LOTS
- 10 NOT USED
- 11 PROPRIETARY BIOPOLTRATION SYSTEM
- 12 MODULAR WETLANDS SYSTEM
- 13 SUMP PUMP
- 14 DISCHARGE POINT

**NOTE:**

- STC STORMTECH CHAMBERS
- MWS MODULAR WETLANDS SYSTEM
- DMA DRAINAGE MANAGEMENT AREA
- RD ROOF DRAIN
- BOUNDARY
- SUBAREAS
- SURFACE FLOW DIRECTION
- SD FLOW DIRECTION
- LANDSCAPING



SAMPLE STENCIL TO BE USED NEAR GRATE AND CURB OPENING INLETS  
**STORM DRAIN STENCILING**  
N.T.S.



DMA ID	PERVIOUS AREA (AC.)	IMPERVIOUS AREA (AC.)	TOTAL AREA (AC.)	BMP ID	BMP VOLUME REQUIRED (CU-FT)	BMP VOLUME PROVIDED (CU-FT)
DMA 1	0.46	8.78	9.24	MWS & STC #1	17,741	19,015
DMA 2	0.0405	0.3795	0.42	STREET BIO #2	588	597
DMA 3	0.1409	0.1991	0.34	STREET BIO #3	435	448
DMA 4	0.0848	0.2052	0.29	STREET BIO #4	433	448
DMA 5	0.0209	0.1791	0.20	STREET BIO #5	365	415
DMA 6	0.0110	0.1290	0.14	STREET BIO #6	262	265
DMA 7	0.0268	0.1932	0.22	STREET BIO #7	395	415
<b>TOTAL</b>	<b>0.78</b>	<b>10.07</b>	<b>10.85</b>		<b>20,219</b>	<b>21,603</b>

**OWNER:**  
LDC MOLTO EDMONT, LLC  
ONE LINCOLN CENTRE  
18W140 BUTTERFIELD ROAD, #750  
OAKBROOK TERRACE, CA 90181  
TEL: 949-226-4601

**ENGINEER:**  
**Thienes Engineering, Inc.**  
CIVIL ENGINEERING & LAND SURVEYING  
14349 FIRESTONE BOULEVARD  
LA MIRADA, CALIFORNIA 90638  
(714) 925-4611 FAX (714) 925-4172  
EMAIL: CESAR@THIENES.COM

**CITY OF MORENO VALLEY**  
PUBLIC WORKS DEPARTMENT  
**PRELIMINARY WQMP SITE MAP**  
PEN21-0123 / LWQ23-0013  
**BAY AND DAY INDUSTRIAL BUILDING**  
SOUTHWEST CORNER  
OF  
**BAY AVENUE AND DAY STREET**  
MORENO VALLEY, CALIFORNIA

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
FLOW BASED (CFS)	0.346		
PEAK BYPASS REQUIRED (CFS) - IF APPLICABLE	OFFLINE		
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
PRETREATMENT	BIOFILTRATION	DISCHARGE	
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		

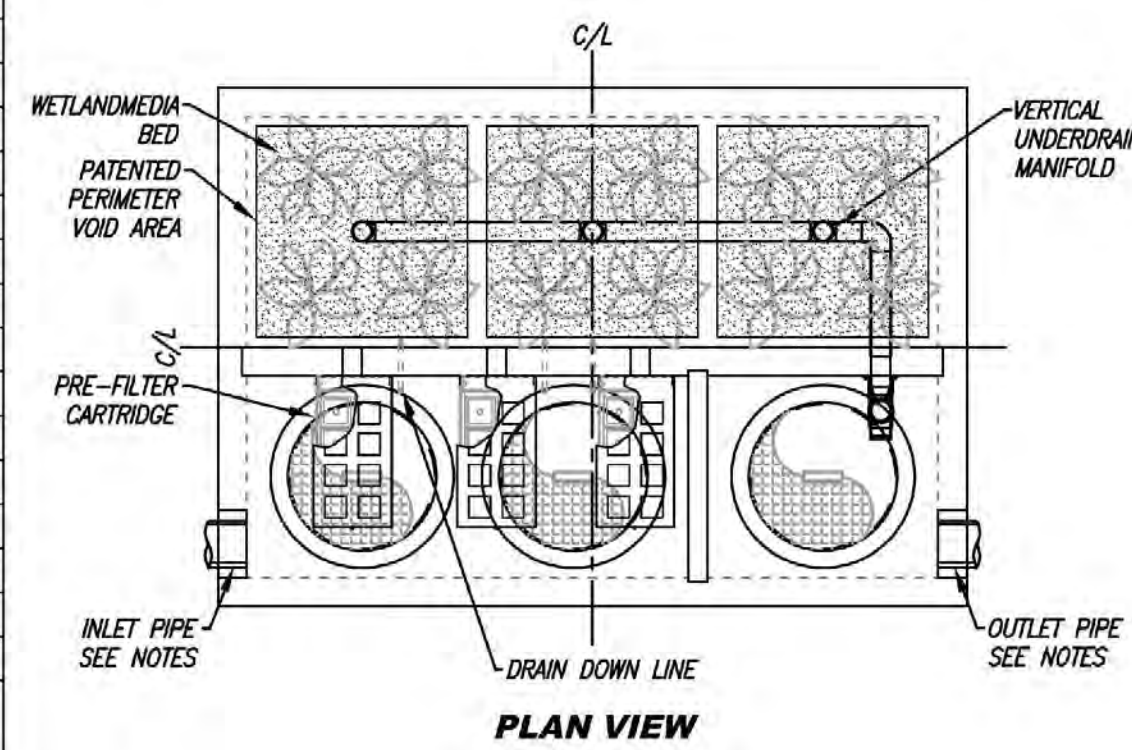
NOTES:  
\* PRELIMINARY NOT FOR CONSTRUCTION

**INSTALLATION NOTES**

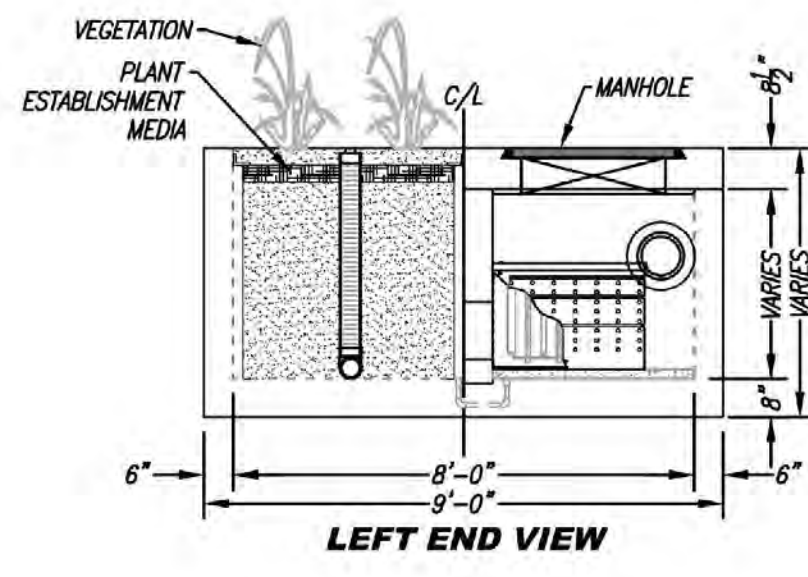
- CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
- UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
- CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. PIPES CANNOT INTRUDE BEYOND FLUSH. INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
- CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND WATCHES. CONTRACTOR TO USE GROUT AND/OR BRICKS TO MATCH COVERS WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
- VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
- CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.

**GENERAL NOTES**

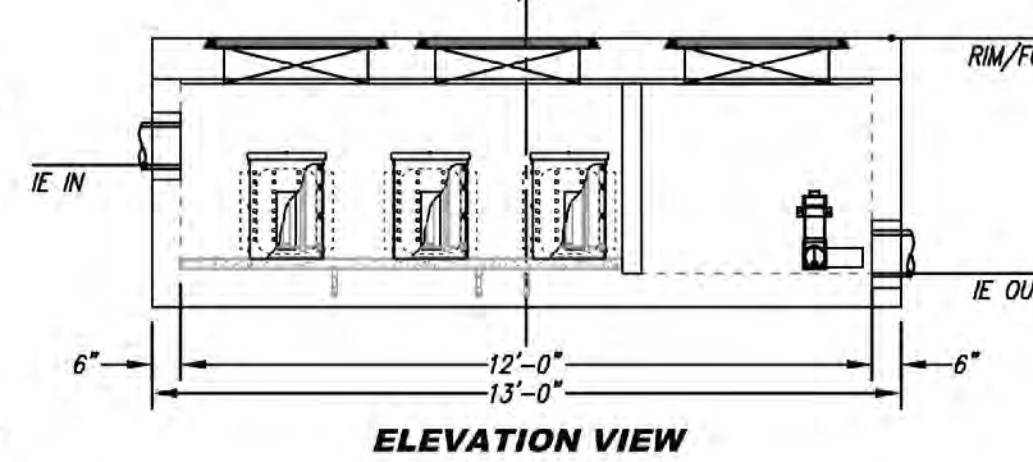
- MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
- ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND WEIGHTS ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT CONTECH.



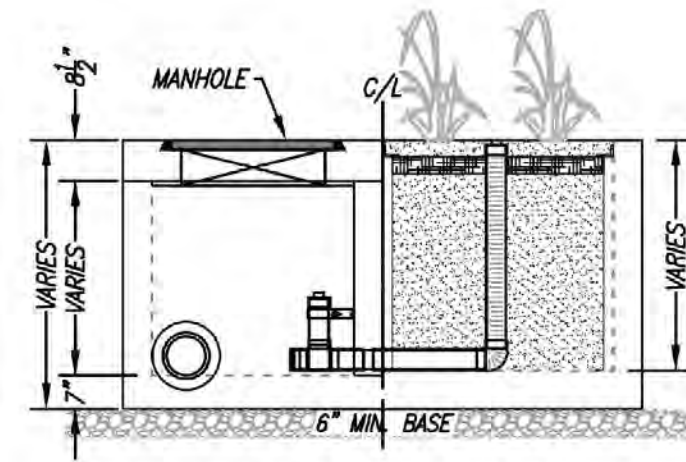
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

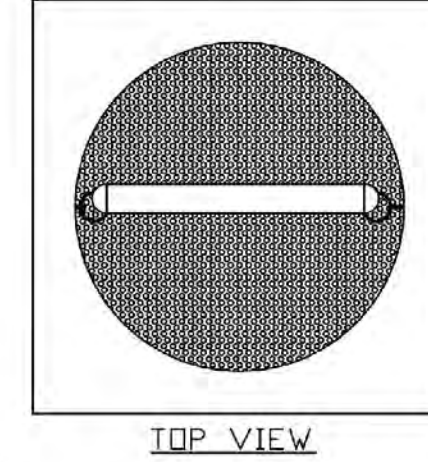
TREATMENT FLOW (CFS)	0.346
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MWS-L-8-12-V  
STORMWATER BIOFILTRATION SYSTEM  
STANDARD DETAIL

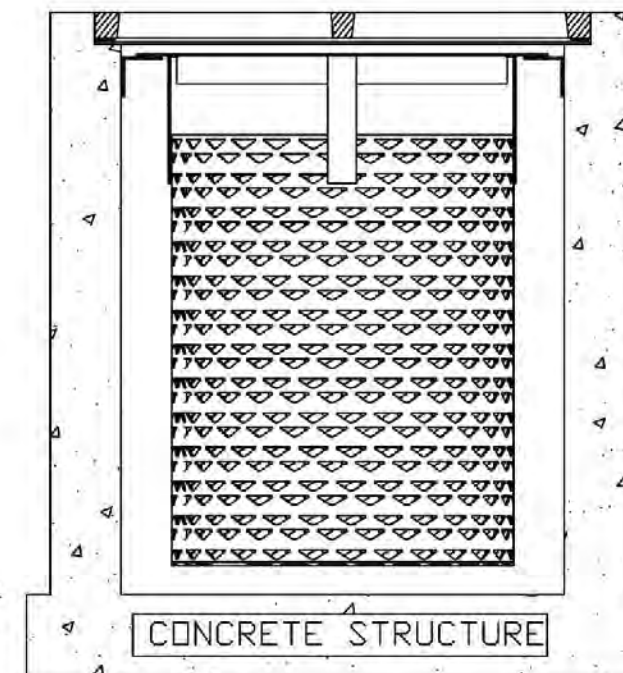


**BIO CLEAN FULL CAPTURE FILTER**

FOR USE IN GRATE INLETS

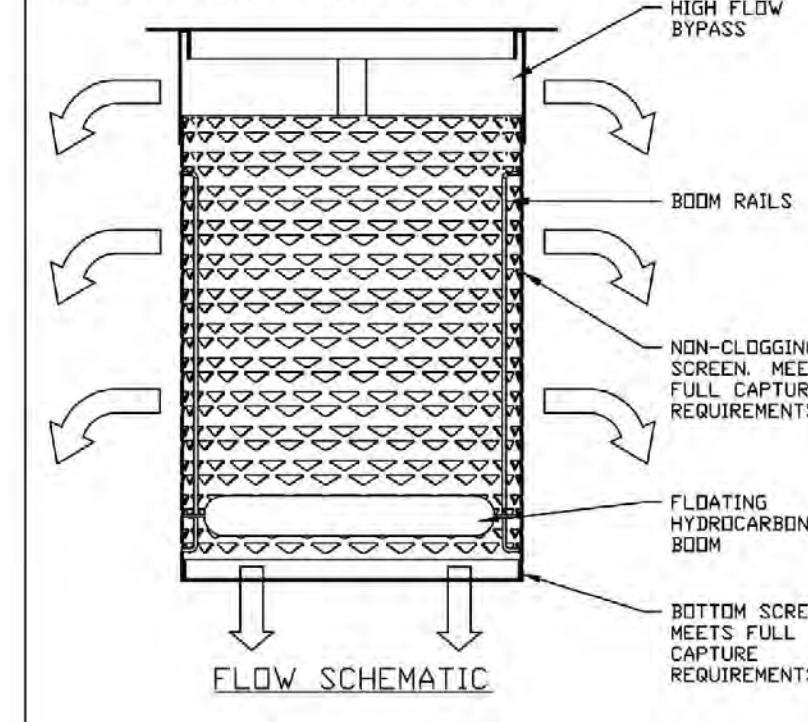


TOP VIEW



CONCRETE STRUCTURE

- NOTES:
- ALL HARDWARE, FLANGE, FRAME, SCREENS SHALL BE STAINLESS STEEL.
  - HYDROCARBON BOOM SHALL BE 2" DIAMETER AND CONNECTED MECHANICALLY TO THE FILTER FRAME WITH HOLES ALLOWING IT TO FLOAT ON THE WATER SURFACE REGARDLESS OF HEIGHT.
  - SEE PERFORMANCE REPORTS IN MANUFACTURER'S SPECIFICATIONS.
  - OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE - CONTACT BIO CLEAN FOR MORE INFORMATION.
  - BASED ON 5% PIPE AREA.
  - CONSIDERS A SAFETY FACTOR OF 2.0.
  - CONSIDERS A LOCAL DEPRESSION PONDING DEPTH OF 6 INCHES.
  - STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
  - 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	23.59	10.13	7.92

DRAWING BIO CLEAN GRATE INLET FILTER DETAILS		MEETS FULL CAPTURE REQUIREMENTS	
TYPICAL MODEL DETAIL		TYPICAL MODEL DETAIL	
WARRANTY: 5 YEAR MANUFACTURERS	PROJECT:	REVISIONS:	DATE:
BIO CLEAN ENVIRONMENTAL SERVICES, INC. 398 VIA EL CENTRAL, OESANITE, CA 90288 PHONE: 760-433-7640 FAX: 760-433-3176	REVISIONS:	DATE:	
DATE: 08/07/17	SCALE: 3" = 1'	REVISIONS:	DATE:
DRAWING NO: P	UNITS: INCHES	REVISIONS:	DATE:

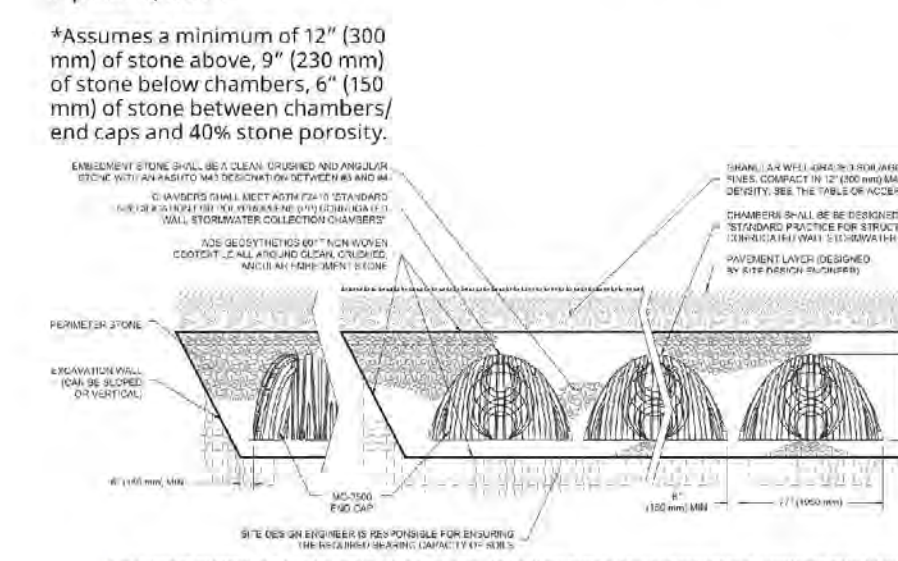
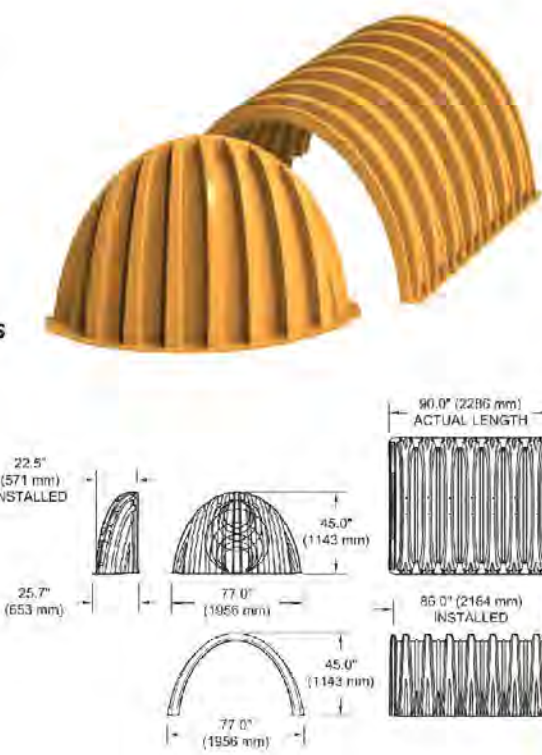


PAGE 1

**StormTech® MC-3500 Chamber**

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

- Nominal Chamber Specifications**  
(not to scale)
- Size (L x W x H)**  
90" x 77" x 45"  
2286 mm x 1956 mm x 1143 mm
- Chamber Storage**  
103.9 ft<sup>3</sup> (3.11 m<sup>3</sup>)
- Min. Installed Storage\***  
175.0 ft<sup>3</sup> (4.96 m<sup>3</sup>)
- Weight**  
134 lbs (60.8 kg)
- Shipping**  
15 chambers/pallet  
7 end caps/pallet  
7 pallets/truck
- Nominal End Cap Specifications**  
(not to scale)
- Size (L x W x H)**  
26.5" x 71" x 45.1"  
673 mm x 1803 mm x 1145 mm
- End Cap Storage**  
14.9 ft<sup>3</sup> (0.42 m<sup>3</sup>)
- Min. Installed Storage\***  
45.1 ft<sup>3</sup> (1.28 m<sup>3</sup>)
- Weight**  
49 lbs (22.2 kg)



**StormTech MC-3500 Specifications**

**Storage Volume Per Chamber**

Bare Chamber Storage ft <sup>3</sup> (m <sup>3</sup> )	Chamber and Stone Foundation Depth in. (mm)			
	9 in (230 mm)	12 in (300 mm)	15 in (375 mm)	18 in (450 mm)
Chamber	109.9 (3.11)	175.0 (4.96)	179.9 (5.09)	184.9 (5.24)
End Cap	14.9 (0.42)	45.1 (1.28)	46.6 (1.32)	48.3 (1.37)

**Amount of Stone Per Chamber**

English Tons (yds <sup>3</sup> )	Stone Foundation Depth			
	9 in	12 in	15 in	18 in
Chamber	8.5 (6.0)	9.1 (6.5)	9.7 (6.9)	10.4 (7.4)
End Cap	3.9 (2.8)	4.1 (2.9)	4.3 (3.1)	4.5 (3.2)
Metric kilograms (m <sup>3</sup> )	230 mm	300 mm	375 mm	450 mm
Chamber	7711 (4.6)	8255 (5.0)	8800 (5.3)	9435 (5.7)
End Cap	3538 (2.1)	3719 (2.2)	3901 (2.4)	4082 (2.5)

**Volume Excavation Per Chamber yd<sup>3</sup> (m<sup>3</sup>)**

Chamber	Stone Foundation Depth			
	9 in (230 mm)	12 in (300 mm)	15 in (375 mm)	18 in (450 mm)
Chamber	11.9 (9.1)	12.4 (9.5)	12.8 (9.8)	13.3 (10.2)
End Cap	4.0 (3.1)	4.1 (3.3)	4.3 (3.3)	4.4 (3.4)

ADS StormTech products, manufactured in accordance with ASTM F2418 or ASTM F2922, comply with all requirements in the Build America, Buy America (BABA) Act.

Working on a project?  
Visit us at [adspipes.com/stormtech](http://adspipes.com/stormtech) and utilize the Design Tool



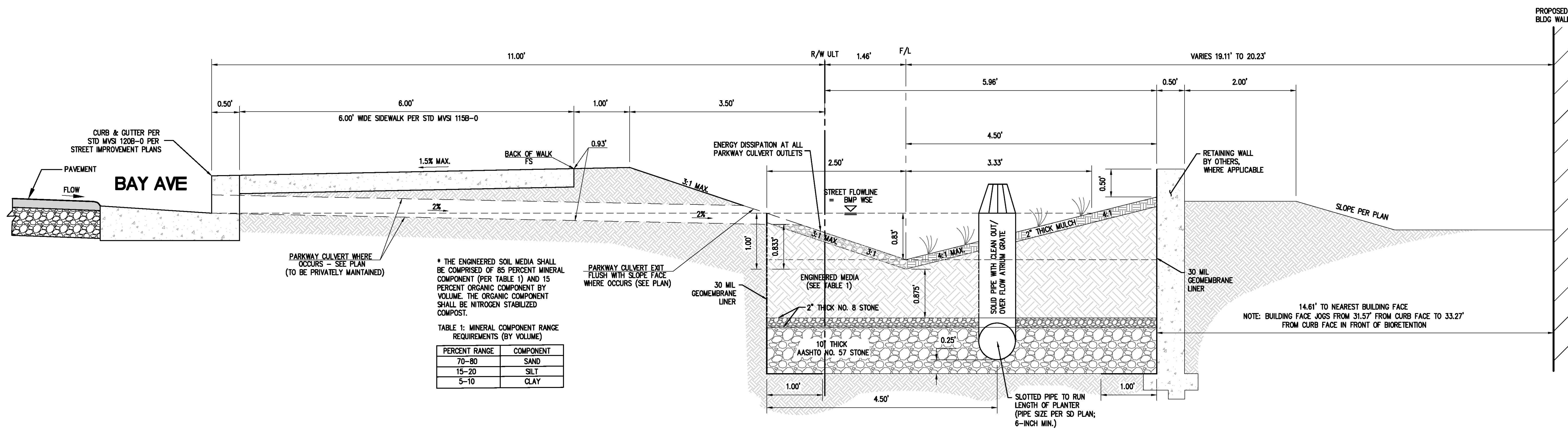
adspipe.com  
800-821-6710

OWNER:  
LDC MOLTO EDGEMONT, LLC  
ONE LINCOLN CENTRE  
180140 BUTTERFIELD ROAD, #750  
OAKBROOK TERRACE, CA 90181  
TEL: 949-226-4601

ENGINEER:  
Thienes Engineering, Inc.  
CIVIL ENGINEERING - LAND SURVEYING  
14319 FRESTONE BOULEVARD  
LA BREA, CALIFORNIA 90639  
PH: 949-481-1422 FAX: 949-481-1422  
EMAIL: GCS@THIENESINC.COM

CITY OF MORENO VALLEY  
PUBLIC WORKS DEPARTMENT  
PRELIMINARY WQMP SITE MAP  
PEN21-0123 / LWQ23-0013  
BAY AND DAY INDUSTRIAL BUILDING  
SOUTHWEST CORNER  
OF  
BAY AVENUE AND DAY STREET  
MORENO VALLEY, CALIFORNIA

2 of 3 Sheets

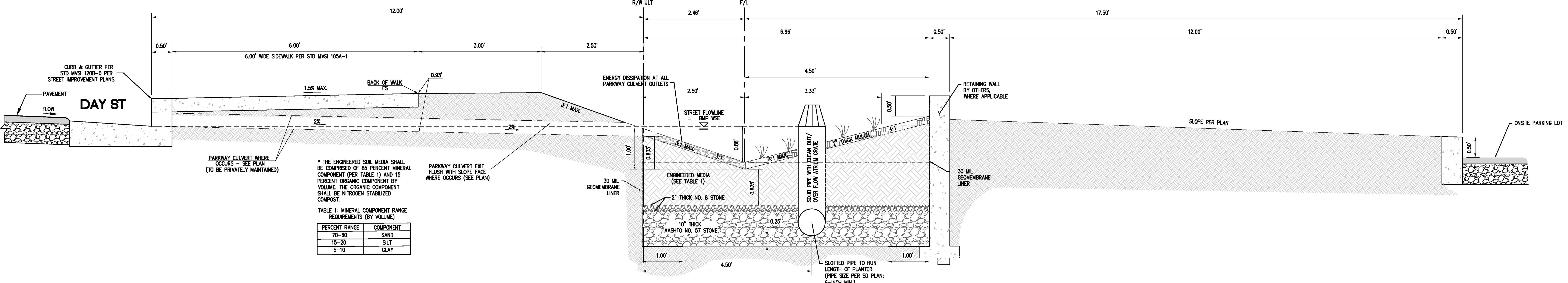


\* THE ENGINEERED SOIL MEDIA SHALL BE COMPRISED OF 85 PERCENT MINERAL COMPONENT (PER TABLE 1) AND 15 PERCENT ORGANIC COMPONENT BY VOLUME. THE ORGANIC COMPONENT SHALL BE NITROGEN STABILIZED COMPOST.

TABLE 1: MINERAL COMPONENT RANGE REQUIREMENTS (BY VOLUME)

PERCENT RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

**STREET BMP - BAY AVE BIORETENTION #2, #3 AND #4**  
**LENGTH = 72 LF FOR #2**  
**LENGTH = 54 LF FOR #3 AND #4**



\* THE ENGINEERED SOIL MEDIA SHALL BE COMPRISED OF 85 PERCENT MINERAL COMPONENT (PER TABLE 1) AND 15 PERCENT ORGANIC COMPONENT BY VOLUME. THE ORGANIC COMPONENT SHALL BE NITROGEN STABILIZED COMPOST.

TABLE 1: MINERAL COMPONENT RANGE REQUIREMENTS (BY VOLUME)

PERCENT RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

**STREET BMP - DAY ST BIORETENTION #5, #6 AND #7**  
**LENGTH = 50 LF FOR #5 AND #7**  
**LENGTH = 32 LF FOR #6**

OWNER:  
LDC MOLTO EDMONT, LLC  
ONE LINCOLN CENTRE  
18W140 BUTTERFIELD ROAD, #750  
OAKBROOK TERRACE, CA 90181  
TEL: 949-226-4601

ENGINEER:  
**Thienes Engineering, Inc.**  
CIVIL ENGINEERING & LAND SURVEYING  
1438 FORESTONE BLVD  
LA MIRADA, CALIFORNIA 90638  
PH: 714-951-6611 FAX: 714-951-1172  
EMAIL: GESAN@THIENES.COM

CITY OF MORENO VALLEY  
PUBLIC WORKS DEPARTMENT  
**PRELIMINARY WOMP SITE MAP**  
PEN21-0123 / LWQ23-0013  
**BAY AND DAY INDUSTRIAL BUILDING**  
SOUTHWEST CORNER  
OF  
BAY AVENUE AND DAY STREET  
MORENO VALLEY, CALIFORNIA

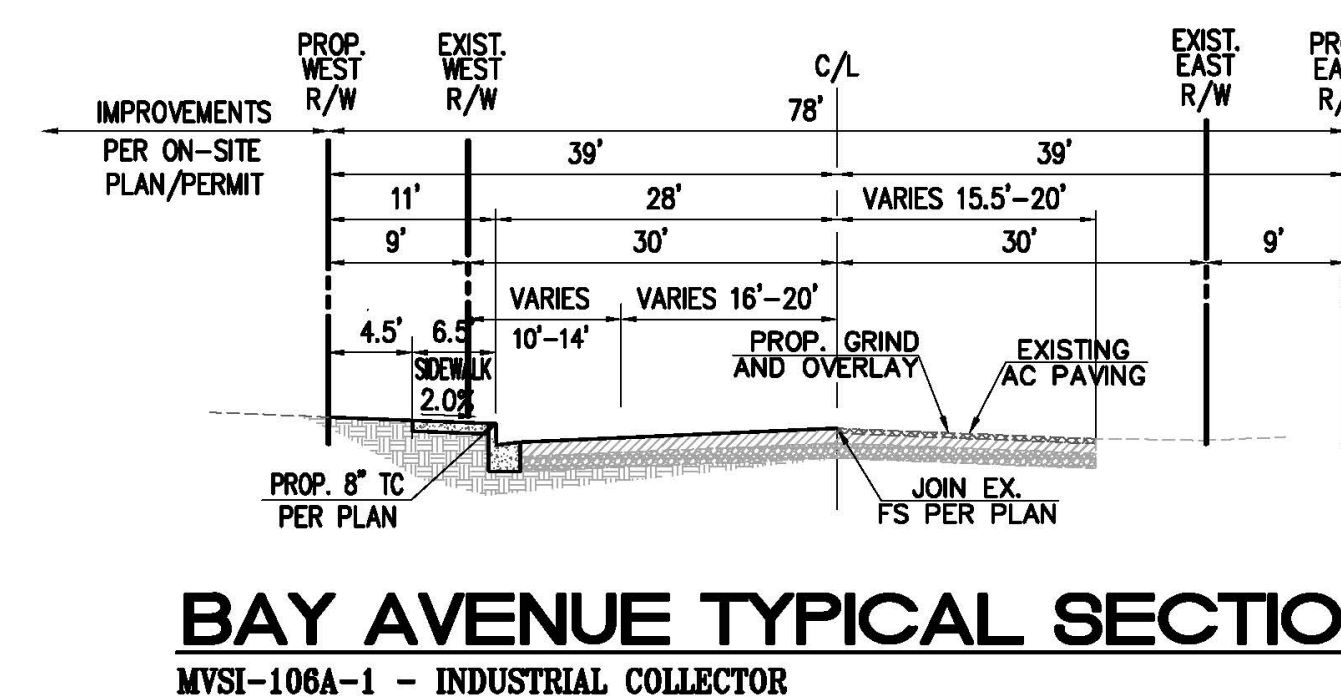
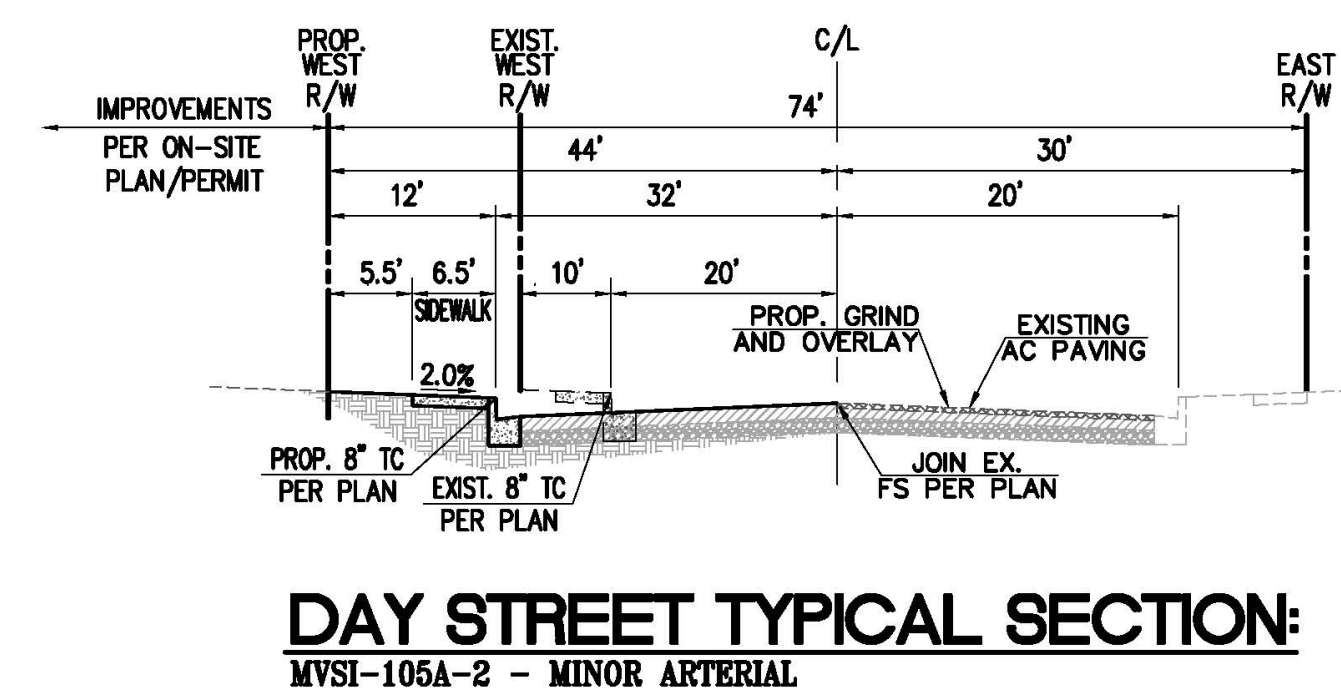
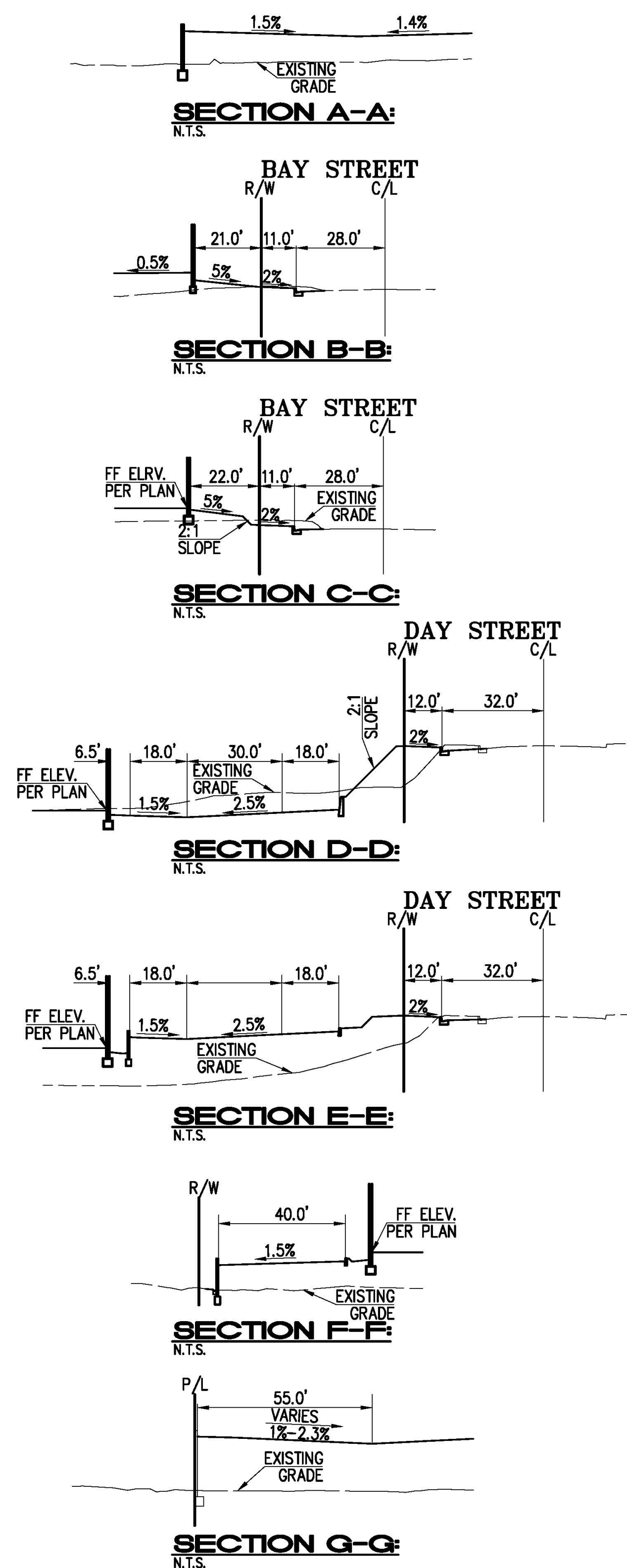
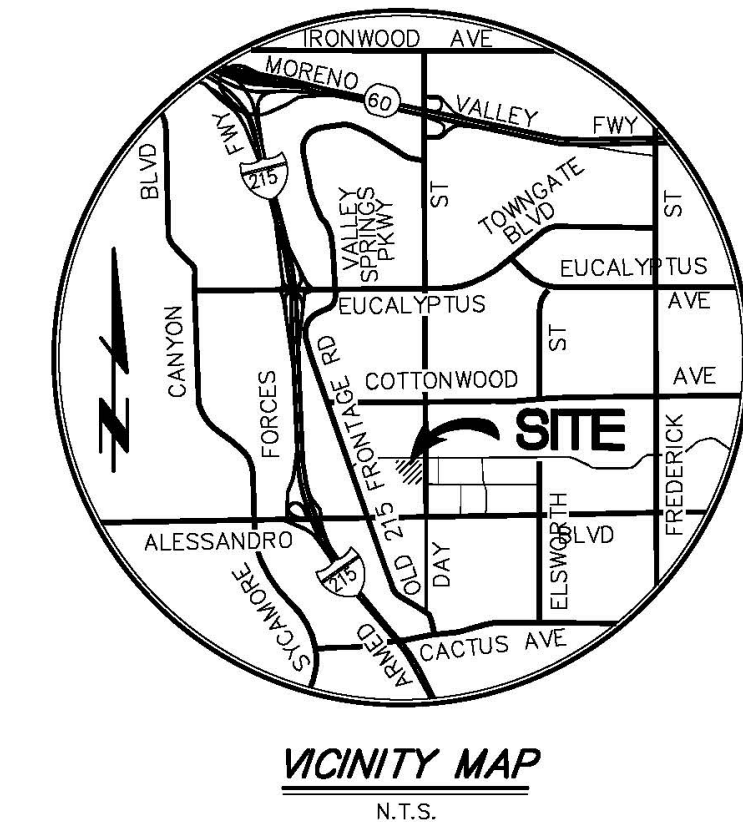
JUN 30 2023

3 of 3 Sheets

# Appendix 2: Construction Plans

*Grading and Drainage Plans*

# CONCEPTUAL GRADING PLAN FOR BAY AVENUE AND DAY STREET MORENO VALLEY, CA



**EARTHWORK BALANCE CALCULATIONS**

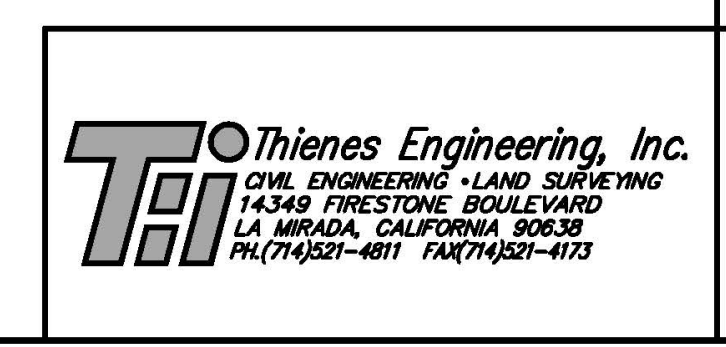
PROJECT: BAY AND DAY  
JOB#: 3930

K. SITE AREA:	450,208 SF
L. SUBSIDENCE FACTOR:	0.125
M. SHRINKAGE FACTOR:	10.0 %
N. SITE STRIPPING FACTOR:	0.10
O. OVEREXCAVATION:	36,815.00 CY
A. CALCULATED CUT:	11,146 CY
B. FOOTING AND UTILITY SPOILS:	2,571 CY
B1. UNDERGROUND STORAGE:	3,984 CY
C. TOTAL CUT: (A+B):	17,701 CY
D. CALCULATED FILL:	86,829 CY
E. LIGHT PAVING FILL:	— CY
F. SUBSIDENCE: (LxK)/27=	2,084 CY
G. SHRINKAGE: (M/100)C=	1,770 CY
H. SITE STRIPPING:	1,667
I. OVEREXCAVATION SHRINKAGE:	3,682 CY
J. TOTAL FILL: (D+E+F+G+H)=	96,032 CY
K. TOTAL (IMPORT) OR EXPORT:	(78,331) CY

SHEET INDEX	
1	TITLE SHEET
2	CONCEPTUAL GRADING PLAN
3	CONCEPTUAL UTILITY PLAN
4	CONCEPTUAL STORM DRAIN PLAN
5	CONCEPTUAL STORM DRAIN PROFILES
6	CONCEPTUAL BMP DETAILS
7	RETAINING WALL PROFILES
8	CONCEPTUAL BOUNDARY AND EASEMENT
9	TRUCK TURN EXHIBIT

**NOTES:**

- THE PROPERTY INDICATED HEREON IS SITUATED WITHIN THE FLOOD INSURANCE RATE MAP (F.I.R.M.) WITH MAP NO. 0806507460, EFFECTIVE DATE: AUGUST 28, 2008. COMMUNITY NUMBER: 080574 FOR CITY OF MORENO VALLEY. PANEL NUMBER: 0746. SUFFIX: "C". ZONE "X-UNSHADED" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN).
- SEE SHEET 6 FOR LEGAL DESCRIPTION AND EASEMENTS



PEN21-0123

**CITY OF MORENO VALLEY**  
PUBLIC WORKS DEPARTMENT

**TITLE SHEET**  
BAY AVENUE AND DAY STREET

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

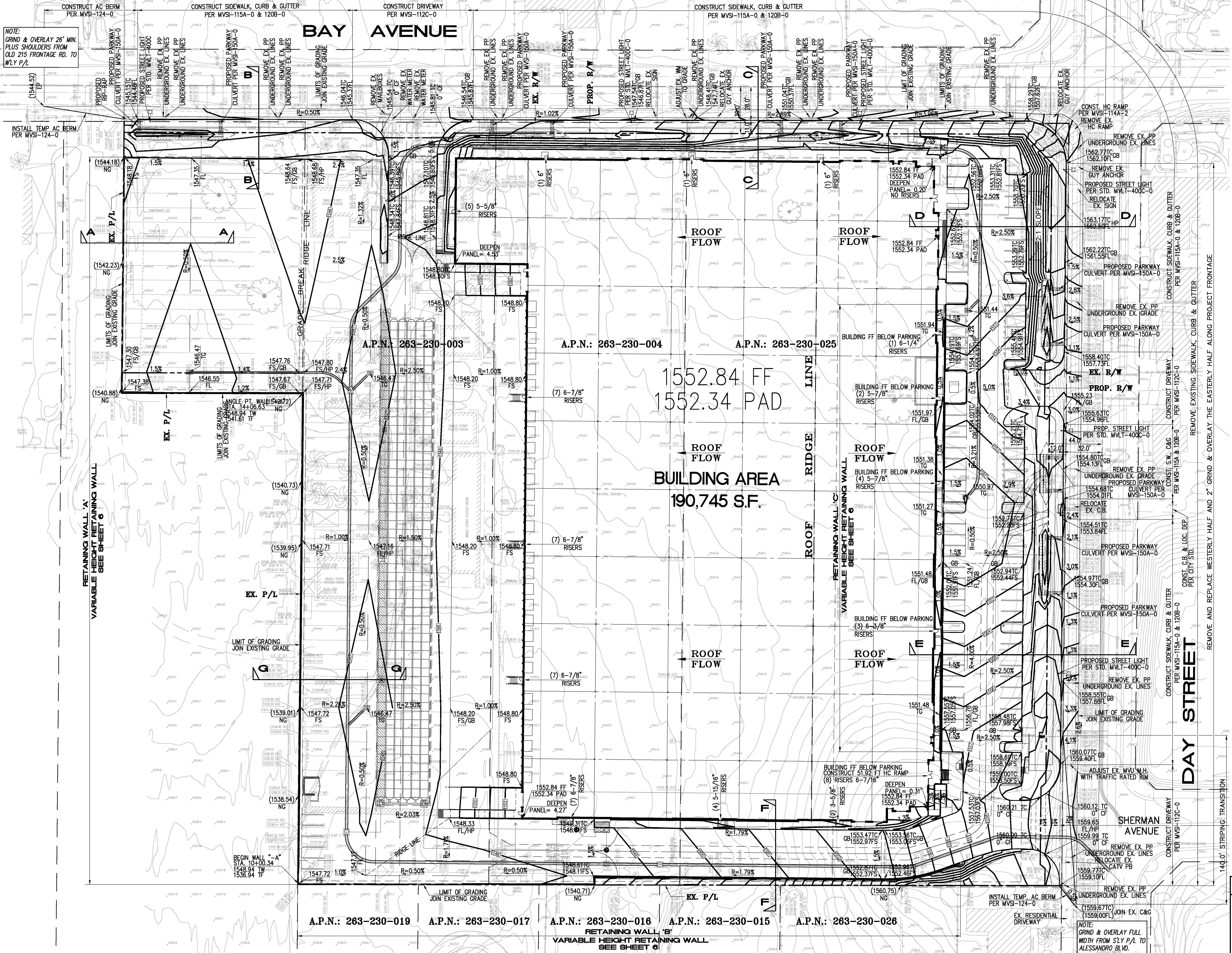
Sheet **1** of **9** Sheets

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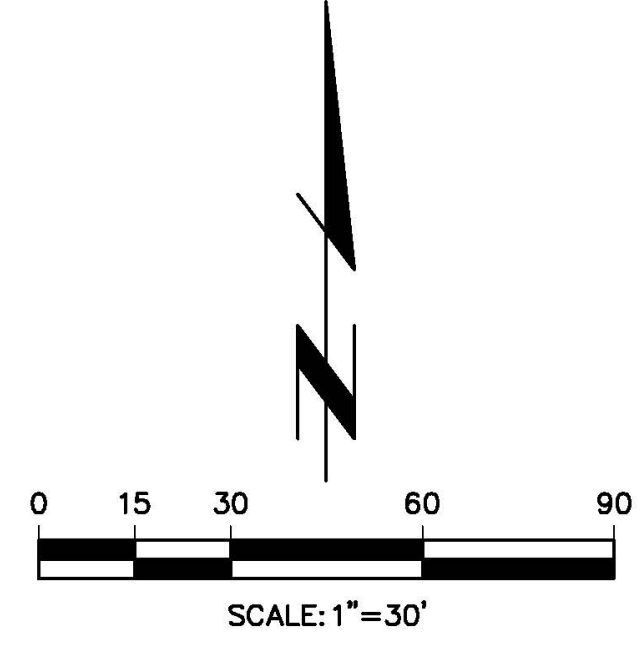
REMOVE AND REPLACE WESTERLY HALF AND 2" GRIND & OVERLAY THE EASTERLY HALF ALONG PROJECT FRONTAGE



NOTE:  
GRIND & OVERLAY 26" MIN.  
PLUS SHOULDERS FROM  
OLD 215 FRONTAGE RD. TO  
WLY P/L

RETAINING WALL 'A'  
VARIABLE HEIGHT RETAINING WALL  
SEE SHEET 6

DAY STREET  
REMOVE AND REPLACE WESTERLY HALF AND 2" GRIND & OVERLAY THE EASTERLY HALF ALONG PROJECT FRONTAGE



A.P.N.: 263-230-019    A.P.N.: 263-230-017    A.P.N.: 263-230-016    A.P.N.: 263-230-015    A.P.N.: 263-230-026

RETAINING WALL 'B'  
VARIABLE HEIGHT RETAINING WALL  
SEE SHEET 6

PEN21-0123  
CITY OF MORENO VALLEY  
PUBLIC WORKS DEPARTMENT  
**CONCEPTUAL GRADING PLAN**  
BAY AVENUE AND DAY STREET

Designed by	Approved by	Date
Checked by	Public Works Director	R.C.E.
Designed by		
Checked by		
Sheet <b>2</b> of <b>9</b> Sheets		

**Thienes Engineering, Inc.**  
CIVIL ENGINEERING - LAND SURVEYING  
14349 FINESTONE BOULEVARD  
LA MIRADA, CALIFORNIA 90638  
PH: (562) 461-1111 FAX: (562) 461-1112

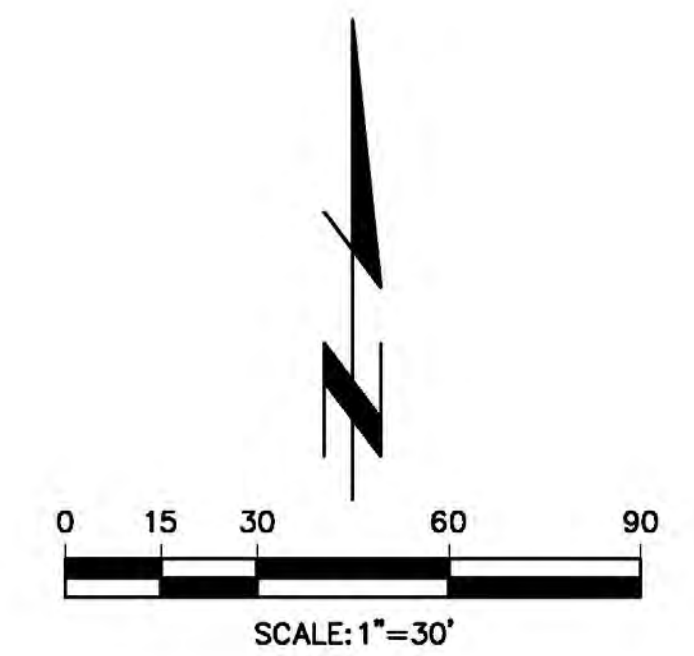
# BAY AVENUE

(PUBLIC STREET)

BUILDING AREA  
190,745 S.F.

DAY STREET

SHERMAN AVENUE



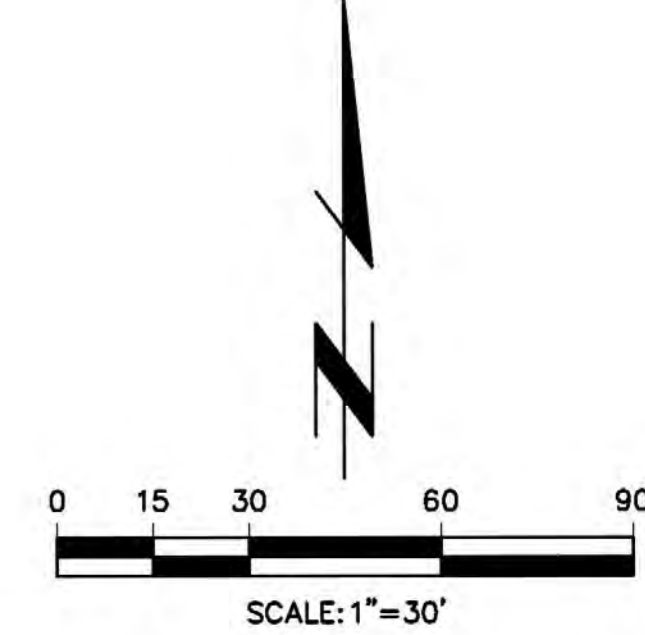
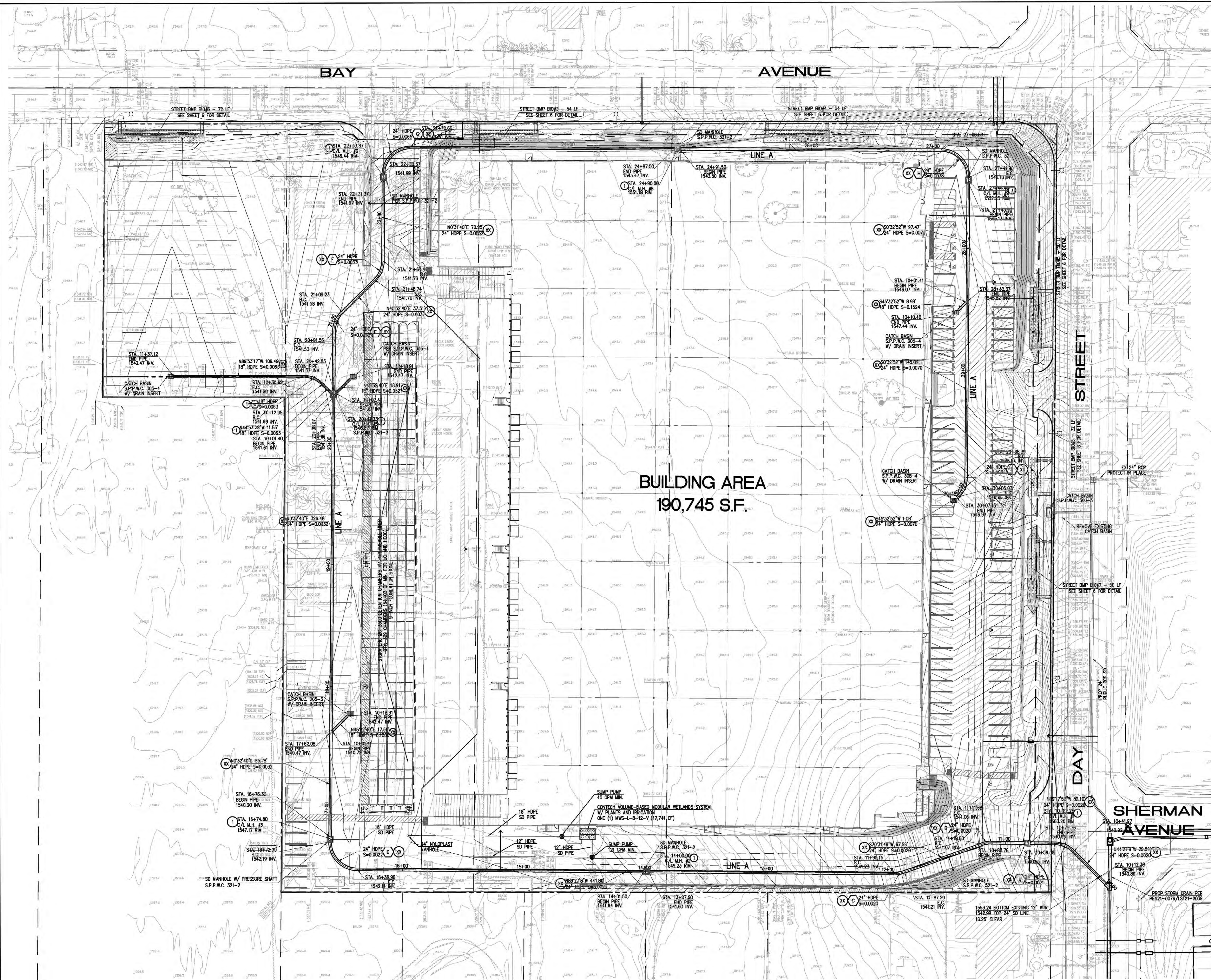
PEN21-0123

CITY OF MORENO VALLEY  
PUBLIC WORKS DEPARTMENT  
**CONCEPTUAL UTILITY PLAN**  
BAY AVENUE AND DAY STREET

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14349 FINESTONE BOULEVARD  
LA MIRADA, CALIFORNIA 90638  
PH: 714-261-4111 FAX: 714-261-4112

Designed by _____	Approved by _____	Date _____
Checked by _____	Public Works Director _____	R.C.E.
Designed by _____		
Checked by _____		
Date _____	Sheet <b>3</b> of <b>9</b> Sheets	

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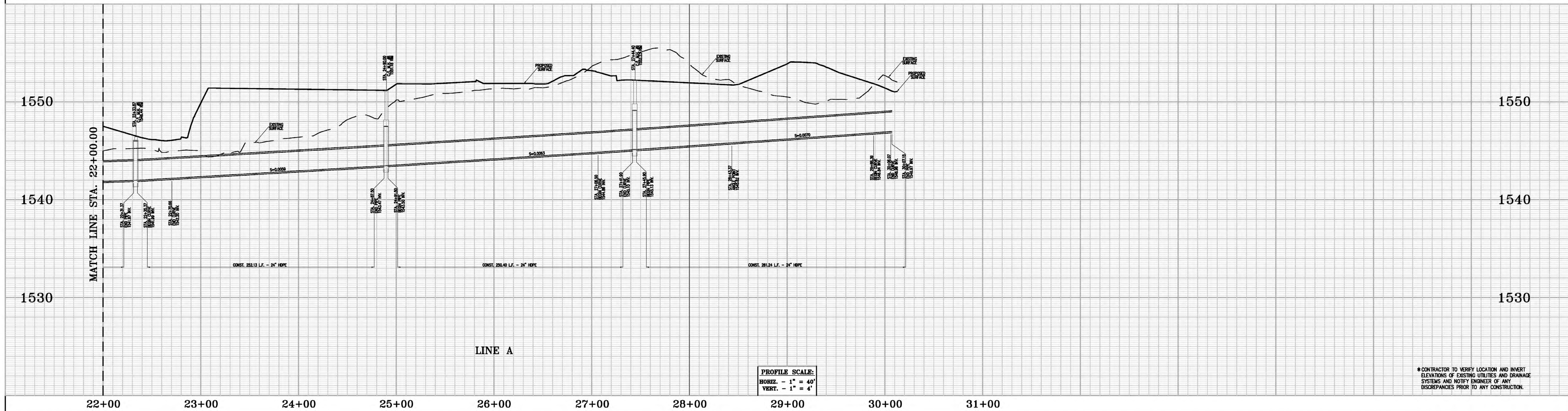
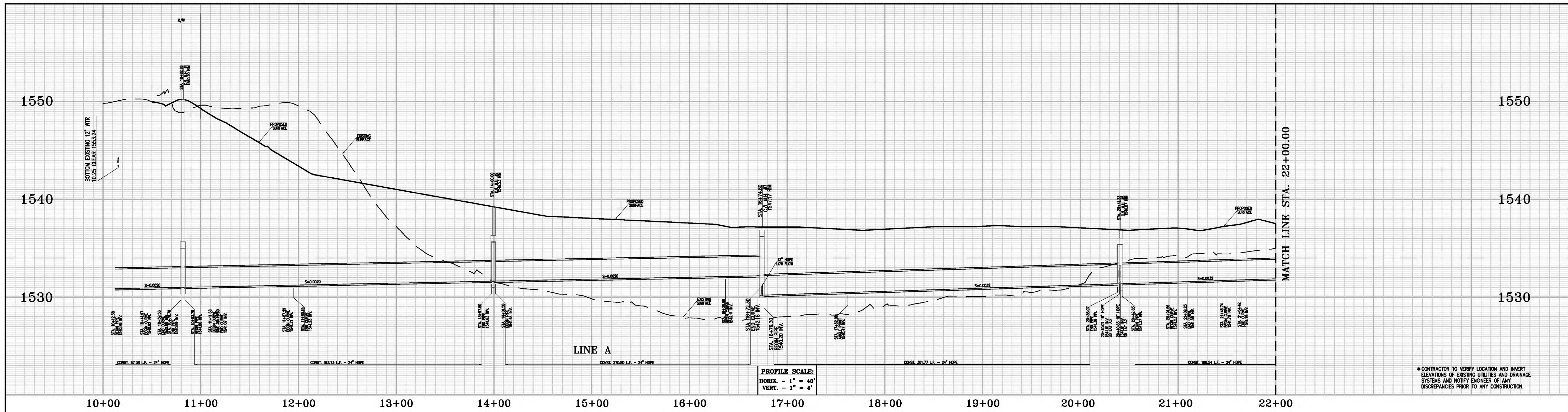
**PEN21-0123**  
 CITY OF MORENO VALLEY  
 PUBLIC WORKS DEPARTMENT  
**CONCEPTUAL STORM DRAIN PLAN**  
 BAY AVENUE AND DAY STREET

**Tai** Thienes Engineering, Inc.  
 CIVIL ENGINEERING - LAND SURVEYING  
 14300 FIRESTONE BOULEVARD  
 LA MIRADA, CALIFORNIA 90638  
 (714) 962-4811 FAX (714) 962-4123

Designed by _____	Aproved by _____	Date _____
Checked by _____	Public Works Director _____	R.C.E.
Designed by _____		
Checked by _____		
Date _____		

Sheet **4** of **9** Sheets

3930 / 4 OF 9 SHEETS



\* CONTRACTOR TO VERIFY LOCATION AND INVERT ELEVATIONS OF EXISTING UTILITIES AND DRAINAGE SYSTEMS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ANY CONSTRUCTION.

\* CONTRACTOR TO VERIFY LOCATION AND INVERT ELEVATIONS OF EXISTING UTILITIES AND DRAINAGE SYSTEMS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ANY CONSTRUCTION.

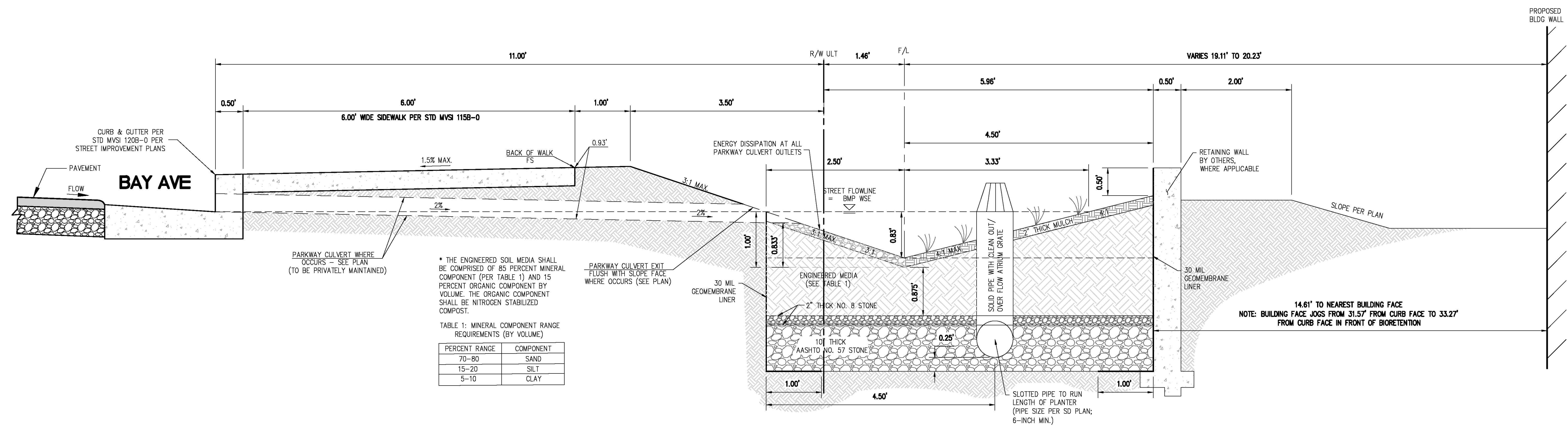
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CITY OF MORENO VALLEY  
PUBLIC WORKS DEPARTMENT  
**CONCEPTUAL STORM DRAIN PLAN**  
BAY AVENUE AND DAY STREET



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3930 / 5 OF 9 SHEETS

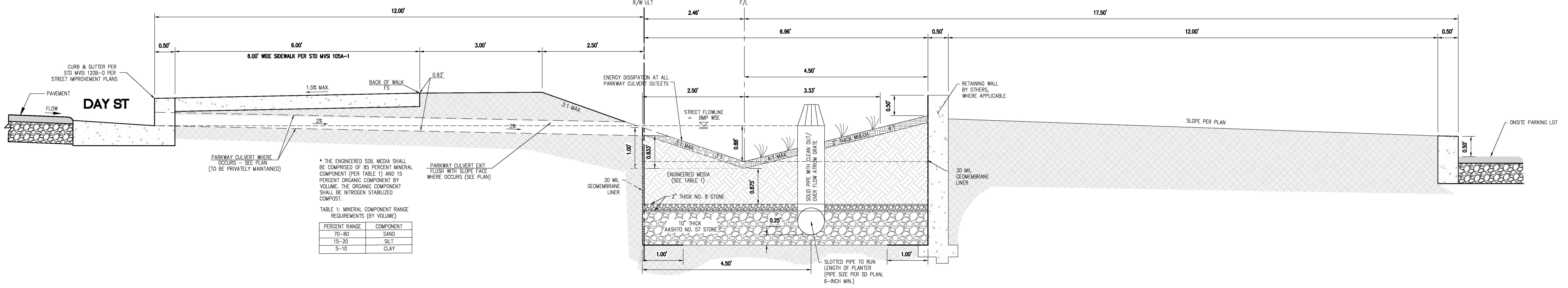


\* THE ENGINEERED SOIL MEDIA SHALL BE COMPRISED OF 85 PERCENT MINERAL COMPONENT (PER TABLE 1) AND 15 PERCENT ORGANIC COMPONENT BY VOLUME. THE ORGANIC COMPONENT SHALL BE NITROGEN STABILIZED COMPOST.

TABLE 1: MINERAL COMPONENT RANGE REQUIREMENTS (BY VOLUME)

PERCENT RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

**STREET BMP - BAY AVE BIORETENTION #2, #3 AND #4**  
 LENGTH = 72 LF FOR #2  
 LENGTH = 54 LF FOR #3 AND #4



\* THE ENGINEERED SOIL MEDIA SHALL BE COMPRISED OF 85 PERCENT MINERAL COMPONENT (PER TABLE 1) AND 15 PERCENT ORGANIC COMPONENT BY VOLUME. THE ORGANIC COMPONENT SHALL BE NITROGEN STABILIZED COMPOST.

TABLE 1: MINERAL COMPONENT RANGE REQUIREMENTS (BY VOLUME)

PERCENT RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

**STREET BMP - DAY ST BIORETENTION #5, #6 AND #7**  
 LENGTH = 50 LF FOR #5 AND #7  
 LENGTH = 32 LF FOR #6

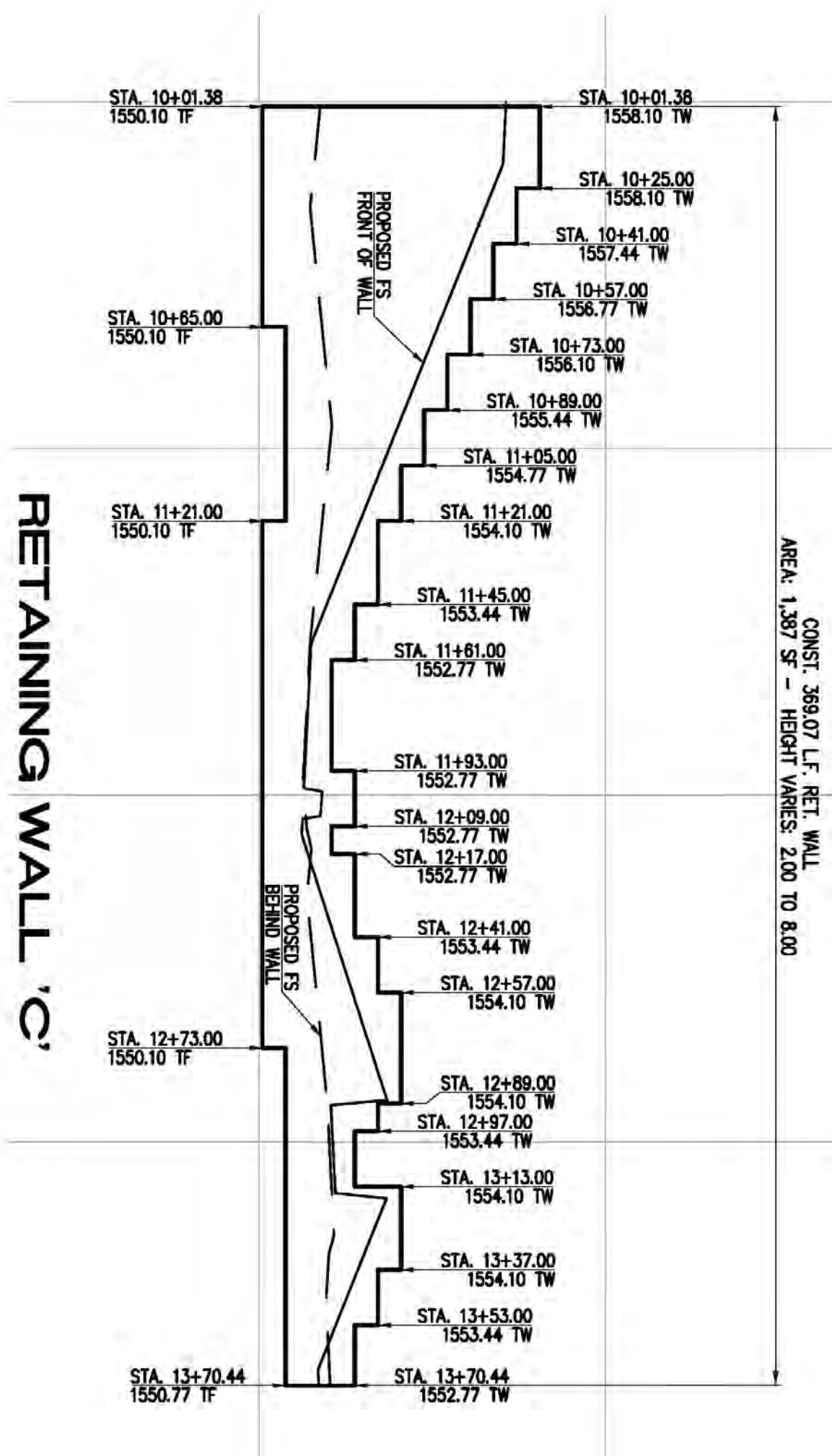
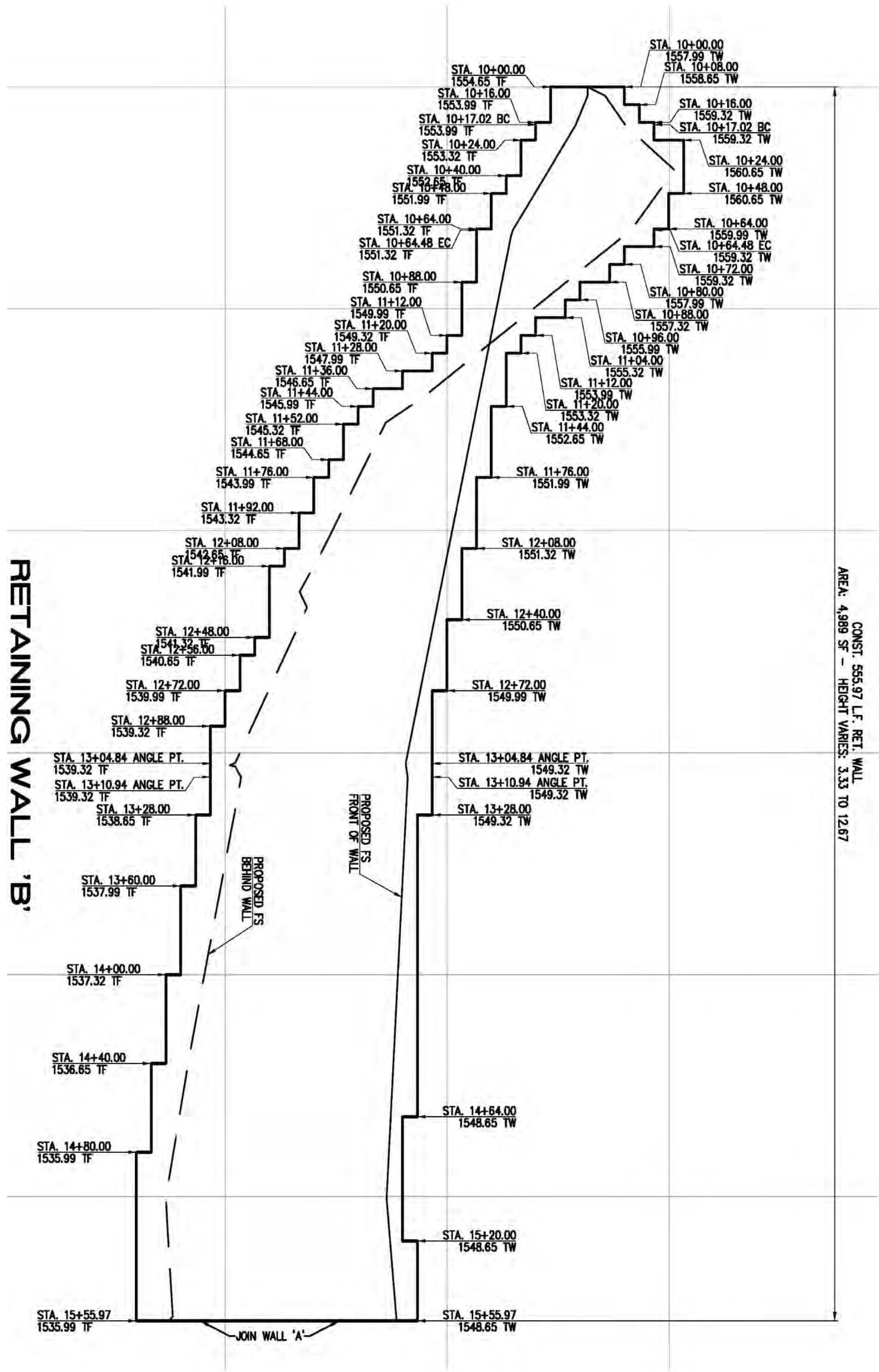
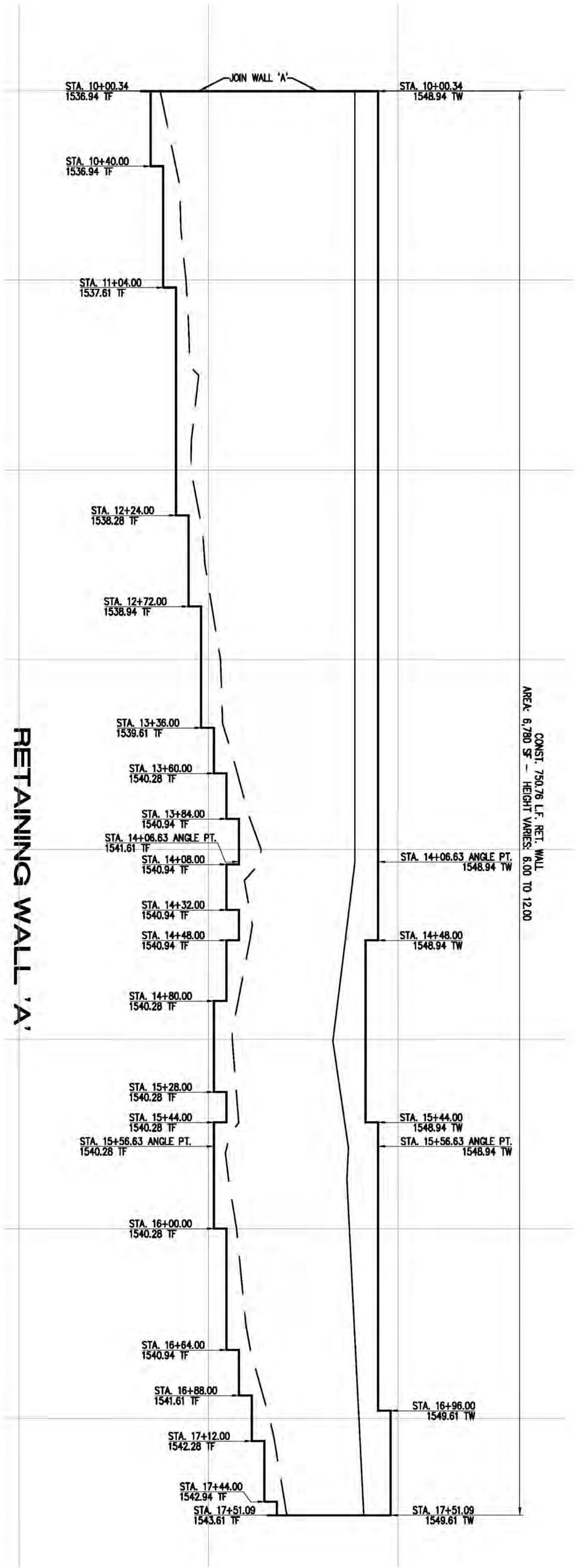
PEN21-0123

CITY OF MORENO VALLEY  
 PUBLIC WORKS DEPARTMENT  
**CONCEPTUAL BMP DETAILS**  
 BAY AVENUE AND DAY STREET

**Thienes Engineering, Inc.**  
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 14310 FIRESTONE BOULEVARD  
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 (714) 952-4811 FAX (714) 952-4172

Designed by _____	Approved by _____	Date _____
Checked by _____	Public Works Director	R.C.E.
Designed by _____		
Checked by _____		
Date _____	Sheet <b>6</b> of <b>9</b> Sheets	

39.30 / 6 OF 9 SHEETS



PROFILE SCALE:  
 HORIZ. - 1" = 40'  
 VERT. - 1" = 4'

PEN21-0123  
 CITY OF MORENO VALLEY  
 PUBLIC WORKS DEPARTMENT  
**RETAINING WALL PROFILES**  
 BAY AVENUE AND DAY STREET



Designed by	Approved by	Date
Drawn by	Public Works Director	R.C.E.
Checked by		
Date		

**BAY AVENUE**

**DAY STREET**

**BUILDING AREA  
190,745 S.F.**

**EXISTING EASEMENTS:**

- ① AN EASEMENT FOR SEWER PIPELINE AND INCIDENTAL PURPOSES, RECORDED MAY 06, 1964 AS INSTRUMENT NO. 56197 OF OFFICIAL RECORDS. IN FAVOR OF: EDGEMONT COMMUNITY SERVICES DISTRICT
- ② AN EASEMENT FOR DRAINAGE AND INCIDENTAL PURPOSES, RECORDED NOVEMBER 03, 2008 AS INSTRUMENT NO. 2008-0587818 OF OFFICIAL RECORDS. IN FAVOR OF: CITY OF MORENO VALLEY TO BE QUITCLAIM
- ③ AN EASEMENT FOR PONDING AND INCIDENTAL PURPOSES, RECORDED NOVEMBER 03, 2008 AS INSTRUMENT NO. 2008-0587819 OF OFFICIAL RECORDS. IN FAVOR OF: CITY OF MORENO VALLEY TO BE QUITCLAIM

**BASIS OF BEARINGS:**

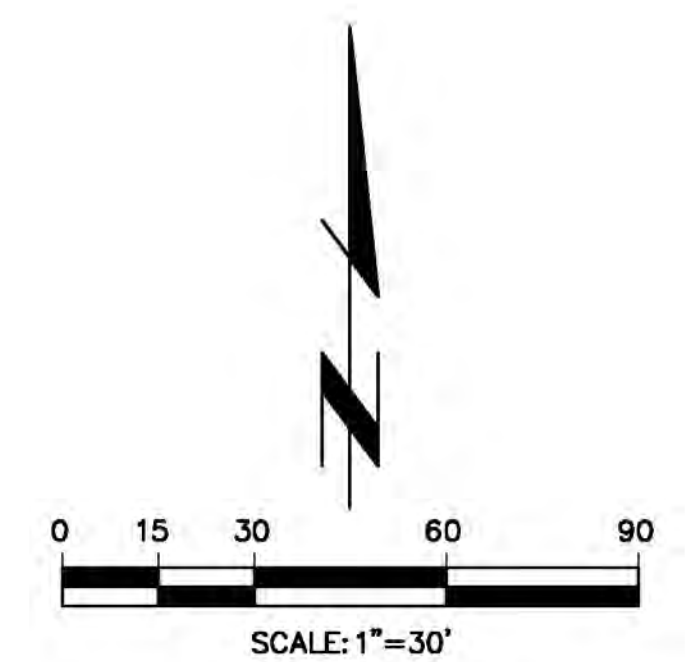
THE BASIS OF BEARINGS FOR THIS SURVEY IS THE CALIFORNIA STATE PLANE COORDINATE SYSTEM (CCS83), ZONE 6, NORTH AMERICAN DATUM 1983 (NAD83) BASED LOCALLY ON CONTINUOUSLY OPERATING REFERENCE STATIONS (CORS) "MLFP" AND "P584" AS BEING NORTH 84°41'07.4104" WEST (BASIS OF BEARINGS) (GRID) AND REPRESENTED HEREON BY THE CENTERLINE OF ALESSANDRO AVENUE AS BEING NORTH 89°14'42" EAST. (2010.0 EPOCH)

**EXISTING LEGAL DESCRIPTION:**

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:  
 LOT 35 OF EDGEMONT 2 AS SHOWN BY MAP ON FILE IN BOOK 12, PAGE 19 OF MAPS, RECORDS OF RIVERSIDE COUNTY, CALIFORNIA.  
 TOGETHER WITH THE EAST ONE-HALF (1/2) OF LOT 34 OF EDGEMONT #2 AS PER MAP RECORDED IN BOOK 12, PAGE 19, OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF RIVERSIDE COUNTY.

**PROPOSED:**

- ① PROPOSED EASEMENT FOR STREET AND PUBLIC UTILITY PURPOSES TO THE CITY OF MORENO VALLEY PER PARCEL MAP NO. 38179 (BAY STREET)
- ② PROPOSED EASEMENT FOR STREET AND PUBLIC UTILITY PURPOSES TO THE CITY OF MORENO VALLEY PER PARCEL MAP NO. 38179 (DAY STREET)

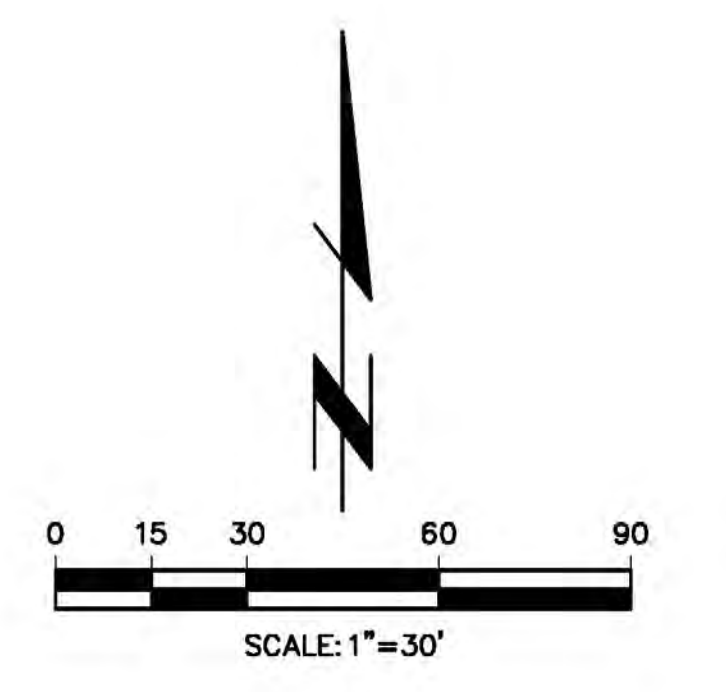
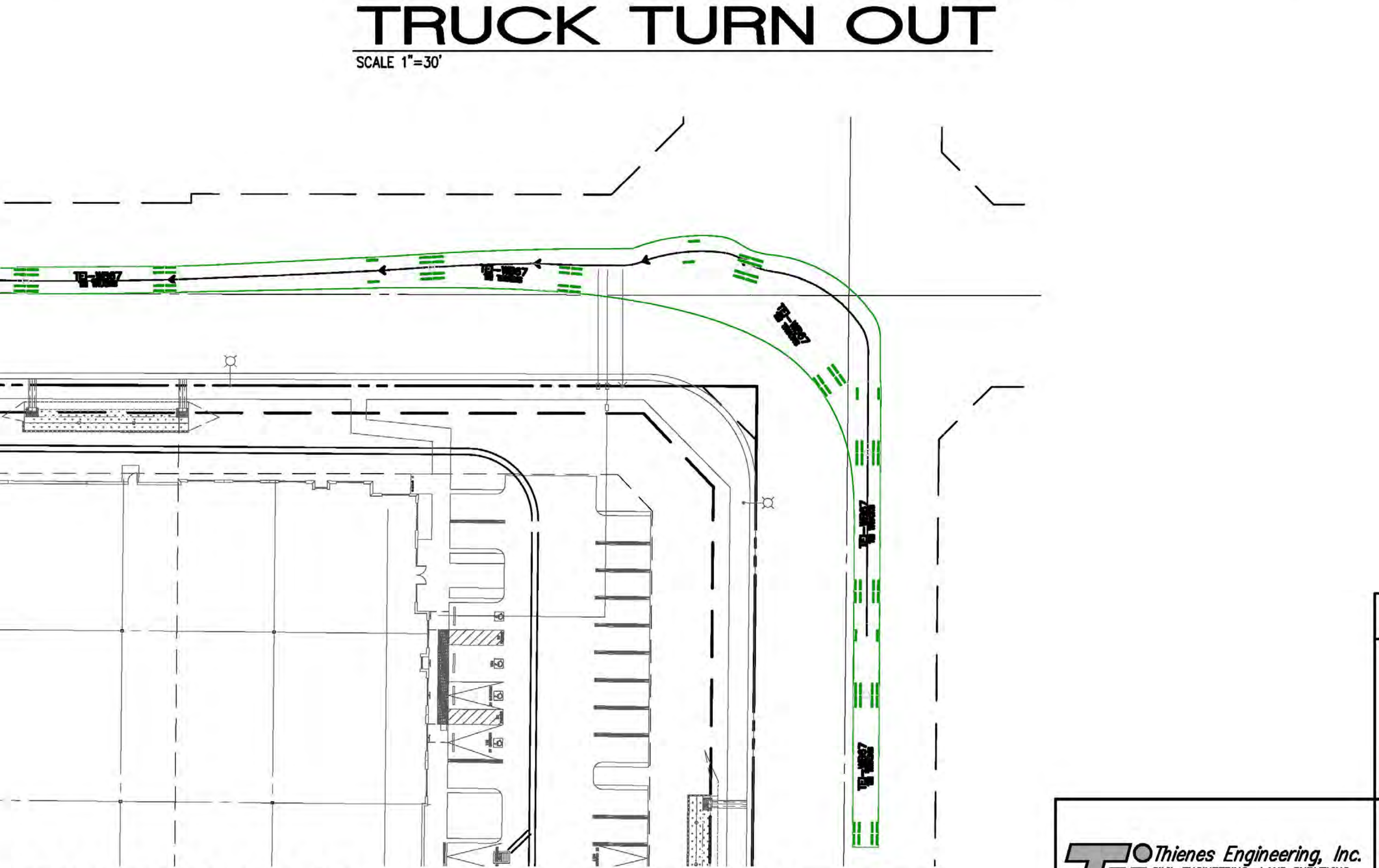
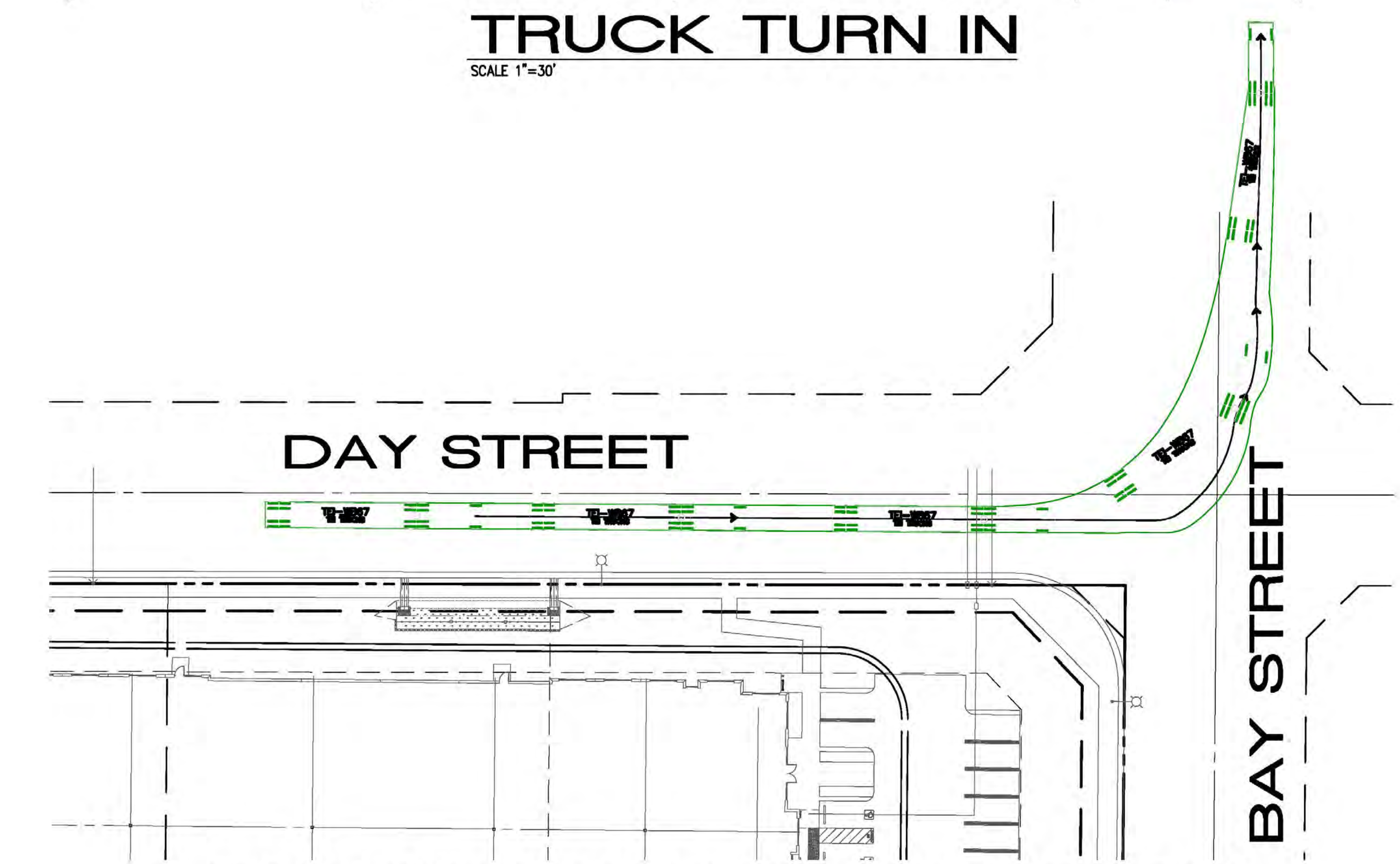
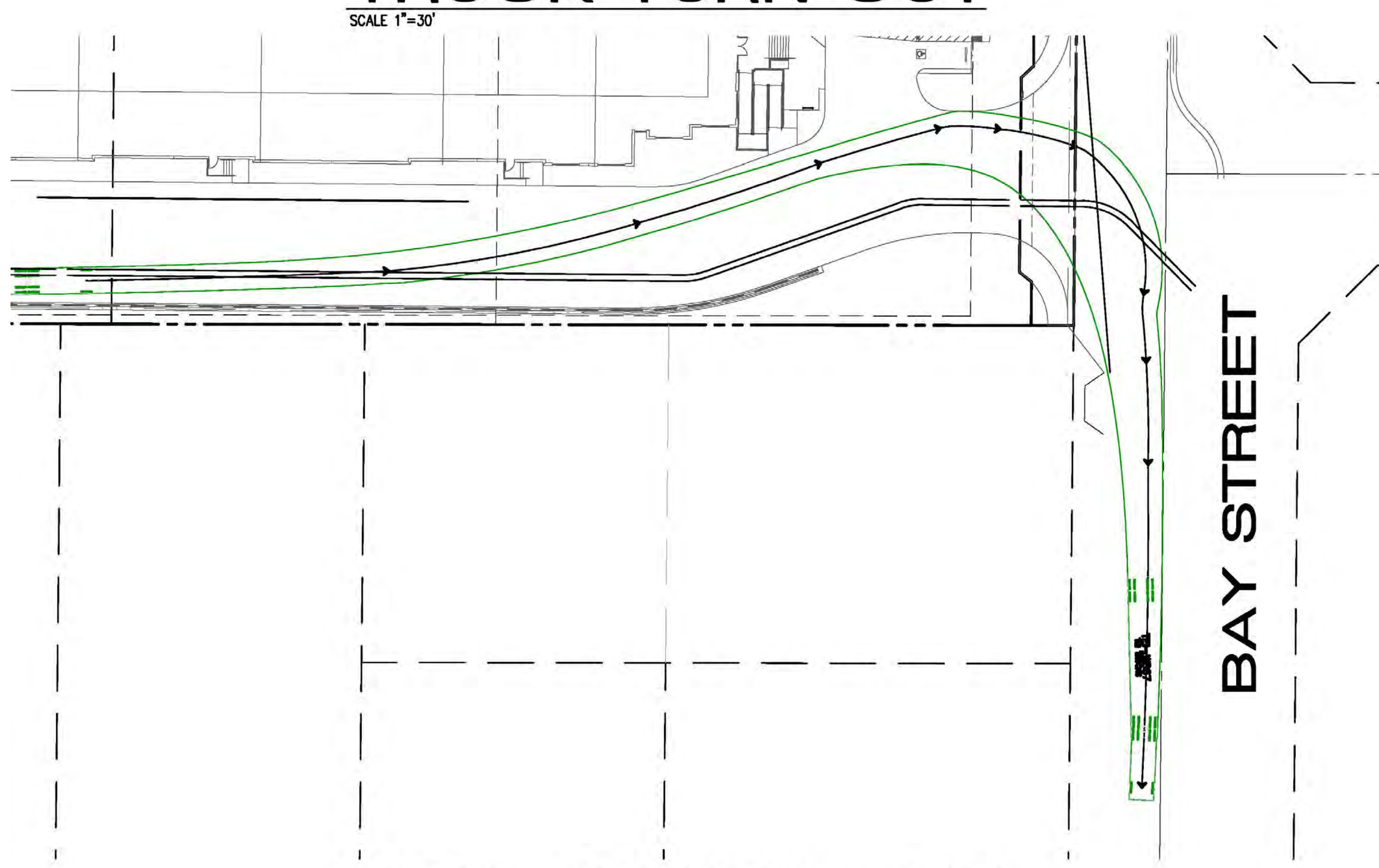
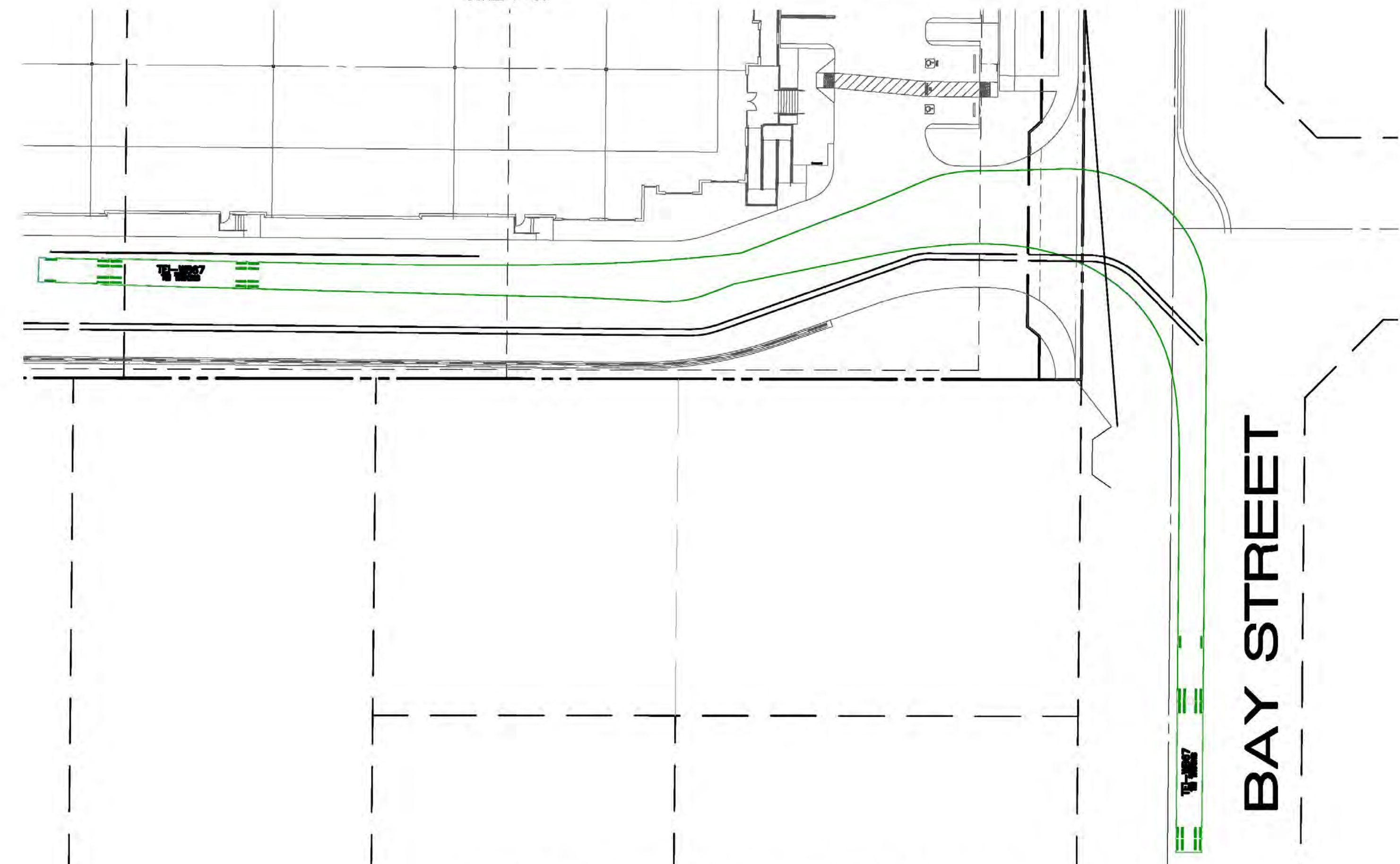
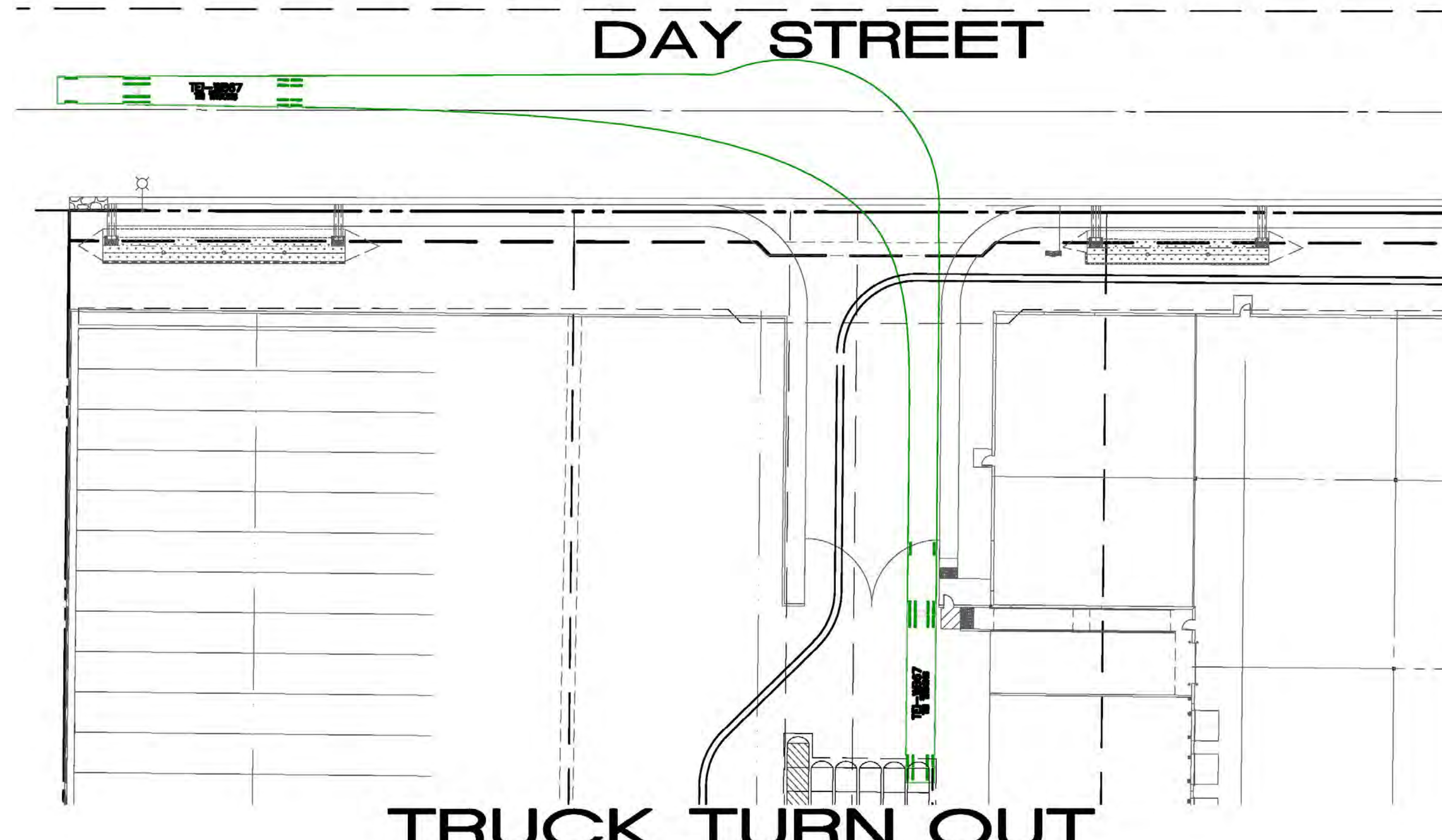
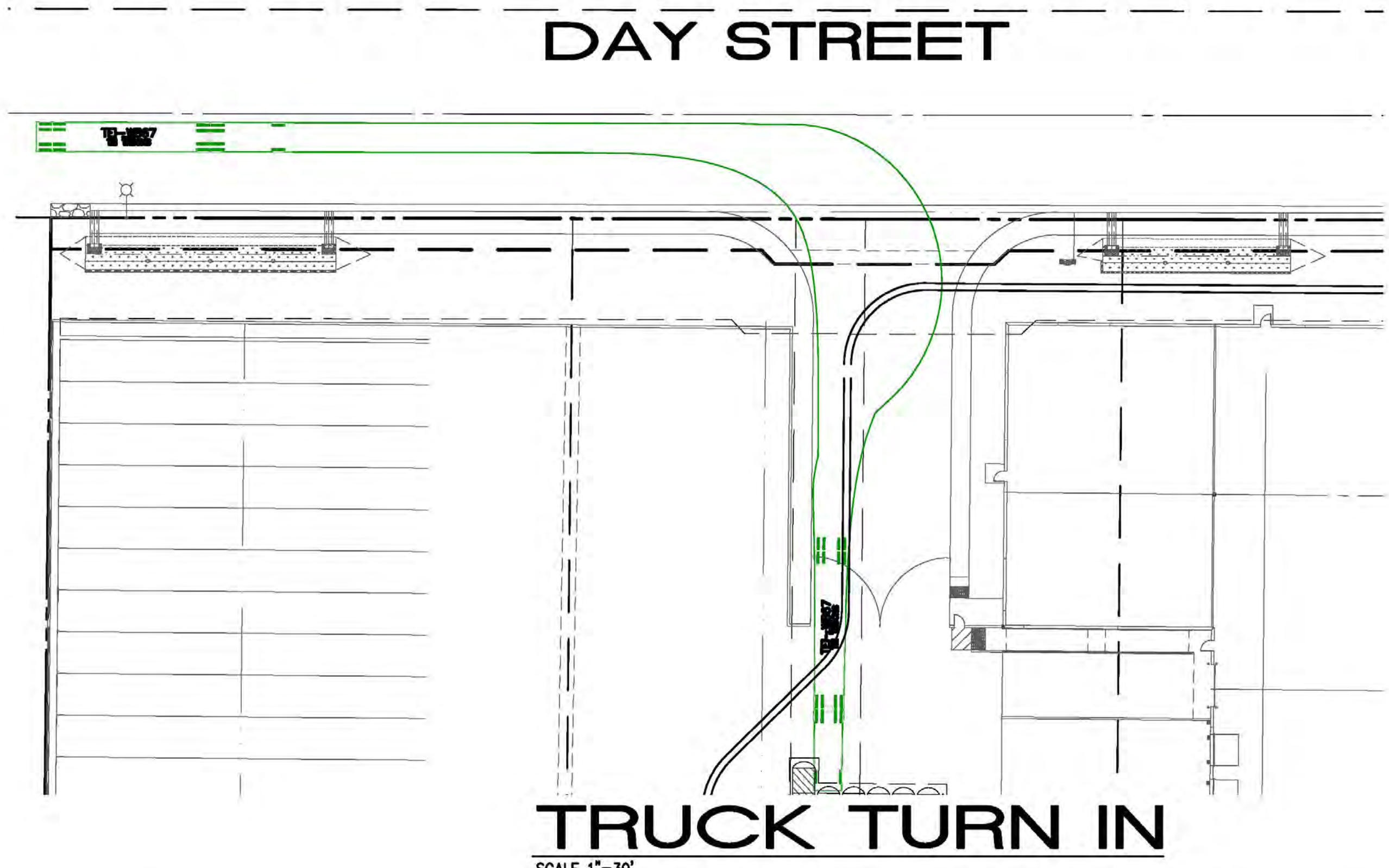


**PEN21-0123**  
 CITY OF MORENO VALLEY  
 PUBLIC WORKS DEPARTMENT  
**CONCEPTUAL BOUNDARY AND EASEMENT**  
**BAY AVENUE AND DAY STREET**

**Thienes Engineering, Inc.**  
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 14349 FINESTONE BOULEVARD  
 LA MIRADA, CALIFORNIA 92653  
 (949) 432-4811 FAX (949) 432-4112

Designed by _____	Approved by _____	Date _____
Checked by _____		
Date _____	Public Works Director _____	R.C.E. _____
Designed by _____		
Date _____		
Checked by _____		
Date _____		
Sheet <b>8</b> of <b>9</b> Sheets		

39.30 / 8 OF 9 SHEETS



PEN21-0123

CITY OF MORENO VALLEY  
PUBLIC WORKS DEPARTMENT

**TRUCK TURN EXHIBIT**  
BAY AVENUE AND DAY STREET

Designed by _____	Approved by _____	Date _____
Checked by _____	Public Works Director _____	R.C.E. _____
Designed by _____	Date _____	
Checked by _____	Date _____	
Sheet <b>9</b> of <b>9</b> Sheets		

39.30 / 9 OF 9 SHEETS

**Thienes Engineering, Inc.**  
CIVIL ENGINEERING - LAND SURVEYING  
14349 FIRESTONE BOULEVARD  
LA MIRADA, CALIFORNIA 90638  
PH: (714) 261-4811 FAX: (714) 261-4172



# Appendix 3: Soils Information

*Geotechnical Study and Other Infiltration Testing Data*

**GEOTECHNICAL INVESTIGATION**

Proposed Warehouse Building Development  
Southwest Corner Bay Avenue and Day Street  
Moreno Valley, California

LDC Molto Edgemont, LLC  
555 N. El Camino Real, A456  
San Clemente, California 92672

Project Number 22228-21  
January 22, 2021

**NorCal Engineering**

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

January 22, 2021

Project Number 22228-20

LDC Molto Edgemont, LLC  
555 N. El Camino Real, A456  
San Clemente, California 92672

Attn: Matthew Snyder

RE: **GEOTECHNICAL INVESTIGATION** - Proposed Warehouse  
Building Development - Located at the Southwest Corner of Bay  
Avenue and Day Street, in the City of Moreno Valley, California

Dear Mr. Snyder:

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 210,710 square feet on the 9.2-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 the southwest corner of Bay Avenue and Day Street, in the City of Moreno Valley, as shown on the Vicinity Map, Figure 1.
- 2.2 **Existing Improvements:** The property is occupied by several residential structure in the east portion of the site but is otherwise vacant and covered with light vegetation growth. A storm drain inlet is located near the east property line along Day Street.
- 2.3 **Drainage:** The site topography is generally flat and drainage pattern is not readily discernible. Land at the southeast corner of the property slopes down to the north gently on the order of 12 vertical feet.

## **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	33.921186°
	Longitude	-117.279323°
Site Class		D
Risk Category		II
Maximum Spectral Response Acceleration	S <sub>S</sub>	1.500g
	S <sub>1</sub>	0.600g
Adjusted Maximum Acceleration	S <sub>MS</sub>	1.500g
Design Spectral Response Acceleration Parameters	S <sub>DS</sub>	1.000g

The San Jacinto (San Jacinto Valley) Fault zone is located approximately 10 kilometers from the site and is capable of producing a Magnitude 6.9 earthquake and a  $PGA_M$  of 0.638g. 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 eight (8) subsurface exploratory borings by hollow-stem auger drill rig and hand auger and six (6) 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 sandy CLAY with gravel, some minor debris and roots were encountered in the explorations to depths ranging from 1 to 4 feet. These soils were noted to be soft to firm and damp to moist.

**Native Soils** – Native soils classifying as sandy CLAY 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 25 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. Therefore, the liquefaction potential of the underlying soils has been evaluated with findings from our deep boring (B-1) which extended to a depth of 51.5 feet below grade. The boring encountered stiff/dense to very stiff/dense clays and sands at 5 feet and below. The SPT blowcounts were 31 blows/foot or greater from 10 to 50 feet.

Assuming a conservative historic high groundwater of 20 feet below grade in the area, the stiff/dense soil layers below that level are judged to be non-liquefiable and the seismic settlement would be less than ½ inch with a  $PGA_M$  of 0.638g. These settlements should occur rather uniformly across the lot with differential settlements on the order of less than ¼ inch over a 30 feet (horizontal) distance in the building pad area.

Our liquefaction 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 4 feet) shall be removed to competent native materials, the exposed surface scarified to a depth of 8 inches, brought to approximately 3% above optimum moisture content and compacted to a minimum of 90% of the laboratory standard (ASTM: D-1557-12) 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 4 to 8% 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 18 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)

<u>Width (ft)</u>	<u>Continuous Foundation</u>	<u>Isolated Foundation</u>
1.5	2000	2500
2.0	2100	2600
4.0	2400	2900
6.0	2800	3300

The bearing value may be increased by 500 psf for each additional foot of depth in excess of the 18-inch minimum depth, up to a maximum of 4500 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 18 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 2 #4 steel bars top and bottom. 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  $\frac{3}{4}$  inch and differential settlements of less than  $\frac{1}{4}$  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  $(20 \text{ pcf}) H$  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 4 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. Concrete slabs (4000 psi) 8 inches in thickness with dowel baskets may delete the above reinforcement requirement. 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 150 ppm.

### 7.11 Preliminary Pavement Design

The table below provides a preliminary pavement design based upon a tested R-Value of 43 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**

<u>Type of Traffic</u>	<u>Traffic Index</u>	<u>Inches Asphalt</u>	<u>Inches Base</u>
Auto Parking/Circulation	5.0	3.0	3.5
Truck	7.0*	4.5	6.0
Truck	8.0**	5.5	6.5

\* Design assumes 26 80,000 lb. trucks per week over 20 years.

\*\* Design assumes 80 80,000 lb. trucks per week over 20 years.

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 7 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**

Three test locations (T-1, T-2 and T-3) 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 versus 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:

$$V_{ir} = \Delta V_{ir} / (A_{ir} \Delta t)$$

where:

$V_{ir}$  = inner ring incremental infiltration velocity, cm/hr

$\Delta V_{ir}$  = volume of water used during time interval to maintain constant head in the inner ring,  $cm^3$

$A_{ir}$  = internal area of the inner ring,  $cm^2$

$\Delta t$  = time interval, hr

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 2.0 or greater.

<u>Test No.</u>	<u>Depth (feet bgs)</u>	<u>Soil Type</u>	<u>Infiltration Rate</u>	
			<u>(cm/hr)</u>	<u>(in/hr)</u>
T-1	5.0	sandy Clay	0.7	0.28
T-2	7.5	sandy Clay	0.6	0.24
T-3	10.0	sandy Clay	0.1	0.04

Soils at all locations are not suitable for infiltration due to very low tested rates. All systems shall meet the California Regional Water Quality Control Board (CRWQCB) requirements.

## **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.

**NorCal Engineering**

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



Mark A. Burkholder  
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.***

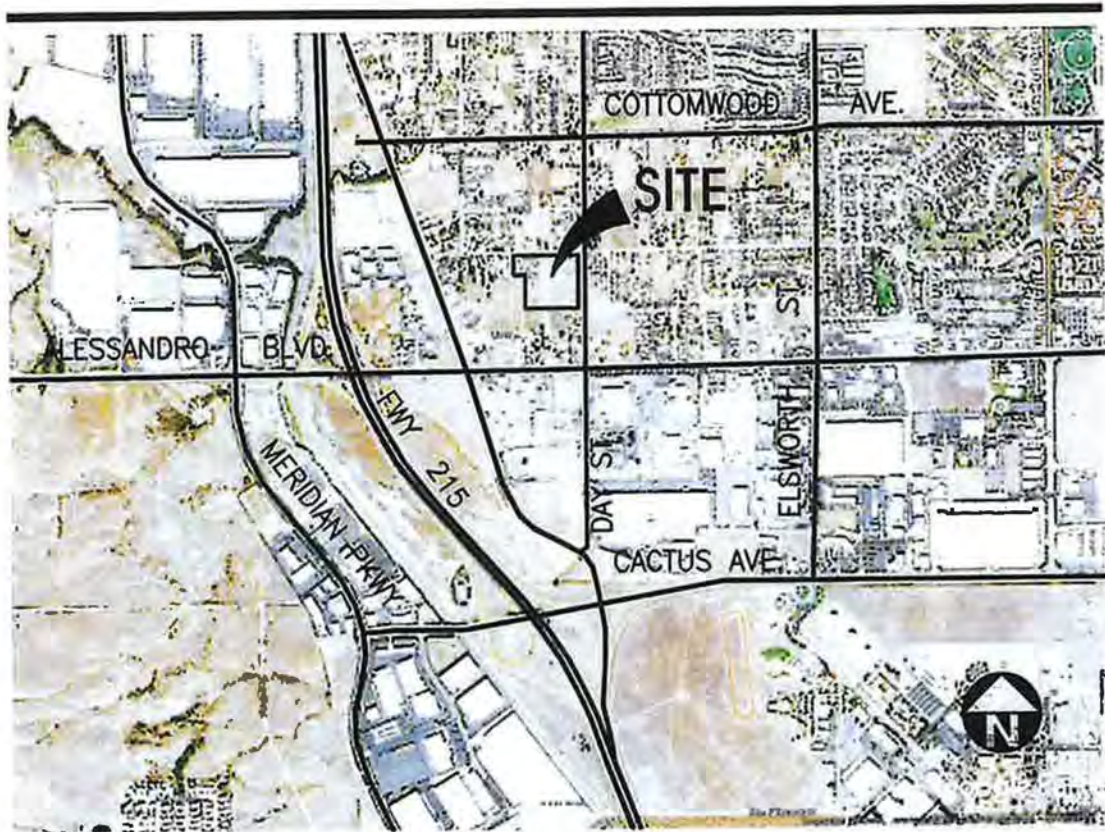
Evidence of excessive wetting of expansive soils may be seen in concrete slabs, both interior and exterior. Slabs may lift at construction joints producing a trip hazard or may crack from the pressure of soil expansion. Wet clays in foundation areas may result in lifting of the structure causing difficulty 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.



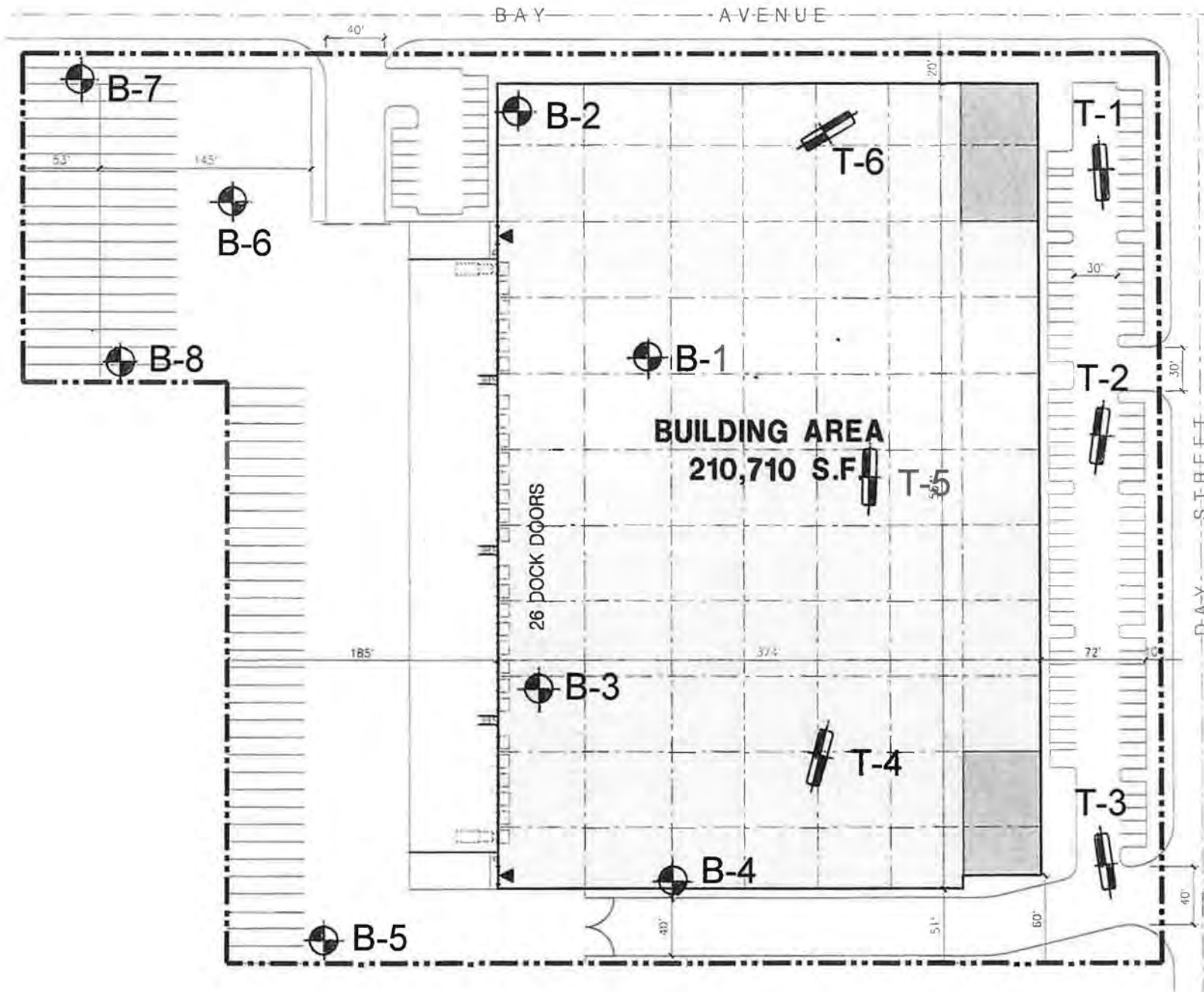
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VICINITY MAP

PROJECT 22228-20

DATE 1/2021

FIGURE 1



**Aerial Map**

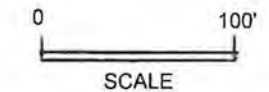
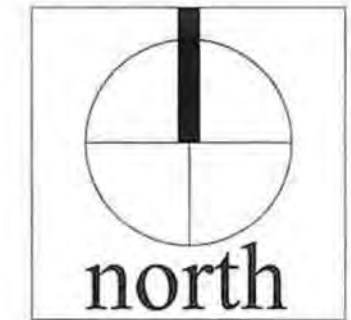


**Legend**

- POTENTIAL OFFICE WITH 2ND FLOOR
- WAREHOUSE
- DRIVE THRU DOOR

**Tabulation**

<b>SITE AREA</b>	
In s.f.	432,125 s.f.
In acres	9.92 ac
<b>BUILDING AREA</b>	
Office - 1st floor	4,000 s.f.
Office - 2nd floor	4,000 s.f.
Warehouse	202,710 s.f.
<b>TOTAL</b>	<b>210,710 s.f.</b>
<b>COVERAGE</b>	
	48.8%
<b>AUTO PARKING REQUIRED</b>	
Office: 1/250 s.f.	32 stalls
Whse: 1st 20,000 @ 1/1,000 s.f.	20 stalls
2nd 20,000 @ 1/2,000 s.f.	10 stalls
above 40,000 @ 1/4,000 s.f.	41 stalls
<b>TOTAL</b>	<b>103 stalls</b>
<b>AUTO PARKING PROVIDED</b>	
Standard (9' x 18')	104 stalls
<b>TRAILER PARKING REQUIRED</b>	
Trailer: 1 per dock door	26 doors
<b>TRAILER PARKING PROVIDED</b>	
Trailer (12' x 53')	67 stalls
<b>ZONING ORDINANCE FOR CITY</b>	
Zoning Designation - Business park (BP)	
<b>MAXIMUM BUILDING HEIGHT ALLOWED</b>	
Height - no height requirement	
<b>MAXIMUM FLOOR AREA RATIO</b>	
FAR - to be verified	
<b>SETBACKS</b>	
<b>Building</b>	<b>Landscape</b>
Front - 20'	Front / street - 10'
Side/Rear - 3'	
Street - 20'	



Note: This is a conceptual plan. It is based on preliminary information which is not fully verified and may be incomplete. It is meant as a comparative aid in examining alternate development strategies and any quantities indicated are subject to revision as more reliable information becomes available.

Conceptual Site Plan  
**Bay Ave. & Day Street**  
 Moreno Valley, CA

**NorCal Engineering**  
 SOILS AND GEOTECHNICAL CONSULTANTS

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PROJECT 22228-20      DATE 1/2021

**GEOTECHNICAL MAP**

# **APPENDICES**

(In order of appearance)

## **Appendix A – Seismic Design**

## **Appendix B –Logs of Test Explorations**

**\*Logs of Test Borings B-1 to B-8**

**\*Logs of Test Excavations T-1 to T-6**

## **Appendix C - Laboratory Analysis**

**\*Table I - Maximum Dry Density Tests**

**\*Table II - Expansion Index Tests**

**\*Table III - Atterberg Limits Tests**

**\*Table IV - Sulfate Tests**

**\*Table V - pH Tests**

**\*Table VI - Resistivity Tests**

**\*Table VII - Chloride Tests**

**\*Table VIII - Resistance 'R' Value Tests**

**\*Plates A-B - Direct Shear Tests**

**\*Plates C-E - Consolidation Tests**

## **Appendix D – Liquefaction Analysis**

## **Appendix E – Infiltration Test Data**

# **APPENDIX A**

# ASCE 7 Hazards Report

**Address:**  
No Address at This  
Location

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

**Elevation:** 0 ft (NAVD 88)  
**Latitude:** 33.921186  
**Longitude:** -117.279323







## 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 :	0.58
$F_v$ :	N/A	PGA <sub>M</sub> :	0.638
$S_{MS}$ :	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:** Fri Jan 22 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**

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	
		MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-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)		SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
		SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES)		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	
	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 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)

**COMPONENT PROPORTIONS**

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

**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

**LDC Molto Edgemont, LLC**  
22228-20

**Log of Boring B-1**

Boring Location: SWC Bay Ave & Day St, Moreno Valley

Date of Drilling: 12/29/2020

Groundwater Depth: 25

Drilling Method: Drill Rig

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory	
			Type	Blow Counts	Moisture	Dry Density
0		FILL SOILS Sandy CLAY with rootlets, occasional gravel and organics Brown, soft, damp				
5		NATURAL SOILS Sandy CLAY Brown, stiff, moist				
		Clayey SAND with gravel Brown, very dense, moist	☒	25/35/48	8.9	38
10			☒	25/50+	12.6	31
15		Sandy SILT to Silty SAND with some clay Brown, very stiff, moist	☒	25/42/50	9.9	41
20		Silty SAND Brown, very dense, moist	☒	21/30/38	10.2	32
25		Seeping groundwater @ 25'	☒	23/25/27	14.1	21
30			☒	5/10/21	21.6	37

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**NorCal Engineering**

Boring Location: SWC Bay Ave & Day St, Moreno Valley

Date of Drilling: 12/29/2020

Groundwater Depth: 25

Drilling Method: Drill Rig

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory	
			Type	Blow Counts	Moisture	Dry Density
35		Silty SAND Brown, very dense, moist	⊗	19/27/32	13.2	20
40		Sandy CLAY Brown, very stiff, very moist	⊗	16/18/24	16.0	47
45			⊗	13/20/37	19.3	56
50			⊗	11/16/28	18.3	55
Boring completed at depth of 51.5'						
55						
60						
65						
70						

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**LDC Molto Edgemont, LLC**  
22228-20

**Log of Boring B-2**

<b>Boring Location: SWC Bay Ave &amp; Day St, Moreno Valley</b>	
<b>Date of Drilling: 12/29/2020</b>	<b>Groundwater Depth: None Encountered</b>
<b>Drilling Method: Drill Rig</b>	
<b>Hammer Weight: 140 lbs</b>	<b>Drop: 30"</b>
<b>Surface Elevation: Not Measured</b>	

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0		<b>FILL SOILS</b> Clayey SAND with rootlets and organics Brown, soft, damp to moist <b>NATURAL SOILS</b> Sandy CLAY Brown, stiff, moist	<input checked="" type="checkbox"/>				
5			■	35/50+	9.1	114.8	
10		Clayey SAND with some small gravel Brown, very dense, moist	■	28/48	11.3	120.7	
15		Silty SAND Brown, very dense, moist	■	30/50+	10.9	105.8	
20			■	30/38	10.3	110.2	
Boring completed at depth of 21'							

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\22228-20.log Date: 1/22/2021

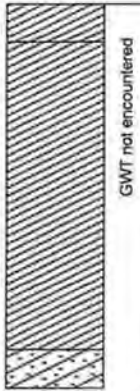
**NorCal Engineering**



**LDC Molto Edgemont, LLC**  
22228-20

**Log of Boring B-3**

Boring Location: SWC Bay Ave & Day St, Moreno Valley	
Date of Drilling: 12/28/2020	Groundwater Depth: None Encountered
Drilling Method: Hand Auger	
Hammer Weight:	Drop:
Surface Elevation: Not Measured	

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0		<b>FILL SOILS</b> Sandy CLAY with occasional gravel and rootlets Brown, soft, damp	<input checked="" type="checkbox"/>		6.2	112.8	
5		<b>NATURAL SOILS</b> Sandy CLAY Brown, stiff, damp	<input type="checkbox"/>		9.3	115.3	
10		<b>Clayey SAND</b> Brown, very dense, damp Refusal at depth of 10'	<input type="checkbox"/>		6.6		
15							
20							
25							
30							
35							

**NorCal Engineering**

Boring Location: SWC Bay Ave & Day St, Moreno Valley

Date of Drilling: 12/28/2020


Groundwater Depth: None Encountered

Drilling Method: Hand Auger

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory	
			Type	Blow Counts	Moisture	Dry Density
0	 GWT not encountered	FILL SOILS				
		Sandy CLAY with occasional gravel, rootlets and organics Brown, stiff, moist				
		NATURAL SOILS				
5		Sandy CLAY Brown, stiff, moist	■		9.0	111.7
		Boring completed at depth of 5'				
10						
15						
20						
25						
30						
35						

**LDC Molto Edgemont, LLC**  
22228-20

**Log of Boring B-5**

Boring Location: SWC Bay Ave & Day St, Moreno Valley

Date of Drilling: 12/28/2020


Groundwater Depth: None Encountered

Drilling Method: Hand Auger

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory	
			Type	Blow Counts	Moisture	Dry Density
0		FILL SOILS				
		Sandy CLAY with rootlets Brown, soft, damp				
		NATURAL SOILS				
		Sandy CLAY	■		8.2	114.2
5		Brown, stiff, moist	■		7.4	118.6
		Boring completed at depth of 7.5'				
10						
15						
20						
25						
30						
35						

**NorCal Engineering**

**LDC Molto Edgemont, LLC**  
22228-20

**Log of Boring B-6**

Boring Location: SWC Bay Ave & Day St, Moreno Valley

Date of Drilling: 12/28/2020


Groundwater Depth: None Encountered

Drilling Method: Hand Auger

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0	 GWT not encountered	FILL SOILS Sandy CLAY with occasional gravel and rootlets Brown, soft, damp					
5		NATURAL SOILS Sandy CLAY Brown, stiff, moist Boring completed at depth of 5'					
10							
15							
20							
25							
30							
35							

**NorCal Engineering**

Boring Location: SWC Bay Ave & Day St, Moreno Valley

Date of Drilling: 12/28/2020


Groundwater Depth: None Encountered

Drilling Method: Hand Auger

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0		FILL SOILS Sandy CLAY with rootlets Brown, soft, damp					
5		NATURAL SOILS Sandy CLAY Brown, stiff, damp	■		6.3	117.3	
10		Clayey SAND Brown, dense, damp	■		9.4	122.1	
		Boring completed at depth of 10'					

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**LDC Molto Edgemont, LLC**  
22228-20

**Log of Boring B-8**

Boring Location: SWC Bay Ave & Day St, Moreno Valley

Date of Drilling: 12/28/2020


Groundwater Depth: None Encountered

Drilling Method: Hand Auger

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory	
			Type	Blow Counts	Moisture	Dry Density
0	 GWT not encountered	FILL SOILS				
		Sandy CLAY with occasional gravel and rootlets Brown, soft, moist				
		NATURAL SOILS				
		Sandy CLAY				
5		Brown, stiff, moist				
		Boring completed at depth of 5'				
10						
15						
20						
25						
30						
35						

**NorCal Engineering**

Boring Location: SWC Bay Ave & Day St, Moreno Valley

Date of Drilling: 12/29/20


Groundwater Depth: None Encountered

Drilling Method: Backhoe

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory	
			Type	Blow Counts	Moisture	Dry Density
0		FILL SOILS Sandy CLAY with occasional gravel, rootlets and asphalt pieces Brown, firm, damp				
5		NATURAL SOILS Sandy CLAY Brown, stiff, damp Trench completed at depth of 5'	☑		6.8	
10						
15						
20						
25						
30						
35						

Boring Location: SWC Bay Ave & Day St, Moreno Valley

Date of Drilling: 12/29/20

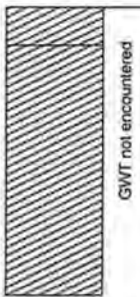
Groundwater Depth: None Encountered

Drilling Method: Backhoe

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0	 GWT not encountered	FILL SOILS Sandy CLAY with rootlets and organics Brown, soft, damp	<input type="checkbox"/>				
5		NATURAL SOILS Sandy CLAY Brown, stiff, damp	<input type="checkbox"/>				
		Trench completed at depth of 7.5'	<input type="checkbox"/>		7.4		
10							
15							
20							
25							
30							
35							



**LDC Molto Edgemont, LLC**  
22228-20

**Log of Trench T-3**

Boring Location: SWC Bay Ave & Day St, Moreno Valley

Date of Drilling: 12/29/20

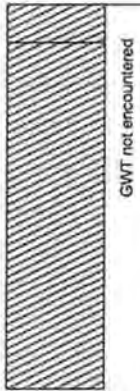
Groundwater Depth: None Encountered

Drilling Method: Backhoe

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0		FILL SOILS Sandy CLAY with rootlets Brown, soft, moist NATURAL SOILS Sandy CLAY Brown, stiff to very stiff, moist					
5							
10		Trench completed at depth of 10'	☑		8.3		
15							
20							
25							
30							
35							

**NorCal Engineering**

**Boring Location: SWC Bay Ave & Day St, Moreno Valley**

**Date of Drilling: 12/29/20**


**Groundwater Depth: None Encountered**

**Drilling Method: Backhoe**

**Hammer Weight:**

**Drop:**

**Surface Elevation: Not Measured**

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0		FILL SOILS Sandy CLAY with rootlets and organics Brown, soft, damp	■		4.3	110.7	
5		NATURAL SOILS Sandy CLAY Brown, very stiff, damp to moist	■		9.5	127.6	
		Trench completed at depth of 6'					
10							
15							
20							
25							
30							
35							

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**Boring Location: SWC Bay Ave & Day St, Moreno Valley**

**Date of Drilling: 12/29/20**


**Groundwater Depth: None Encountered**

**Drilling Method: Backhoe**

**Hammer Weight:**

**Drop:**

**Surface Elevation: Not Measured**

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0		<b>FILL SOILS</b> Sandy CLAY with rootlets and organics Brown, soft, moist <b>NATURAL SOILS</b> Sandy CLAY Brown, stiff, damp	■		5.1	113.4	
5							
Trench completed at depth of 7'							
10							
15							
20							
25							
30							
35							

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Boring Location: SWC Bay Ave & Day St, Moreno Valley

Date of Drilling: 12/29/20


Groundwater Depth: None Encountered

Drilling Method: Backhoe

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0		FILL SOILS					
		Sandy CLAY with occasional gravel and asphalt pieces	■		2.9	112.6	
		Brown, soft, damp					
5		NATURAL SOILS					
		Sandy CLAY	■		4.7	117.2	
		Brown, stiff, damp					
10			■		8.6	115.1	
		Trench completed at depth of 11'					
15							
20							
25							
30							
35							

# **APPENDIX C**

**TABLE I**  
**MAXIMUM DENSITY TESTS**  
**(ASTM: D-1557-12)**

<u>Sample</u>	<u>Classification</u>	<u>Optimum Moisture</u>	<u>Maximum Dry Density (lbs./cu.ft.)</u>
B-2 @ 2-4'	sandy CLAY	9.5	131.0

**TABLE II**  
**EXPANSION INDEX TESTS**  
**(ASTM: D-4829-11)**

<u>Sample</u>	<u>Classification</u>	<u>Expansion Index</u>
B-2 @ 2-4'	sandy CLAY	32

**TABLE III**  
**ATTERBERG LIMITS**  
**(ASTM: D-4318-10)**

<u>Sample</u>	<u>Liquid Limit</u>	<u>Plastic Limit</u>	<u>Plasticity Index</u>
B-2 @ 2-4'	23	17	6

**TABLE IV**  
**SOLUBLE SULFATE TESTS**  
**(CT 417)**

<u>Sample</u>	<u>Sulfate Concentration (%)</u>
B-3 @ 2-3'	0.0002

**TABLE V**  
**pH TESTS**

<u>Sample</u>	<u>pH</u>
B-3 @ 2-3'	6.7

**TABLE VI**  
**RESISTIVITY TESTS**  
**(CT 643)**

<u>Sample</u>	<u>Resistivity (ohm-cm)</u>
B-3 @ 2-3'	4204

**TABLE VII**  
**CHLORIDE TESTS**  
**(CT 422)**

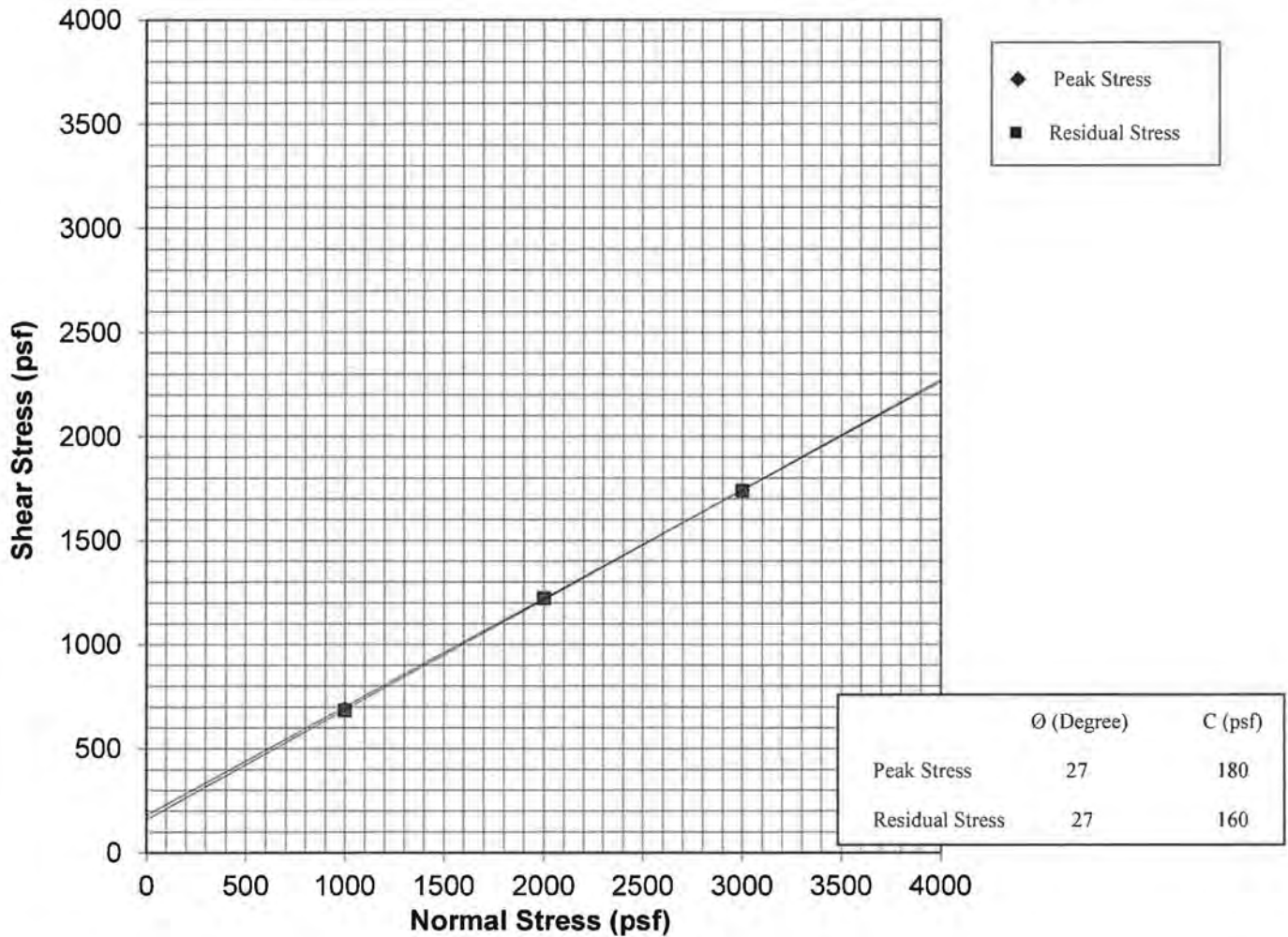
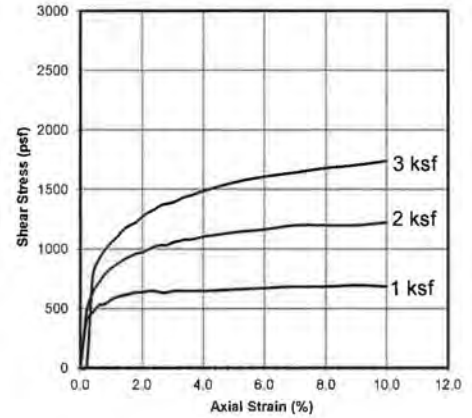
<u>Sample</u>	<u>Concentration (ppm)</u>
B-3 @ 2-3'	150

**TABLE VIII**  
**RESISTANCE 'R' VALUE TESTS**  
**(CA 301)**

<u>Sample</u>	<u>'R' Value</u>
T-2 @ 1-2'	43

Sample No. B2@2-5'  
 Sample Type: Remolded/Saturated  
 Soil Description: sandy Clay

		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	696	1224	1740
Displacement	(in)	0.225	0.250	0.250
Residual Stress	(psf)	684	1224	1740
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	117.9	117.9	117.9
In Situ Water Content	(%)	9.5	9.5	9.5
Saturated Water Content	(%)	15.8	15.8	15.8
Strain Rate	(in/min)	0.020	0.020	0.020



**NorCal Engineering**  
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**DIRECT SHEAR TEST**  
 ASTM D3080  
 Plate A

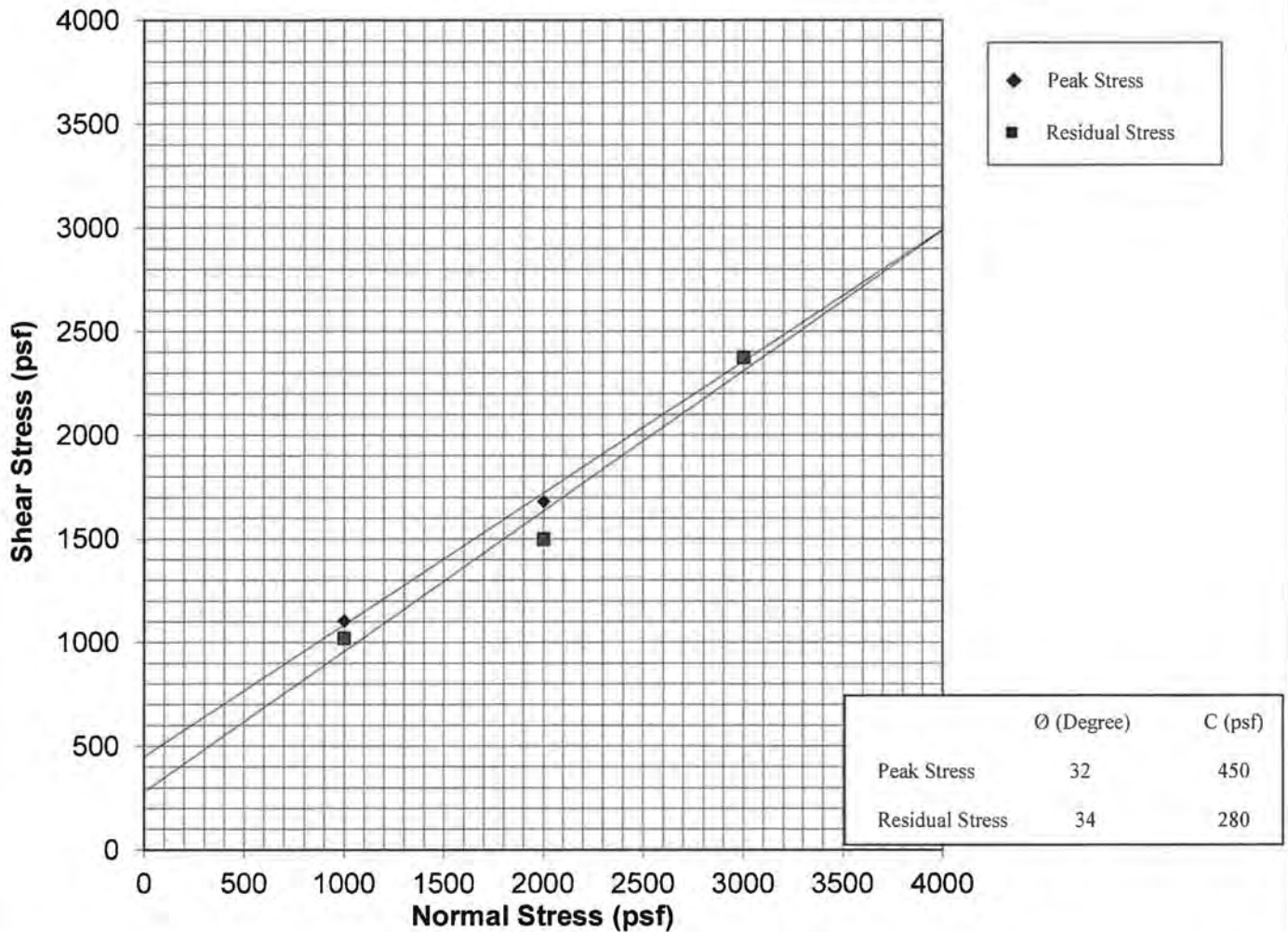
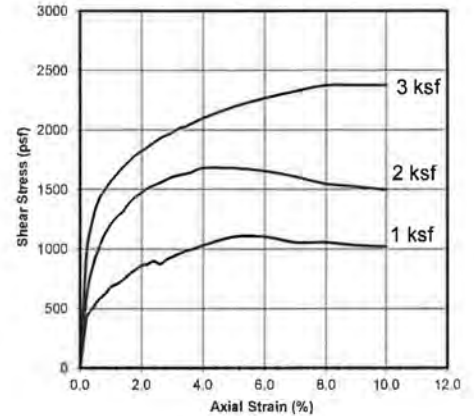
PROJECT NUMBER: 22228-20

DATE: 1/21/2021



Sample No. T4@5'  
 Sample Type: Undisturbed/Saturated  
 Soil Description: sandy Clay w/some small gravel

		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	1104	1680	2376
Displacement	(in.)	0.125	0.100	0.200
Residual Stress	(psf)	1020	1500	2376
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	127.6	127.6	127.6
In Situ Water Content	(%)	9.5	9.5	9.5
Saturated Water Content	(%)	11.8	11.8	11.8
Strain Rate	(in/min)	0.020	0.020	0.020



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**LDC Molto Edgemont, LLC**

PROJECT NUMBER: 22228-20

DATE: 1/21/2021

**DIRECT SHEAR TEST**

**ASTM D3080**

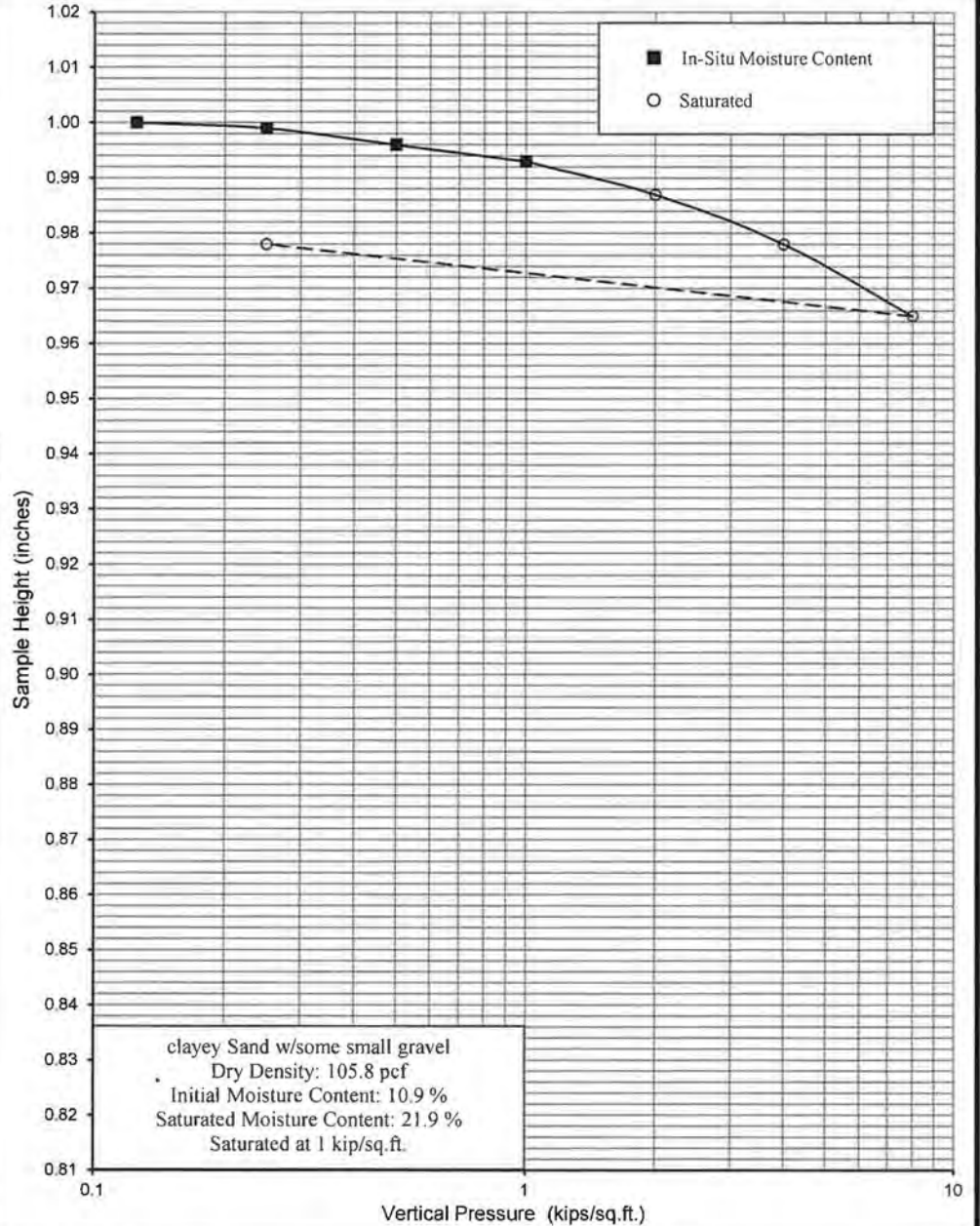
**Plate B**

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	Sample No.	B2	Depth	15'	Date	1/21/2021
------------------------------------	------------------------	----------------------------	------------	----	-------	-----	------	-----------

0.125	1.0000	0.0
0.25	0.9990	0.1
0.5	0.9960	0.4
1	0.9930	0.7
1	0.9930	0.7
2	0.9870	1.3
4	0.9780	2.2
8	0.9650	3.5
0.25	0.9780	2.2

Saturated

Date Tested: 1/11/2021  
Sample: B2  
Depth: 15'



clayey Sand w/some small gravel  
Dry Density: 105.8 pcf  
Initial Moisture Content: 10.9 %  
Saturated Moisture Content: 21.9 %  
Saturated at 1 kip/sq.ft.

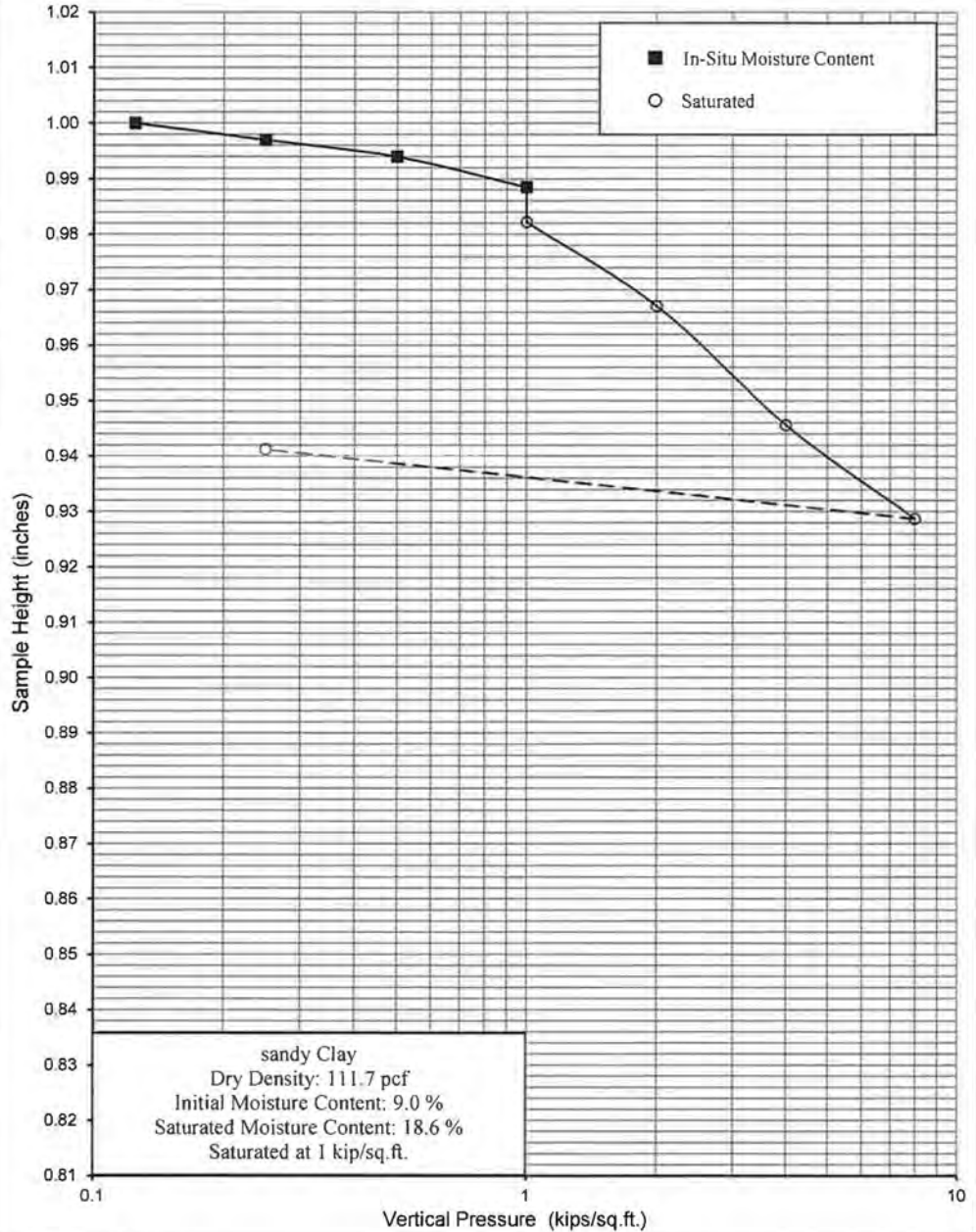
<b>NorCal Engineering</b> SOILS AND GEOTECHNICAL CONSULTANTS <b>LDC Molto Edgemont, LLC</b>	<b>CONSOLIDATION TEST</b> <b>ASTM D2435</b> <b>Plate C</b>
	PROJECT NUMBER: 22228-20                      DATE: 1/21/2021

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	Sample No.	B4	Depth	4'	Date	1/21/2021
------------------------------------	------------------------	----------------------------	------------	----	-------	----	------	-----------

0.125	1.0000	0.0
0.25	0.9970	0.3
0.5	0.9940	0.6
1	0.9885	1.2
1	0.9822	1.8
2	0.9671	3.3
4	0.9456	5.4
8	0.9287	7.1
0.25	0.9412	5.9

Saturated

Date Tested: 1/11/2021  
Sample: B4  
Depth: 4'



## NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LDC Molto Edgemont, LLC

PROJECT NUMBER: 22228-20

DATE: 1/21/2021

## CONSOLIDATION TEST

ASTM D2435

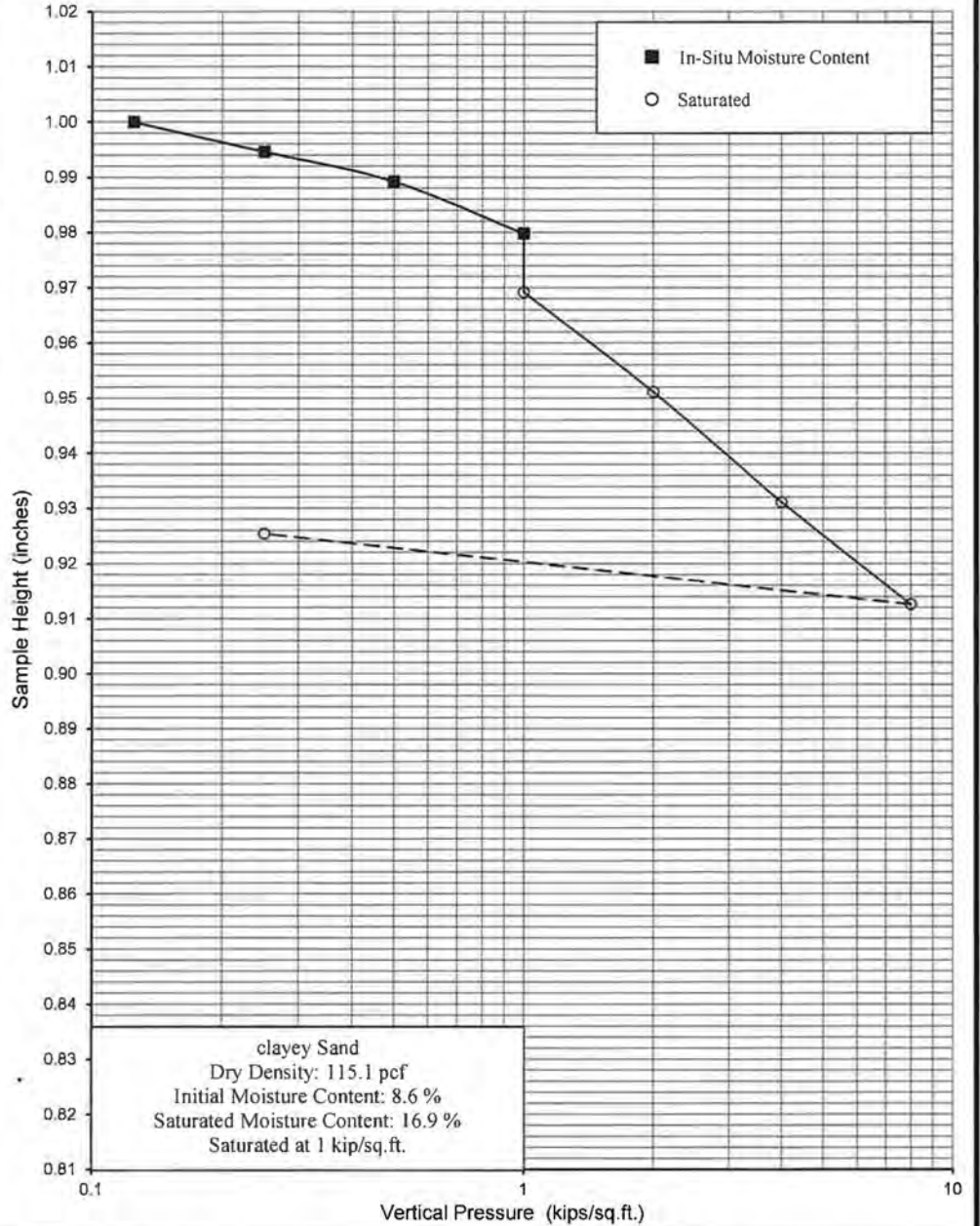
Plate D

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	Sample No.	T6	Depth	10'	Date	1/21/2021
------------------------------------	------------------------	----------------------------	------------	----	-------	-----	------	-----------

0.125	1.0000	0.0
0.25	0.9946	0.5
0.5	0.9892	1.1
1	0.9798	2.0
1	0.9692	3.1
2	0.9511	4.9
4	0.9311	6.9
8	0.9126	8.7
0.25	0.9254	7.5

Date Tested: 1/12/2021  
Sample: T6  
Depth: 10'

Saturated



## NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LDC Molto Edgemont, LLC

PROJECT NUMBER: 22228-20

DATE: 1/21/2021

## CONSOLIDATION TEST

ASTM D2435

Plate E

# **APPENDIX D**

SITE LOCATION: \_\_\_\_\_  
 GEOTECHNICAL REPORT: \_\_\_\_\_  
 GEOLOGY REPORT: \_\_\_\_\_

DEPTH TO WATER TABLE = 20'  
 EARTHQUAKE MAGNITUDE = 6.9  
 PEAK GROUND ACCELERATION = 0.64g

DEPTH BELOW FINAL GRADE (FEET)	MOIST DENSITY (PCF)	$\sigma_0$ TOTAL STRESS (PSF)	$\bar{\sigma}_0$ EFFECTIVE STRESS (PSF)	$\sigma_v/\sigma_0$ (-)	$r_d$ (-)	$T_{h/\sigma_0}$ (-)	N VALUE (BLOWS/FT)	RELATIVE DENSITY (%)	$C_H$ (-)	$C_E$ (-)	$C_B$ (-)	$C_R$ (-)	$C_S$ (-)	$(N_1)_{60}$ (BLOWS/FT)	FINES (%)	CRR M=7.5	MSF (-)	CRR M=6.9	Liq. F.S.
5	125	625	same	1.00	0.99	0.42	>50	>90	>1.6	1.00	1.05	0.70	1.20	>72	38	>0.50	1.3	>0.65	>1.5
10	130	1275			0.96	0.40	>50		1.2			0.75		>57	31				>1.6
15	115	1850			0.92	0.38	>50		1.04			0.85		>56	41				>1.7
20	120	2450			0.87	0.36	>50		0.90			0.90		>51	32				>1.8
25		3050	2738	1.11	0.80	0.37	52		0.88			0.95		55	21				>1.8
30		3650	3026	1.21	0.74	0.37	31	80	0.84			1.00		33	37				>1.8
35		4250	3314	1.28	0.68	0.37	59	>90	0.81					60	20				>1.8
40		4850	3602	1.35	0.64	0.36	42	85	0.78					41	47				>1.8
45		5450	3890	1.40	0.61	0.36	57	>90	0.76					55	56				>1.8
50		6050	4178	1.45	0.58	0.35	44	85	0.74					41	55				>1.9

① INDUCED CYCLIC STRESS RATIO =  $T_{ave}/\bar{\sigma}_0 = 0.65 \cdot \frac{\alpha_{max}}{g} \cdot \frac{\sigma_0}{\bar{\sigma}_0} \cdot r_d$

Actual Energy Ratio = 0.67-1.17 (Safety Hammer)  
 = 6.50-1.00 (Dowry Hammer)

- $C_E$  = 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

Sampling Method = 1.0 Standard sampler  
 = 1.2 Sampler w/o liners

**NorCal Engineering**  
 SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT \_\_\_\_\_ DATE \_\_\_\_\_

EVALUATION OF LIQUEFACTION POTENTIAL

# **APPENDIX E**



SOILS AND GEOTECHNICAL CONSULTANTS

Project: LDC Molto Edgemont, LLC
Project No.: 22228-20
Date: 12/28/2020
Test No. T-1
Depth: 5'
Tested By: J.S.

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)
8:30			69.3			36.4					
8:40	10	10	69.7	0.4		36.5	0.2				
8:40			69.7			36.5					
8:50	10	20	69.9	0.2		36.7	0.4				
8:50			69.9			36.7					
9:00	10	30	70.1	0.2		36.9	0.4				
9:00			70.1			36.9					
9:10	10	40	70.3	0.2		37.0	0.2				
9:10			70.3			37.0					
9:20	10	50	70.4	0.1		37.0	0.1				
9:20			70.4			37.0					
9:30	10	60	70.6	0.2		37.1	0.2				
9:30			70.6			37.1					
9:40	10	70	70.7	0.1		37.1	0.1		0.6	0.6	
9:40			70.7			37.1					
9:50	10	80	70.9	0.2		37.2	0.2		1.2	1.2	
9:50			70.9			37.2					
10:00	10	90	71.0	0.1		37.4	0.2		0.6	0.6	
10:00			71.0			37.4					
10:10	10	100	71.1	0.1		37.5	0.1		0.6	0.6	
10:10			71.1			37.5					
10:20	10	110	71.2	0.1		37.6	0.1		0.6	0.6	
10:20			71.2			37.6					
10:30	10	120	71.3	0.1		37.6	0.0		0.6	0.0	

Average = 0.7 / 0.6 cm/hr





SOILS AND GEOTECHNICAL CONSULTANTS

Project: LDC Molto Edgemont, LLC
Project No.: 22228-20
Date: 12/28/2020
Test No. T-2
Depth: 7.5'
Tested By: J.S.

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)
9:03			101.2			39.6					
9:13	10	10	101.5	0.3		39.8	0.2				
9:13			101.5			39.8					
9:23	10	20	101.6	0.1		40.0	0.2				
9:23			101.6			40.0					
9:33	10	30	101.6	0.0		40.0	0.0				
9:33			101.6			40.0					
9:43	10	40	101.6	0.0		40.0	0.0				
9:43			101.6			40.0					
9:53	10	50	101.6	0.0		40.0	0.0				
9:53			101.6			40.0					
10:03	10	60	101.7	0.1		40.0	0.0				
10:03			101.7			40.0					
10:13	10	70	101.7	0.0		40.1	0.1		0.0	0.6	
10:13			101.7			40.1					
10:23	10	80	101.9	0.2		40.2	0.2		1.2	1.2	
10:23			101.9			40.2					
10:33	10	90	101.9	0.0		40.2	0.0		0.0	0.0	
10:33			101.9			40.2					
10:43	10	100	102.0	0.1		40.3	0.1		0.6	0.6	
10:43			102.0			40.3					
10:53	10	110	102.2	0.2		40.4	0.1		1.2	0.6	
10:53			102.2			40.4					
11:03	10	120	102.3	0.1		40.5	0.1		0.6	0.6	

Average = 0.6 / 0.6 cm/hr



SOILS AND GEOTECHNICAL CONSULTANTS

Project: LDC Molto Edgemont, LLC
Project No.: 22228-20
Date: 12/28/2020
Test No. T-3
Depth: 10'
Tested By: J.S.

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)
10:50			78.2			46.9					
11:00	10	10	78.2	0.0		46.9	0.0				
11:00			78.2			46.9					
11:10	10	20	78.2	0.0		46.9	0.0				
11:10			78.2			46.9					
11:20	10	30	78.2	0.0		46.9	0.0				
11:20			78.2			46.9					
11:30	10	40	78.2	0.0		46.9	0.0				
11:30			78.2			46.9					
11:40	10	50	78.2	0.1		46.9	0.0				
11:40			78.2			46.9					
11:50	10	60	78.3	0.1		46.9	0.0				
11:50			78.3			46.9					
12:00	10	70	78.3	0.0		47.0	0.1		0.0	0.6	
12:00			78.3			47.0					
12:10	10	80	78.3	0.0		47.0	0.0		0.0	0.0	
12:10			78.3			47.0					
12:20	10	90	78.3	0.0		47.0	0.0		0.0	0.0	
12:20			78.3			47.0					
12:30	10	100	78.4	0.1		47.0	0.0		0.6	0.0	
12:30			78.4			47.0					
12:40	10	110	78.4	0.0		47.1	0.1		0.0	0.6	
12:40			78.4			47.1					
12:50	10	120	78.4	0.0		47.1	0.0		0.0	0.0	

Average = 0.1 / 0.2 cm/hr

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

March 16, 2021

Project Number 22228-20

LDC Molto Edgemont, LLC  
555 N. El Camino Real, A456  
San Clemente, California 92672

Attn: Matthew Snyder

RE: **Supplemental Infiltration Testing** - Proposed Warehouse Building Development - Located at the Southwest Corner of Bay Avenue and Day Street, in the City of Moreno Valley, California

Dear Mr. Snyder:

As requested, supplemental soil infiltration testing has been performed at the subject site. These tests supplement earlier tests as provided in our *Geotechnical Investigation* report dated January 22, 2021. Test locations and depths were provided to this firm.

**INFILTRATION TESTING**

A truck mounted hollow stem auger was used to excavate the exploratory borings SB-1 and SB-2 for testing in order to establish general infiltration rates for the proposed stormwater retention/infiltration system. Logs of our borings are included in Appendix A and locations of tests are shown on the attached Updated Geotechnical Map.

Both tests were initially planned to be performed at 15 feet below grade; however seeping groundwater was encountered in boring SB-2 at the 15 feet level. A second boring was drilled at this location and testing performed at 7.5 feet.

The borings consisted of 6-inch diameter test holes. A 3-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. Due to slow initial infiltration rate, test hole SB-1 was saturated overnight and tests performed at 30-minute intervals the next day. Based upon the initial rapid rate of infiltration at SB-2, test measurements were measured at 10-minute maximum intervals immediately after the pre-soak period. Measurements were obtained by using an electronic tape measure with 1/16-inch divisions and timed with a stopwatch.

### **Discussion of Results**

Based upon the results of our testing, the underlying soils exhibit highly variable infiltration rates at depths of 15 and 7.5 feet. The infiltration field data and test calculations are attached in Appendix B. The following table provides our test results for each test:

<u>Test No.</u>	<u>Depth (feet bgs)</u>	<u>Soil Type</u>	<u>Field Infiltration Rate</u>
SB-1	15	sandy CLAY	0.0 in/hr*
SB-2	7.5	silty SAND w/some clay	15.7 in/hr

\* Not suitable for infiltration

The test holes did not encounter any adverse condition such as severe caving or siltation. Perched groundwater as encountered at approximately 15 feet below grade near SB-2 below grade should be considered in the design and may preclude systems deeper than 5 feet.

The final design rates may be computed using applicable safety factors as required by the City of Moreno Valley. Any system should be located a minimum of 10 feet away from structures. The test results are representative of the soils encountered in our exploratory borings.

The use of an on-site stormwater retention/disposal system may be geotechnically feasible for future development provided the groundwater depth is considered in the design. All systems must meet the California Regional Water Quality Control Board (CRWQCB) requirements. The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations.

### **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.

The infiltration testing 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.

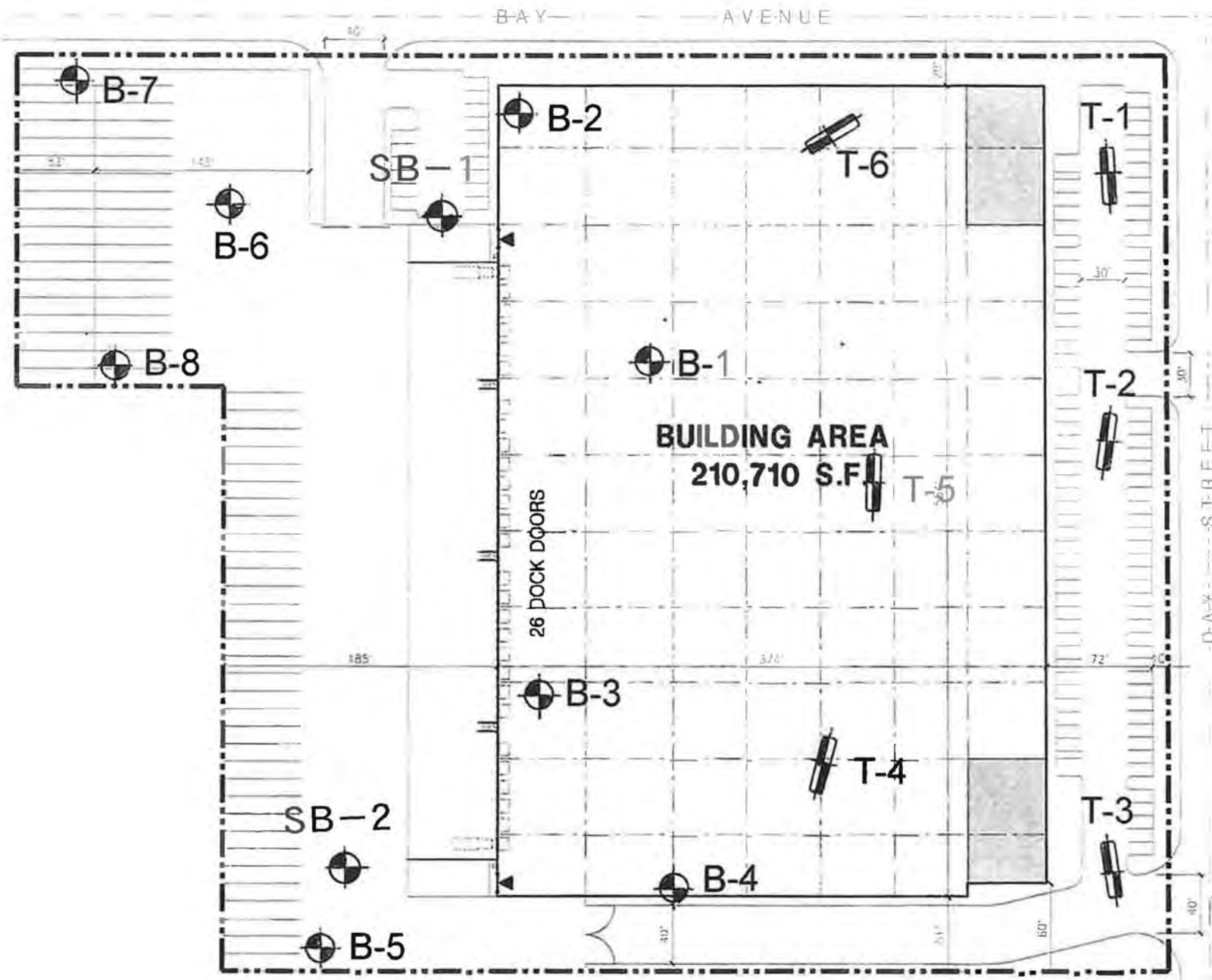
Respectfully submitted,  
NORCAL ENGINEERING



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



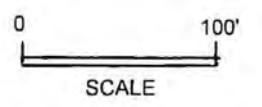
Mark A. Burkholder  
Project Manager



- Legend**
- POTENTIAL OFFICE WITH 2ND FLOOR
  - WAREHOUSE
  - DRIVE THRU DOOR

**Tabulation**

<b>SITE AREA</b>	
In s.f.	432,125 s.f.
In acres	9.92 ac.
<b>BUILDING AREA</b>	
Office - 1st floor	4,000 s.f.
Office - 2nd floor	4,000 s.f.
Warehouse	202,710 s.f.
<b>TOTAL</b>	<b>210,710 s.f.</b>
<b>COVERAGE</b>	
	48.8%
<b>AUTO PARKING REQUIRED</b>	
Office: 1/250 s.f.	32 stalls
Whse: 1st 20,000 @ 1/1,000 s.f.	20 stalls
2nd 20,000 @ 1/2,000 s.f.	10 stalls
above 40,000 @ 1/4,000 s.f.	41 stalls
<b>TOTAL</b>	<b>103 stalls</b>
<b>AUTO PARKING PROVIDED</b>	
Standard (9' x 18')	104 stalls
<b>TRAILER PARKING REQUIRED</b>	
Trailer: 1 per dock door	26 doors
<b>TRAILER PARKING PROVIDED</b>	
Trailer (12' x 53')	67 stalls
<b>ZONING ORDINANCE FOR CITY</b>	
Zoning Designation - Business park (BP)	
<b>MAXIMUM BUILDING HEIGHT ALLOWED</b>	
Height - no height requirement	
<b>MAXIMUM FLOOR AREA RATIO</b>	
FAR - to be verified	
<b>SETBACKS</b>	
<b>Building</b>	<b>Landscape</b>
Front - 20'	Front / street - 10'
Side/Rear - 3'	
Street - 20'	



Note: This is a conceptual plan. It is based on preliminary information which is not fully verified and may be incomplete. It is meant as a comparative aid in examining alternate development strategies and any quantities indicated are subject to revision as more reliable information becomes available.

Conceptual Site Plan  
**Bay Ave. & Day Street**  
 Moreno Valley, CA

**NorCal Engineering**  
 SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 22228-20      DATE 3/2021

UPDATED  
 GEOTECHNICAL MAP

## **APPENDIX A**



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	
				GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	
	MORE THAN 50% OF COARSE FRACTION <u>RETAINED</u> ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
				SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
		MORE THAN 50% OF COARSE FRACTION <u>PASSING</u> 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	
	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 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)

## COMPONENT PROPORTIONS

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

## 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

**LDC Molto Edgemont LLC**  
22228-20

**Log of Boring B-1**

Boring Location: Bay Ave and Day St, Moreno Valley

Date of Drilling: 3/10/2021

Groundwater Depth: None Encountered

Drilling Method: Drill Rig

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0		FILL SOILS Sandy CLAY with rootlets and occasional gravel Brown, soft, moist					
5		NATURAL SOILS Sandy CLAY Brown, stiff, moist					
10		Clayey SAND with occasional gravel Brown, dense, moist					
15		Sandy CLAY Brown, very stiff, moist  Boring completed at depth of 15'	M		8.8		
20							
25							
30							
35							

**NorCal Engineering**

**Boring Location: Bay Ave and Day St, Moreno Valley**

**Date of Drilling: 3/10/2021**






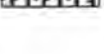




**Groundwater Depth: None Encountered**

**Drilling Method: Drill Rig**

**Hammer Weight: 140 lbs**

**Drop: 30"**

**Surface Elevation: Not Measured**

Depth (feet)	Lithology	Material Description	Samples		Laboratory	
			Type	Blow Counts	Moisture	Dry Density
0		FILL SOILS Sandy CLAY with rootlets Brown, soft, moist				
0		NATURAL SOILS Silty SAND with some clay and occasional small gravel Brown, dense, moist				
5		NOTE: Seeping groundwater encountered at 15' in adjacent boring at this location				
7		Boring completed at depth of 7'				
10						
15						
20						
25						
30						
35						

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\2222820-2.log Date: 3/17/2021

## **APPENDIX B**

# SOIL INFILTRATION RATE CALCS → Auger Boring

Location:	SB-1	SB-2
• Depth =	15 ft	7.5 ft
• Hole Dia. =	6 in.	6 in.
• Drop = $\Delta d$	0	11 in.
• Time = $\Delta t$ Interval	30 min.	10 min
• Preadjusted Perc. Rate	0"/hr.	66"/hr.
• Initial Water Depth = $d_1$	19.5 in.	15 in.
• Reduction Factor = $R_f$	7.5	4.2
• INFILTRATION RATE	0"/hr	15.7"/hr

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

$$\text{Reduction Factor} = R_f = \left[ \frac{2 \cdot d_1 - \Delta d}{\text{Dia.}} \right] + 1$$

**NorCal Engineering**  
SOILS AND GEOTECHNICAL CONSULTANTS

SOIL INFILTRATION RATE  
CALCULATIONS

DATE



SOILS AND GEOTECHNICAL CONSULTANTS

**PERCOLATION TEST DATA**

<b>Client:</b> LDC Molto Edgemont, LLC	<b>Date:</b> 3/10/2021
<b>Project No.:</b> 22228-20	<b>Tested By:</b> J.C.
<b>Test Hole:</b> SB-1	<b>USCS Soil Classification:</b>
<b>Depth of Test Hole:</b> 15'	<b>Sides (if rectangular):</b>
<b>Diameter of Test Hole:</b> 6"	<b>Length:</b>
<b>Sandy Soil Criteria Test*:</b>	<b>Width:</b>

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	9:18	9:43	25	156.0	156.0	0.0	
2	9:43	10:08	25	156.0	156.0	0.0	

\*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	7:10	7:40	30	160.0	160.0	0.0	
2	7:40	8:10	30	160.0	160.0	0.0	
3	8:10	8:40	30	160.0	160.0	0.0	
4	8:40	9:10	30	160.0	160.0	0.0	
5	9:10	9:40	30	160.0	160.0	0.0	
6	9:40	10:10	30	160.0	160.5	0.5	
7	10:10	10:40	30	160.5	160.5	0.0	
8	10:40	11:10	30	160.5	160.5	0.0	
9	11:10	11:40	30	160.5	160.5	0.0	
10	11:40	12:10	30	160.5	160.5	0.0	
11	12:10	12:40	30	160.5	160.5	0.0	
12	12:40	1:10	30	160.5	160.5	0.0	
13							
14							
15							

COMMENTS:



SOILS AND GEOTECHNICAL CONSULTANTS

**PERCOLATION TEST DATA**

<b>Client:</b> LDC Molto Edgemont, LLC	<b>Date:</b> 3/10/2021
<b>Project No.:</b> 22228-20	<b>Tested By:</b> J.C.
<b>Test Hole:</b> SB-2	<b>USCS Soil Classification:</b>
<b>Depth of Test Hole:</b> 7.5'	<b>Sides (if rectangular):</b>
<b>Diameter of Test Hole:</b> 6"	<b>Length:</b>
<b>Sandy Soil Criteria Test*:</b>	<b>Width:</b>

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	10:17	10:26	9	80.0	96.0	15.0	
2	10:26	10:36	10	81.0	96.0	16.0	

\*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	$\Delta T$ TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	$\Delta D$ CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	10:36	10:46	10	75.0	88.0	13.0	
2	10:46	10:56	10	75.0	87.0	12.0	
3	10:56	11:06	10	75.0	87.0	12.0	
4	11:06	11:16	10	75.0	86.0	11.0	
5	11:16	11:26	10	75.0	86.0	11.0	
6	11:26	11:36	10	75.0	86.0	11.0	
7							
8							
9							
10							
11							
12							
13							
14							
15							

COMMENTS:



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

March 31, 2021

Project Number 22228-20

LDC Molto Edgemont, LLC  
555 N. El Camino Real, A456  
San Clemente, California 92672

Attn: Matthew Snyder

RE: Second Supplemental Infiltration Testing - Proposed Warehouse Building Development - Located at the Southwest Corner of Bay Avenue and Day Street, in the City of Moreno Valley, California

Dear Mr. Snyder:

As requested, additional supplemental soil infiltration testing has been performed at the subject site. These tests supplement earlier tests as provided in our *Geotechnical Investigation* report dated January 22, 2021 and our report titled *Supplemental Infiltration Testing* dated March 16, 2021. Test locations and depths were provided to this firm.

**INFILTRATION TESTING**

Hand operated equipment was used to excavate the exploratory borings SB-3 and SB-4 for testing in order to establish general infiltration rates for the proposed stormwater retention/infiltration system. An additional boring, SB-5, was excavated in order to locate groundwater. Logs of our borings are included in Appendix A and locations of tests are shown on the attached Updated Geotechnical Map.

The borings consisted of 6-inch diameter test holes. A 3-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. Due to slow initial infiltration rate, the test holes were saturated overnight and tests performed at 30-minute intervals the next day. Measurements were obtained by using an electronic tape measure with 1/16-inch divisions and timed with a stopwatch.

### **Discussion of Results**

Based upon the results of our testing, the underlying soils exhibit very low infiltration rates at depths of 8½ and 6 feet. The infiltration field data and test calculations are attached in Appendix B. The following table provides our test results for each test:

<u>Test No.</u>	<u>Depth (feet bgs)</u>	<u>Soil Type</u>	<u>Field Infiltration Rate</u>
SB-3	8½	Clayey SAND	0.17 in/hr*
SB-4	6	Sandy CLAY	0.17 in/hr*

\* Not suitable for infiltration

The test holes did not encounter any adverse condition such as severe caving or siltation. Groundwater as encountered at approximately 18½ feet at SB-5 below grade should be considered in the design and may preclude systems deeper than 8 feet.

The final design rates may be computed using applicable *safety factor of 3* as required by the County of Riverside. Any system should be located a minimum of 10 feet away from structures. The test results are representative of the soils encountered in our exploratory borings.

Based on the results of our field testing, the subsurface soils encountered in the proposed on-site drainage disposal system at 6 and 8½ feet below ground surface are not suitable for infiltration. All systems must meet the latest county specifications and the California Regional Water Quality Control Board (CRWQCB) requirements.

### **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.

The infiltration testing 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

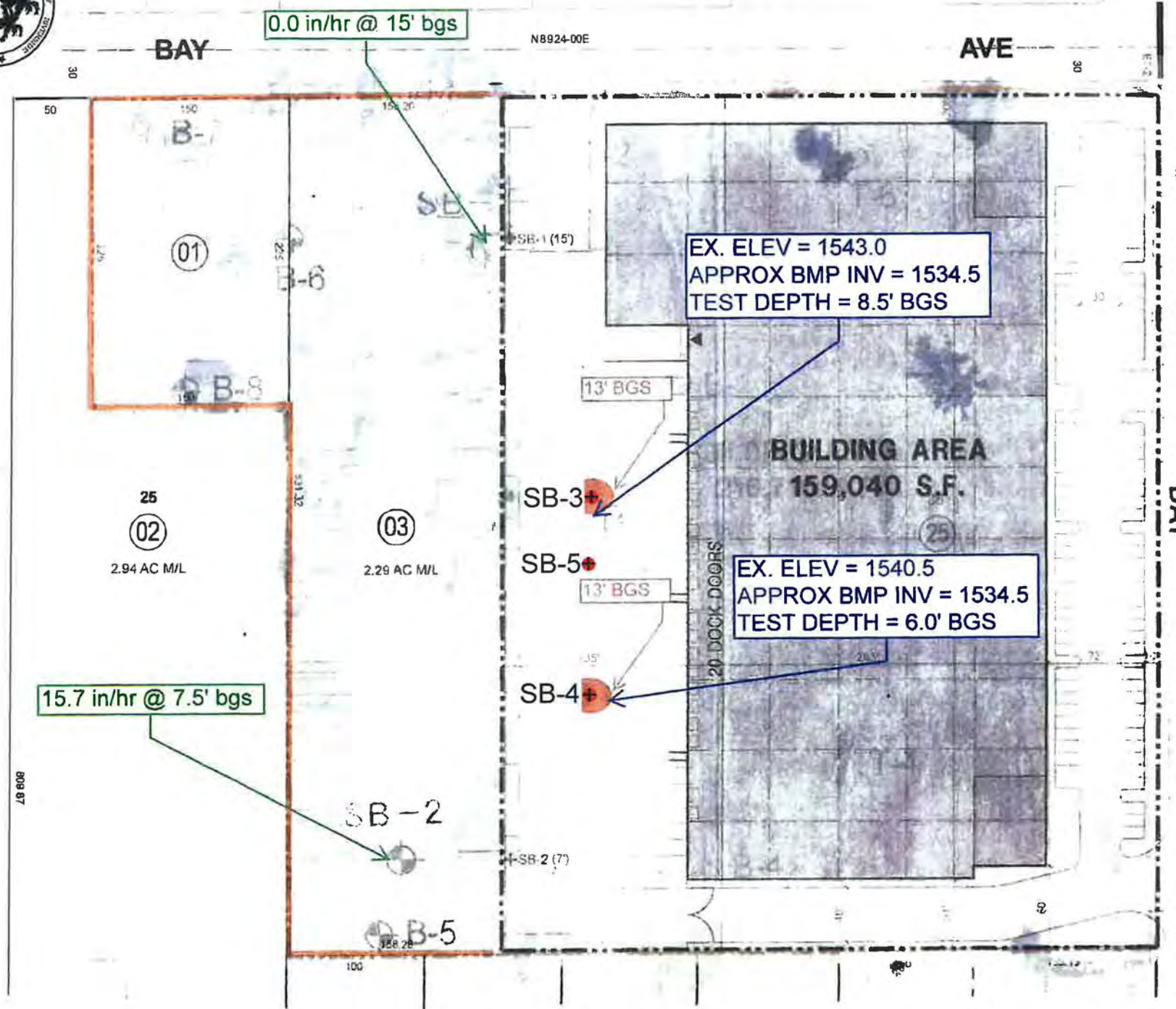
  
Keith D. Tucker  
Project Engineer  
R.G.E. 841



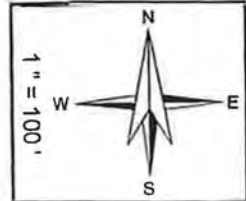
  
Mike Barone  
Project Manager

**NorCal Engineering**

## **APPENDIX A**



THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSES ONLY. NO LIABILITY IS ASSUMED FOR THE ACCURACY OF THE DATA SHOWN. ASSESSOR'S PARCEL MAY NOT COMPLY WITH LOCAL LOT-SPLIT OR BUILDING SITE ORDINANCES.



**NorCal Engineering**  
SOILS AND GEOTECHNICAL CONSULTANTS  
LDC MOLTO EDMONT, LLC  
PROJECT 22228-20 | DATE MARCH 2021

UPDATED GEOTECHNICAL MAP

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
	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	
	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**

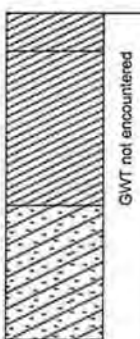
DRY	Absence of moisture, dusty, dry to the touch.
DAMP	Some perceptible moisture; below optimum
MOIST	No visible water; near optimum moisture content
WET	Visible free water, usually soil is below water table.

**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



<b>Boring Location: SWC Bay Ave &amp; Day St, Moreno Valley</b>	
<b>Date of Drilling: 3/27/2021</b>	<b>Groundwater Depth: None Encountered</b>
<b>Drilling Method: Hand Auger</b>	
<b>Hammer Weight:</b>	<b>Drop:</b>
<b>Surface Elevation: Not Measured</b>	

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0		<b>FILL SOILS</b> Sandy CLAY with rootlets, occasional gravel and organics Brown, soft, damp					
5		<b>NATURAL SOILS</b> Sandy CLAY Brown, stiff, moist					
		Clayey SAND with occasional gravel Brown, very dense, moist					
		Boring completed at depth of 8.5'					
10							
15							
20							
25							
30							
35							

Boring Location: SWC Bay Ave & Day St, Morenc Valley	
Date of Drilling: 3/27/2021	Groundwater Depth: None Encountered
Drilling Method: Hand Auger	
Hammer Weight:	Drop:
Surface Elevation: Not Measured	

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0		FILL SOILS Sandy CLAY with rootlets and organics Brown, soft, moist					
5		NATURAL SOILS Sandy CLAY Brown, stiff, moist					
		Boring completed at depth of 6'					
10							
15							
20							
25							
30							
35							

Boring Location: SWC Bay Ave & Day St, Moreno Valley	
Date of Drilling: 3/27/2021	Groundwater Depth: 18.5'
Drilling Method: Hand Auger	
Hammer Weight:	Drop:
Surface Elevation: Not Measured	

Depth (feet)	Lithology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	Fines Content %
0		FILL SOILS Sandy CLAY with rootlets, gravel and organics Brown, soft, damp					
5		NATURAL SOILS Sandy CLAY Brown, stiff, moist					
10		Clayey SAND with occasional gravel Brown, very dense, moist					
15		Silty SAND to Sandy SILT with some clay Brown, very stiff, moist					
20		Boring completed at depth of 20'					

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\2222820-3.log Date: 4/1/2021

## **APPENDIX B**

# SOIL INFILTRATION RATE CALCS. ⇒ Auger Boring

Location:	SB-3	SB-4
• Depth =	8.5 ft	6 ft
• Hole Dia. =	6 in	6 in
• Drop = $\Delta d$	0.5 in	0.5 in
• Time = $\Delta t$ Interval	30 min	30 min
• Preadjusted Perc. Rate	1.0 in/hr	1.0 in/hr
• Initial Water Depth = $d_i$	15 in	15 in
• Reduction Factor = $R_f$	5.9	5.9
• INFILTRATION RATE	0.17 in/hr	0.17 in/hr

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

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

**NorCal Engineering**  
SOILS AND GEOTECHNICAL CONSULTANTS

SOIL INFILTRATION RATE  
CALCULATIONS

LDC Molto

22228-20

DATE 3-30-21



SOILS AND GEOTECHNICAL CONSULTANTS

**PERCOLATION TEST DATA**

<b>Client:</b> LDC Molto Edgemont, LLC	<b>Date:</b> 3/26/2021
<b>Project No.:</b> 22228-20	<b>Tested By:</b> D.R.
<b>Test Hole:</b> SB-3	<b>USCS Soil Classification:</b>
<b>Depth of Test Hole:</b> 8.5'	<b>Sides (if rectangular):</b>
<b>Diameter of Test Hole:</b> 6"	<b>Length:</b>
<b>Sandy Soil Criteria Test*:</b>	<b>Width:</b>

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	9:08	9:33	25	87.0	87.0	0.0	
2	9:33	9:58	25	87.0	87.5	0.5	

\*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	7:16	7:46	30	87.0	87.0	0.0	
2	7:46	8:16	30	87.0	87.0	0.0	
3	8:16	8:46	30	87.0	87.5	0.5	
4	8:46	9:16	30	87.0	87.0	0.0	
5	9:16	9:46	30	87.0	87.0	0.0	
6	9:46	10:16	30	87.0	87.5	0.5	
7	10:16	10:46	30	87.0	87.0	0.0	
8	10:46	11:16	30	87.0	87.0	0.0	
9	11:16	11:46	30	87.0	87.5	0.5	
10	11:46	12:16	30	87.0	87.0	0.0	
11	12:16	12:46	30	87.0	87.0	0.0	
12	12:46	1:16	30	87.0	87.5	0.5	
13							
14							
15							

COMMENTS:



SOILS AND GEOTECHNICAL CONSULTANTS

**PERCOLATION TEST DATA**

<b>Client:</b> LDC Molto Edgemont, LLC	<b>Date:</b> 3/26/2021
<b>Project No.:</b> 22228-20	<b>Tested By:</b> D.R.
<b>Test Hole:</b> SB-4	<b>USCS Soil Classification:</b>
<b>Depth of Test Hole:</b> 6'	<b>Sides (if rectangular):</b>
<b>Diameter of Test Hole:</b> 6"	<b>Length:</b>
<b>Sandy Soil Criteria Test*:</b>	<b>Width:</b>

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	9:39	10:04	25	57.0	58.0	1.0	
2	10:04	10:29	25	57.0	57.5	0.5	

\*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	7:09	7:39	30	57.0	58.0	1.0	
2	7:39	8:09	30	57.0	57.5	0.5	
3	8:09	8:39	30	57.0	57.5	0.5	
4	8:39	9:09	30	57.0	57.5	0.5	
5	9:09	9:39	30	57.0	57.5	0.5	
6	9:39	10:09	30	57.0	57.5	0.5	
7	10:09	10:39	30	57.0	57.5	0.5	
8	10:39	11:09	30	57.0	57.5	0.5	
9	11:09	11:39	30	57.0	57.5	0.5	
10	11:39	12:09	30	57.0	57.5	0.5	
11	12:09	12:39	30	57.0	57.5	0.5	
12	12:39	1:09	30	57.0	57.5	0.5	
13							
14							
15							

COMMENTS:

# Appendix 4: Historical Site Conditions

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





January 22, 2021

Michael Powers  
Client Company  
One Lincoln Centre  
18W140 Butterfield Road, Suite 750  
Oakbrook Terrace, Illinois 60181

**RE: Phase I Environmental Site Assessment**  
Edgemont Assemblage  
Southwest of Bay Avenue and Day Street  
Moreno Valley, Riverside County, California 92553  
V3 Project No.: 20758

Dear Mr. Powers:

V3 Companies (V3) has completed a Phase I *Environmental Site Assessment (ESA)* of the above-referenced Site. The results of this assessment are provided in the enclosed project report. This environmental assessment has been conducted under the guidance and protocols of the *American Society of Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (Standard E1527-13)* and the U.S. EPA December 30, 2013 Standards and Practices for “*All Appropriate Inquiries*”; Final Rule (40 CFR Part 312).

V3 is providing this electronic version of the report for your review. If you have any questions regarding the findings provided in this document, please contact us at (630) 724-9200. V3 has enjoyed working with you on this project, and hopes to be of further service in the future.

Sincerely,  
V3 COMPANIES

A handwritten signature in cursive script that reads 'Elaine Petkovsek'.

Elaine Petkovsek, P.E.  
Project Manager

EP/vh/aa

Enclosure: Phase I Environmental Site Assessment Report

**PHASE I  
ENVIRONMENTAL SITE  
ASSESSMENT**



**PROJECT SITE:**

**Edgemont Assemblage**  
**Southwest of Bay Avenue and Day Street**  
18W140 Butterfield Road, Suite 750  
Moreno Valley, Riverside County, California 92553

**PREPARED FOR:**

Client Company  
One Lincoln Centre  
Oakbrook Terrace, Illinois 60181

**PREPARED BY:**

V3 Companies  
7325 Janes Avenue  
Woodridge, Illinois 60517  
(630) 724-9200

January 22, 2021

V3 Project Number: 20758

**SIGNATURES OF ENVIRONMENTAL PROFESSIONALS  
THAT PERFORMED PHASE I ENVIRONMENTAL SITE ASSESSMENT**

This Phase I Environmental Site Assessment report has been prepared by V3 Companies (V3), on behalf of the User, in general conformance with the scope and limitations of *American Society of Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (Standard E1527-13)* and the U.S. EPA December 30, 2013 Standards and Practices for “*All Appropriate Inquiries*”; Final Rule (40 CFR Part 312), unless otherwise noted herein.

We declare that, to the best of our professional knowledge and belief, we meet the definition of *environmental professional* as defined in the “*All Appropriate Inquiries*”, Final Rule (40 CFR 312.10), and have the required specific qualifications related to education, training, and experience. We have developed and performed all appropriate inquiry in general conformance with the standards and practices set forth in 40 CFR, Part 312.



---

Valerie Hofmann, CHMM, Project Scientist



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Elaine A. Petkovsek, P.E., Project Manager

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## LIST OF ACRONYMS

AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
AULs	Activity and Use Limitations
BFPP	Bona Fide Prospective Purchaser
BGS	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CREC	Controlled Recognized Environmental Condition
EPCRA	Emergency Planning and Community Right to Know Act
ERNS	Emergency Response Notification System of Spills
ESA	Environmental Site Assessment
FOIA	Freedom of Information Act
HREC	Historical Recognized Environmental Condition
LLPs	Landowner Liability Protections
NFA	No Further Action
NFR	No Further Remediation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List (Superfund Sites)
OSHA	Occupational Safety and Health Administration
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition
SARA	Superfund Amendments and Reauthorization Act
SPCC	Spill Prevention, Control and Countermeasures
TRI	Toxic Release Inventory
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage or Disposal Facility
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
UST	Underground Storage Tank
VEC	Vapor Encroachment Condition
VES	Vapor Encroachment Screen

A list of definitions and acronyms pertinent to regulatory records database is provided in the EDR regulatory database record report in **Appendix E** and those pertinent to the AAI/ASTM ESA process are provided in **Appendix L**.

## 1.0 EXECUTIVE SUMMARY

V3 Companies (V3) has completed a Phase I *Environmental Site Assessment (ESA)* of the Edgemont Assemblage located at sSouthwest of Bay Avenue and Day Street, Moreno Valley, California (Site). This *environmental site assessment* has been conducted under the guidance and protocols of the *American Society of Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (Standard E1527-13)* and the U.S. EPA December 30, 2013 Standards and Practices for “*All Appropriate Inquiries*”; Final Rule (40 CFR, Part 312).

V3 prepared this Executive Summary solely to provide a general overview. The Executive Summary omits a number of details, any one of which could be crucial to the proper application of this report. The full report should be reviewed for further information about findings, recommendations, and other concerns identified during this assessment.

### Site History and Description

The 9.92-acre Site is referred to as the Edgemont Assemblage and consists of three lots: Kelly’s Legacy, Bansal, and Sun. The Kelly’s Legacy lot is on the east portion of the Site; the Bansal lot is on the west portion and bisects the Sun lot in a north/south direction. Information on each lot is summarized below.

#### Kelly’s Legacy:

The lot was vacant land since at least 1938 to approximately 1949 when development began. Buildings with unknown use were on the lot from approximately 1949 to approximately 1978. The lot has been vacant land since approximately 1978 when the buildings were razed.

#### Bansal:

The lot was vacant land since at least 1938 to approximately 1959 and has since been used for residential purposes. The north portion of the lot is improved with seven, single-story residences and two freestanding automobile garages; the south portion is vacant land.

#### Sun:

The east and west portions of the Sun lot were used for residential purposes since at least 1938 to approximately 1994 when the residences were razed and has since been vacant land.

The Site is currently located in a residential area. The findings of this assessment are summarized below.

## 1.1 Recognized Environmental Conditions

A *Recognized Environmental Condition (REC)* is defined by ASTM E1527-13 as “the presence or likely presence of any *hazardous substances or petroleum products* in, on, or at a *property*: (1) due to *release to the environment*; (2) under conditions indicative of a *release to the environment*; or (3) under conditions that pose a *material threat* of a future *release to the environment*. *De minimis* conditions are not *recognized environmental conditions*.” (Italics denote terms with specific ASTM definitions).

This assessment has revealed no evidence of RECs in connection with the Site.

## 1.2 Controlled Recognized Environmental Conditions

A *Controlled Recognized Environmental Condition* (CREC) is defined by ASTM E1527-13 as “a recognized environmental condition resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority), with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls).”

This assessment has revealed no evidence of CRECs in connection with the Site.

## 1.3 Historical Recognized Environmental Conditions

A *Historical Recognized Environmental Condition* (HREC) is defined by ASTM E 1527-13 as “a past release of any hazardous substances or petroleum products that has occurred in connection with the property and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted use criteria established by a regulatory authority, without subjecting the property to any required controls (for example property use restrictions, activity and use limitations, institutional controls, or engineering controls)” and is not considered a REC in connection with the past release at the time this Phase I ESA was conducted.

This assessment has revealed no evidence of HRECs in connection with the Site.

## 1.4 Identified Data Gaps

Under the ASTM/AAI standards, if *data gaps* are identified during the ESA process, the *environmental professional must* comment on their significance and whether such gaps affect the overall findings. A *data gap* is defined by ASTM E1527-13 as “a lack of or inability to obtain information required this practice despite *good faith* efforts by the *environmental professional* to gather such information.” A *data gap* is significant if other information and/or professional experience raises reasonable concerns involving the *data gap*.

The following significant *data gaps* were identified:

- The User did not complete the User Questionnaire inquiries required by 40 CFR 312.25, 312.28, 312.29, 312.30 and 312.31 as part of “All Appropriate Inquires” and in order to qualify for one of the *Landowner Liability Protections* under CERCLA.
- The Owner Questionnaires for Kelly’s Legacy lot and the Bansal lot were not completed.

## 1.5 Limiting Conditions or Deviations from Scope of Services

During the performance of this ESA, there were limiting conditions with site reconnaissance activities listed below:

- Access to the interior of the residences was not permitted; therefore, the interior of the residences was not viewed.



## 1.6 ASTM E 1527 Non-Scope Considerations

The *User* did not elect to inquire into Non-Scope Considerations in connection with this practice and non-scope considerations are not required for appropriate inquiry as defined in this practice.

## 1.7 Limitations

The findings, opinions and conclusions of this ESA are not scientific certainties, but rather, probabilities based on professional judgment concerning the significance of the data gathered during the course of the environmental investigation. V3 is not able to represent that the Site or adjoining land contains no hazardous waste, oil, or other latent conditions beyond that detected or observed by V3 during the ESA. The possibility always exists for contaminants to migrate through surface water, air, or groundwater. The ability to completely address the environmental risk associated with transport in these media is beyond the scope of this investigation.

## 2.0 INTRODUCTION

V3 Companies (V3) performed a Phase I Environmental Site Assessment (ESA) of the Edgemont Assemblage located Southwest of Bay Avenue and Day Street in Moreno Valley, California (Site). The assessment was performed by the following *environmental professionals*: Ms. Valerie Hofmann, CHMM, Project Scientist, Ms. Elaine A. Petkovsek, P.E., Project Manager of V3, and Mr. Rick Darwicki, of AES Due Diligence, Inc. and representative of V3. The professional credentials of the project team are provided in **Appendix A**. A Site Location Map is provided as **Figure 1**, Surrounding Properties Map as **Figure 2** and a Site Details Map as **Figure 3**.

### 2.1 Site Location and Legal Description

<b>Site Name</b>	Edgemont Assemblage			
<b>Site Address / Location</b>	Southwest of Bay Avenue and Day Street, Moreno Valley, California, 92553			
<b>Township &amp; Range</b>	Section 10, Township 3S, Range 4W, of the San Bernardino, CA Meridian			
<b>Legal Description</b>	See Appendix B for Site legal description.			
<b>PIN #(s)</b>	263-230-025	263-230-001	263-230-004	263-230-003

An ALTA/NSPS Land Title Survey prepared by Thienes Engineering, Inc., dated 12/30/2020, is included in **Appendix B**.

### 2.2 Current Use and Site Description

<b>Current Occupants &amp; Current Use</b>	The east portion of the Site is vacant land; and the west portion of the Site partially vacant land and residential.
<b>Site Description</b>	The 9.92-acre Site is referred to as the Edgemont Assemblage and consists of three lots: Kelly's Legacy, Bansal, and Sun. The Kelly's Legacy lot is on the east portion of the Site; the Bansal lot is on the west portion and bisects the Sun lot in a north/south direction. Kelly's Legacy and both Sun lots are vacant land with scattered trees. The north portion of the Bansal lot is improved with seven residences with two freestanding automobile garages, and landscaped areas; the south portion is vacant land. The Site is located in a residential area.

## 2.3 Purpose & Standards

### Purpose of the Phase I ESA

V3 understands that the *User* intends to purchase the Site. This Phase I ESA was conducted for the purpose of assessing the environmental condition of, and identifying *recognized environmental conditions* in connection with, the Site taking into account commonly known and *reasonably ascertainable* information. The Phase I ESA might also allow a *User* to satisfy one of the requirements related to qualifying as an innocent landowner, contiguous property owner, or *bona fide prospective purchaser*, relative to potential CERCLA liability.

### Applicable Standards

The Phase I ESA process constitutes *all appropriate inquiries* into the previous ownership and uses of the *property*, consistent with good commercial or customary practice – as defined in 42 U.S.C §9601(35)(B), and provides defenses referred to as “*landowner liability protections*” (“LLPs”).

Nationwide ESA procedures and protocols have been established relative to the content, performance, and documentation of the environmental assessment process. These procedures are defined in the standards identified below.

- American Society of Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (Standard E1527-13).
- U.S. EPA December 30, 2013 Standards and Practices for “*All Appropriate Inquiries*”; Final Rule (40 CFR Part 312).

These standards are referred to throughout this report as “ASTM” and “AAI”, respectively. The goal of the processes established in these standards is to identify recognized environmental conditions (RECs) in connection with the Site. RECs are defined by ASTM E1527-13 as “the presence or likely presence of any *hazardous substances or petroleum products* in, on, or at a *property* (1) due to any *release* to the *environment*; (2) under conditions indicative of a *release* to the *environment*; or (3) under conditions that pose a *material threat* of a future *release* to the *environment*. *De minimis* conditions are not *recognized environmental conditions*.” (Italics denote terms with specific ASTM definitions). V3 has conducted and developed this ESA in general accordance with these standards.

ASTM defines *property* as “...the real *property* that is the subject of the *environmental site assessment*...”. For purposes of this report, the term “Site” has the same meaning as *property*.

## 2.4 Scope of Services

This ESA has been prepared and conducted under the guidance and protocols of the ASTM/AAI standards identified above, as set forth in the Service Agreement between V3 and Molto Properties Fund III, LLC Service Agreement dated November 3, 2020. In general, the evaluation process primarily consists of a review of historical and current records and information, a site visit, and an interview of informed individuals. V3 has conducted this assessment consistent with that level of care and skill that is standard to the industry. The ASTM standards are not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged.

### Limiting Conditions or Deviations from Scope of Services

During the performance of this ESA, there were limiting conditions with site reconnaissance activities identified in **Section 5.1**.

### Non-ASTM Scope Considerations

The ASTM standard specifically identifies the services listed in the table below as Non-Scope Considerations (i.e., not within the standard scope of work). As such, the evaluation of these factors is considered an additional service. Non-scope considerations requested by the User, to be performed in conjunction with this assessment, are identified below. The specific scope of work for any requested additional services performed is documented in **Section 8.0**.

<b>Non-Scope Activities</b>	<b>Performed</b>	<b>Not Requested</b>
Asbestos-Containing Building Materials		X
Radon		X
Wetlands		X
Regulatory Compliance		X
Industrial Hygiene		X
Ecological Resources		X
Indoor Air Quality		X
Lead-based Paint		X
Mold		X
Lead in Drinking Water		X
Cultural and Historic Resources		X
Health and Safety		X
Endangered Species		X
Biological Agents		X

## **2.5 Assumptions, Limitations & Exceptions**

Assumptions, Limitations and Exceptions are documented in **Appendix C**.

## **2.6 Special Terms and Conditions**

V3 is not affiliated with the borrower or any other parties to this transaction. This Phase I ESA report is intended to be used in its entirety. No portion of it may be deleted or used out of context without the written consent of V3. The information and opinions contained in this report are time-sensitive and represent our evaluation of the environmental Site conditions at the time the services were provided. This report was prepared for a limited use involving a single transaction, as set forth herein, and may not be used for any other purpose without the written consent of V3.

Both the ASTM and AAI standards identify certain individuals as having specific obligations related to completion of the ESA process, as noted below:

*User* - the party seeking to use Practice E 1527-13 to complete an *environmental site assessment* of the *property*. A *User* may include, without limitation, a potential purchaser of property, a potential tenant of property, an owner of property, a lender, or a property manager. The *User* has specific obligations for completing a successful application of the practice as outlined in **Section 6** of the *ASTM E1527-13* standard.

*Environmental Professional (EP)* – a person who possesses sufficient specific education, training, and experience necessary to exercise professional judgment or develop opinions and conclusions regarding conditions indicative of releases or threatened releases on, at, in, or to a property, sufficient to meet the objectives and performance factors specified in the ASTM standard.

The following table identifies the responsibilities of these individuals relative to the execution of the ESA. The *User* is identified later in this report, and information provided by this individual is included and identified within this ESA report.

AAI Component	User	EP
Inquiry		X
Visual Inspections		X
Interviews		X
Reviews of Historical Sources		X
Reviews of Government Records		X
Search for Environmental Liens and Activity and Use Limitations (AULs)	X	
Consider “specialized knowledge or Experience”	X	
Consider relationship of purchase price to fair market value of property, if contaminated	X	
Consider “commonly known” or “reasonably ascertainable” information	X	X
Consider “degree of obviousness of contamination”	X	X

## 2.7 User Reliance

This report has been prepared on behalf of Client Company and Molto Properties, and may not be relied upon or disseminated to any third person or entity, other than a commercial financial institution or other lender providing financing for the acquisition or improvement of the Site, as of the date of this report. Use of this report by any third party or entity is expressly prohibited without the written authorization of Client Company and V3. As a condition precedent to such use, such third party or entity shall agree to be bound by the same contractual terms as those between V3 and Client Company, including those regarding indemnification and limitation of liability.

## 2.8 Definitions and Acronyms

An abbreviated list of acronyms pertinent to the AAI/ASTM ESA process and pertinent to regulatory records precedes the Executive Summary herein and a comprehensive list of definitions and acronyms is provided in the regulatory records database report in **Appendix E** and in **Appendix L**.

## 2.9 Published References

The following published documents are referenced in relationship to the execution of this ESA:

### ASTM Standards:

*E1527-13 Standard for Phase I Environmental Site Assessments*

*E2091 Guide for Use of Activity and Use Limitations, Including Institutional and Engineering Controls*

*E2600-15 Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions*

Federal Statutes:

*Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (“CERCLA” or “Superfund”), as amended by Superfund Amendments and Reauthorization Act of 1986 (“SARA”) and Small Business Liability Relief and Brownfields Revitalization Act of 2002 (“Brownfields Amendments”), 42 U.S.C. §9601 et seq.*

*Emergency Planning and Community Right-To-Know Act of 1986 (“EPCRA”), 42, U.S.C. §1101 et seq.*

*Freedom of Information Act, 5 U.S.C. §552, as amended by Public Law No. 104-231, 110 Stat. 3048*

*Resource Conservation and Recovery Act (also referred to as the Solid Waste Disposal Act), as amended (“RCRA”), 42 U.S.C §9601 et seq.*

USEPA Regulations:

*“All Appropriate Inquiries” Final Rule, 40 C.F.R. Part 312*

*Chapter 1 EPA, Subchapter J-Superfund, Emergency Planning, and Community Right-To-Know Programs, 40 C.F.R Parts 300-399*

*National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300*

Other Federal Regulations:

OSHA Hazardous Communication Regulation, 29 C.F.R. §1910.1200

Additional documents reviewed as part of this assessment are identified in the appropriate sections of this report.

### **3.0 USER PROVIDED INFORMATION**

Under the ASTM standard, the *User* is defined as “the party seeking to use Practice E1527 to complete an environmental site assessment of the *property*. A *User* may include, without limitation, a potential purchaser of *property*, a potential tenant of *property*, an owner of *property*, a lender, or a *property* manager.”

In the context of this ESA, the *User* is Client Company. The ASTM standard specifies that the *User* is required to identify any special terms and conditions which must be agreed upon by the EP prior to the initiation of the ESA. In addition, the *User* must provide specific information to the EP during the performance of the ESA and is required to complete a questionnaire related to their individual knowledge of environmental issues at the Site.

The *User* did not return the questionnaire which represents a *significant data gap*. Any previous reports provided by the *User* are documented in **Section 4.4**. Other pertinent information obtained from the *User* is documented in appropriate sections of this report including **Section 6.1**.

## 4.0 RECORDS REVIEW

### 4.1 Records Pertaining to Physical Setting

A variety of data pertaining to the physical setting of the Site is provided in the “Geocheck” section of the Environmental Data Resources, Inc. (EDR) report dated 01/07/2021 in **Appendix E**. Additional data was obtained through observations made during the site visit and a review of maps and other published documents identified below. The physical setting of the Site is summarized as follows:

<b>USGS Topographic Map</b>	2012 Riverside East, CA, 7.5 Minute
<b>Property Elevation</b>	Approximately 1550 to 1560 feet above mean sea level (based on USGS Topographic Map)
<b>Surface Topography</b>	Relatively flat
<b>Regional Topography</b>	The regional topography appears to slope in a general northwesterly direction
<b>Site Features</b>	The Site consists of 9.92-acres and three lots: Kelly’s Legacy, Bansal, and Sun. Kelly’s Legacy and both Sun lots are vacant land with scattered trees. The north portion of the Bansal lot is improved with seven residences with two freestanding automobile garages, and landscaped areas; the south portion is vacant land. The Site is located in a residential area.

Regional/Local Geology: Based on a review of the USDA Soil Resource Conservation Service (SCS) and National Cooperative Soil Survey (NCSS) data obtained from the EDR Geocheck Physical Setting Source Map Findings Report, the predominant soil type(s) in the area of the Site is comprised of Monserate sandy loam, well drained soils, with slow infiltration rates. The AASHTO Group soil classification is silt-clay materials.

Hydrogeology: Based on regional topography and physical setting, inferred groundwater flow within the near surface sediments of the Site is assumed to follow topography and would likely flow to the northwest towards tributaries of the Santa Ana River. However, several groundwater studies conducted on a property approximately 0.3-miles to the south of the Site indicates groundwater flow towards the south. Refer to **Section 4.2** and **4.2.2** for more information.

### 4.2 State and Federal Database Search

An ASTM radius search was performed by EDR regulatory database record search, which obtains updated environmental database information from *Standard Federal, State, and Tribal Environmental Record Sources* and supplemental federal, state, tribal, and local record sources. The following sections provide a summary of State and Federal regulatory record review related to the Site and nearby properties and notable EDR regulatory database listings. V3 determined that listed properties that are not discussed herein are not likely to impact the Site. The complete list of databases reviewed by EDR and a summary of their results are provided in EDR’s report in **Appendix E**.

#### State and Federal Regulatory Record Review

The following table summarizes State and Federal agency regulatory record review. Pertinent information is incorporated into the appropriate sections below. The documentation received and reviewed is presented in **Appendix F**.

Agency	Requested	Received	Comment
California Environmental Protection Agency	X	X	Requested Superfund technical files for former March Air Force (MAF) Base located south of the Site. Records obtained online via US EPA and California EPA databases.
US EPA Region 9	X	X	

Records were not received via FOIA request prior to the issuance of this report, which represents a data gap; however, V3 obtained Superfund technical files and historical information for MAF Base online at the US EPA website at <https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0902761>, and the California Department of Toxic Substances Control EnviroStor data portal website at [www.envirostor.dtsc.ca.gov](http://www.envirostor.dtsc.ca.gov). Based on review of these sources, the data gap is not significant.

Because of their large volume, only select copies of reports and documents obtained from the California Envirostor database for MAF are provided in **Appendix F**; copies of all reports may be viewed at the Envirostor website at [www.envirostor.dtsc.ca.gov](http://www.envirostor.dtsc.ca.gov). Refer to Section **4.2.2** for more information.

#### 4.2.1 Site

The Site was not listed in EDR's database report for Standard Federal, State, and Tribal Environmental records.

#### 4.2.2 Adjoining and Nearby Properties

V3 identified the following adjoining/nearby properties that have a potential to impact the Site.

<b>Facility Name:</b>	March Air Force Base		
<b>Address:</b>	22 CSG/CC, Riverside, CA 92518		
<b>Distance/Direction:</b>	Approximately 0.2-miles southwest and 0.5-miles south of the Site.		
<b>Gradient:</b>	Down-gradient		
<b>RCRA:</b>	CA4570024527, Large Quantity Generator (LQG) of ignitable, corrosive, and reactive wastes; metals; methyl ethyl ketone; spent halogenated and nonhalogenated solvents; potassium cyanide; phenol & trichloroethane.	<b>Status</b>	Violations found 1984 to 1995. Dates achieved compliance: 1995 to 2000.
<b>SEMS/CERCLIS:</b>	CA4570024527	<b>Status</b>	Start Date: 11/21/1989 Currently on the Final NPL
<b>US INST CONTROLS /US ENG CONTROLS:</b>	Record of Decision (ROD) Amendment: Contamination media: soil, soil gas, and groundwater.	<b>Status</b>	Currently on Final NPL
<b>Comments:</b>	<p>March Air Force Base (MAFB) covers approximately 6,600 acres and is located immediately east of Interstate 215 (I-215) and south of Cactus Avenue. MAFB was established in 1918 as the Alessandro Aviation Field. Operations at the Base included: aircraft repair and maintenance; degreasing; drycleaning; engine testing/repair; fire training; aircraft refueling; domestic landfilling; machine shops; and paint/depainting. MAFB has historically generated the following hazardous wastes: petroleum, oil and lubricants, chlorinated and non-chlorinated solvents.</p> <p>MAFB is participating in the Installation Restoration Program (IRP). Under this program, the Department of Defense (DOD) identifies, investigates, and remediates contamination from hazardous materials at IRP sites. Previous environmental reports obtained from Envirostor</p>		

	<p>document 42 IRP sites located at the MAFB. The Base has been divided into five groups, referred to as operable units (OUs), that consist of the IRP sites.</p> <p>Several environmental investigations were conducted since 1989 involving the collection of soil, soil gas, and groundwater samples for analysis of chemical of concern, including: volatile organic compounds (VOCs); petroleum hydrocarbons; polynuclear aromatic hydrocarbons (PNAs); PCBs; heavy metals; and dioxins. According to previous environmental reports, groundwater, soil, and soil gas have been impacted. Environmental investigation reports document groundwater flow to the south/southeast and plumes of groundwater contamination either remain on the MAFB or have migrated offsite to the east/south/southeast. Figures extracted from previous environmental reports showing the IRP sites, OUs, and groundwater contamination plumes are provided in <b>Appendix F</b>. Based on the information presented in the previous environmental reports, it is not apparent that impact has migrated onto the Site; therefore, this facility does not represent evidence of a REC in connection with the Site.</p>
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### 4.3 Local Records

The following local agencies were contacted and databases reviewed with regard to pertinent information and potential environmental issues related to the Site or adjoining properties. Copies of applicable data and records of phone conversations (if any) are provided in **Appendix F** and summarized below.

Riverside County Assessor: Records included land size, PINs and associated addresses, and legal descriptions for each lot comprising the Site. Records for the Site are summarized below:

Lot	Land Size	PIN	Address
Kelly's Legacy	4.57-acres	263-230-025	No address
Sun (east portion)	2.29-acres	263-230-004	21917 Bay Avenue
Sun (west portion)	0.77-acres	263-230-001	21875 Bay Avenue
Bansal	2.29-acres	263-230-003	21891 Bay Avenue

Riverside County Planning Department: Records included permits for residence alterations, ventilation system, and electrical utilities for the Bansal lot, and electrical utilities for the west portion of the Sun lot. The building department did not have records of USTs, spills, releases or dumping for the Site. Records returned pose no environmental concern.

Riverside County Fire Department: The fire department did not have records of USTs, spills, releases or dumping for the Site. V3 was referred to the Riverside County – Department of Environmental Health for records.

Riverside County Department of Environmental Health: The health department did not have records of landfills/dumping, septic systems, wells, permits, spills, releases, complaints or violations for the site.

### 4.4 Previous ESA and/or Site Investigation Reports

Previous environmental reports were not provided.



#### 4.5 Title Records

The *User* provided title commitment documents for each lot comprising the Site. V3 reviewed the documents relative to applicable site information including records related to environmental liens or activity and use limitations (AULs). The commitment documents are included in **Appendix H** and the pertinent information is provided below.

Kelly's Legacy lot Property Record, prepared by First American Title Insurance Company, dated 10/01/2020

Property Record	Comment
Current Title Holder	Kelly's Legacy LLC, a California limited liability company
Leases	Leases suggesting environmental concerns were not apparent.
Environmental Liens	Environmental Liens were not recorded.
Activity and Use Limitations (AULs)	Institutional/engineering controls were not recorded.

Sun lot Property Record, prepared by First American Title Insurance Company, dated 10/01/2020

Property Record	Comment
Current Title Holder	David Sun and Diana Sun, as Co-Trustees of the Declaration of Trust of David Sun and Diana Sun dated February 26, 1986
Leases	Leases suggesting environmental concerns were not apparent.
Environmental Liens	Environmental Liens were not recorded.
Activity and Use Limitations (AULs)	Institutional/engineering controls were not recorded.

Bansal lot Property Record, prepared by First American Title Insurance Company, dated 12/11/2020

Property Record	Comment
Current Title Holder	Jagan N. Bansal and Madhu B. Bansal, or the Survivor of them, Trustees or Successor Trustees U/D/T March 11, 1998 FBO The Bansal Family
Leases	Leases suggesting environmental concerns were not apparent.
Environmental Liens	Environmental Liens were not recorded.
Activity and Use Limitations (AULs)	Institutional/engineering controls were not recorded.

No environmental concerns indicative of RECs were identified in the title commitment documents.

#### 4.6 Historical Records Review

##### 4.6.1 Records Reviewed

Multiple historic sources were reviewed to gain an understanding of the Site history, including standard ASTM E1527-13 historical sources. In accordance with the standard, those sources that were both *reasonably ascertainable* and available within project constraints, and/or that were judged likely to be useful for the purposes of this ESA, are listed on the following table. Copies of these documents are provided in **Appendix I** and other appendices, as appropriate.

Historical Document	Reasonably Ascertainable/ Available	Source/dates (if applicable)	Comments
Aerial Photographs	Yes	EDR (1938-2016)	Limited in usefulness due to scale/resolution <b>Sections 4.6.2 and 4.6.3</b>
Fire Insurance Maps	No	EDR (01/07/2021)	No map coverage
Property Tax Files	Yes	Riverside County Assessor	<b>Section 4.3</b>
Recorded Land Title Records	Yes	First American Title Insurance Company (Kelly's Legacy lot 10/01/2020) (Sun lot 10/01/2020) (Bansal lot 12/11/2020)	<b>Section 4.5</b>
Topographic Maps	Yes	EDR (1901-2012)	<b>Sections 4.6.2 and 4.6.3</b>
Local Street Directories	Yes	EDR (1973-2017)	Limited in usefulness due to no address listings for Kelly's Legacy lot <b>Sections 4.6.2 and 4.6.3</b>
Regulatory Records	Yes	EDR (01/07/2021)	<b>Section 4.2</b>
Interviews	Yes	Various	<b>Section 6.0</b>
Other Historical Data	Yes	N/A	<b>Section 4.4</b>

N/A – Not Applicable

#### 4.6.2 Past Use of the Site

Based on review of the available sources/records reviewed, historical uses of the Site are identified below:

YEAR(s)	SITE USE
1901	The Site is vacant land. An unnamed road traverses the Kelly's Legacy lot in a northwest/southeast direction.
1938	The unnamed road on the Kelly's Legacy lot is gone. Day Street and Bay Avenue are present. Kelly's Legacy lot is vacant land. The east portion of the Sun lot is improved with suspected residences on the north side and vacant land to the south; the west portion of the Sun lot is improved with a suspected residence. The Bansal lot is vacant land.
1949	Land disturbance is present on the north portion of the Kelly's Legacy lot with a mound of suspected construction debris, indicative of development; a building is on the northwest portion of the lot, the use is unknown. No significant changes are on the remaining lots.
1953-1976	Two structures and suspected mounds of construction debris are on the north portion of the Kelly Legacy's lot. The buildings previously noted on the east portion of the Sun lot have been razed and a new suspected residence has been constructed. The 1959 aerial photograph shows residences on the north portion of the Bansal lot, and vehicular tracks extending onto the Site from the southern adjoining property. City Directories list resident names for the Bansal and Sun lots.
1978	The structures on the Kelly's Legacy lot have been razed and a mound of construction debris still present. No significant changes have occurred on the remaining portions of the Site. City Directories list resident names for the Bansal lot and the west Sun lot.
1985-1989	The Kelly's Legacy lot is vacant land with no structures and no mounds of construction debris. No significant changes have occurred on the remaining portions of the Site. City Directories list resident names for the Bansal lot and the west Sun lot.

<b>1994-present</b>	The Kelly's Legacy and Sun lots are vacant land with scattered trees. Increased residential development occurred on the Bansal lot. The vehicular tracks on the Site are less pronounced over the years and are no longer present in the 2016 aerial photograph. City Directories list resident names for the Bansal lot.
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The reviewed historical information related to the Site indicates the following for each lot:

Kelly's Legacy:

The lot was vacant land since at least 1938 to approximately 1949 when development began. Mounds of suspect construction debris and buildings with unknown use were observed on the lot from approximately 1949 to approximately 1978. The lot has been vacant land since approximately 1978 when the debris was removed and buildings razed. The unknown use of Kelly's Legacy lot represents a data gap; however, no indications of apparent petroleum products, chemicals or deleterious materials were observed during the site visit and there were no reported releases on the lot. For these reasons, the unknown use of Kelly's Legacy lot from 1949 to approximately 1978 is not a significant gap.

Bansal:

The lot has been used for residential purposes since approximately 1959, prior to which was vacant land.

Sun:

The east and west portions of the lot were used for residential purposes since at least 1938 to approximately 1994 when the residences were razed and has since been vacant land.

Based on a review of the above references, the historical use and operations on the Site do not represent evidence of a REC.

**4.6.3 Past Use of the Adjoining Properties**

Historical information associated with adjoining properties is summarized below:

YEAR(s)	ADJOINING PROPERTY USE
<b>North Adjoining Property</b>	
<b>1901</b>	The property is vacant land. Unnamed roads traverse the property.
<b>1938</b>	Day Street and Bay Avenue are present. The northwest portion of the property is heavily wooded with dense vegetation. An unnamed road extends from Bay Avenue onto the northeast portion of the property. The remainder of the northeast portion of the property is vacant land with no apparent structures.
<b>1949-present</b>	Residences and sections of vacant land with scattered trees are on the property. City Directories list resident names.
<b>South Adjoining Property</b>	
<b>1901</b>	The property is vacant land. An unnamed road traverses the southern portion of the property.
<b>1938</b>	Day Street and Bay Avenue are present. The property is vacant land with no structures.
<b>1949-1953</b>	Residences are on the southeast portion of the property. The remainder of the property is vacant land.
<b>1959</b>	The property to the southeast, past Day Street, appears as a parking lot. Vehicular tracks extend onto the property from the Site. The remainder of the property remains unchanged.
<b>1967-present</b>	The parking lot to the southeast, past Day Street, is gone and is vacant land. The vehicular tracks are less pronounced over the years. The remainder of the property remains unchanged.

East Adjoining Property	
1901	The property is vacant land. An unnamed road traverses the southern portion of the property.
1938	Day Street and Bay Avenue are present. A residence is on the north portion of the property. The remaining portion of the property is vacant land.
1949-present	Sherman Avenue is south of the property. Increased residential development occurs to the north. The south portion of the property remains vacant land. City Directories list resident names.
West Adjoining Property	
1901	The property is vacant land. An unnamed road traverses the southern portion of the property.
1938-present	Residences are on the north portion of the property. The remainder of the property is vacant land with vehicular tracks. City Directories list resident names.

Past use and operations on the adjoining properties do not represent evidence of a REC.

#### 4.7 Vapor Encroachment Screen

The ASTM standard requires consideration of potential sources of subsurface volatile chemical vapor encroachment at/onto the *property* is required by the ASTM standard when evaluating the potential for RECs in association with the property. A *vapor encroachment screen* (VES) has been conducted at the Site in general accordance with *ASTM E2600-15 Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions*.

The objective of a VES is to identify a *vapor encroachment condition* (VEC), which is defined as follows:

“...the presence or likely presence of COC (chemical of concern) vapors in the vadose zone of the *target property* (TP) caused by a release of vapors from contaminated soil and/ or groundwater either on or near the TP...”

Screening identified potential off-site sources of vapor encroachment from a CERS Hazardous Waste site located northwest of the Site, and the former March Air Force Reserve Base south of the Site. The EDR report lists the CERS description as household hazardous waste collection site. Based on distance and suspected chemical of concern, the potential for a VEC from the CERS site does not exist at the Site. Based on previous environmental investigations conducted on the March Air Force Base, no apparent evidence of contamination plumes migrated towards or onto the Site; therefore, a VEC does not exist on the Site. Refer to **Section 4.2.2** for more information. The VES is documented in the *Vapor Encroachment Screen* report in **Appendix J**.

## 5.0 SITE RECONNAISSANCE

Mr. Rick Darwicki, of AES Due Diligence, Inc. and representative of V3 conducted a *site reconnaissance* on January 11, 2021. The purpose of the reconnaissance was to observe the Site for conditions that indicate potential environmental impact. Such conditions might include signs of stressed vegetation, stained soil, uncontrolled dumping, the presence of underground storage tanks, or indications of a release of hazardous wastes and/or regulated substance(s). The *site reconnaissance* included observations of adjoining properties from the Site or surrounding roads. Mr. Darwicki was unaccompanied during the field inspection. Photographic documentation of V3’s field inspection is provided in **Appendix K**.

### 5.1 Limiting Conditions Regarding Methodology

The following limiting conditions interfered with performance of site reconnaissance activities:

- Access to the interior of the residences was not permitted; therefore, the interior of the residences was not viewed.

### 5.2 General Characteristics of Site Vicinity

The Site is located in a predominately residential area. See **Section 5.4** for more detailed information.

### 5.3 Adjoining Properties

Observations of the adjoining properties were made from the Site and from public thoroughfares. The following operations were observed on the adjoining properties:

<b>North</b>	Vacant lots and residential homes along Bay Avenue with posted addresses: 21850, 21852, 21818, 21948, and 22020 Bay Avenue.
<b>East</b>	Residential home with posted address 22007 Bay Avenue; vacant land; and residential homes along Day Street with posted addresses: 13740, 13790, 13804, 13806 and 13808 Day Street.
<b>South</b>	Vacant lot and residential homes along Alessandro Avenue with posted addresses: 21024, 21894, 21872, 21874, 21826, 21828, and 21882 Alessandro Avenue. Long narrow lots, mostly vacant on the northern half.
<b>West</b>	Vacant land with narrow access from Bay Avenue, followed by residential home with posted address 21827 Bay Avenue.

Small quantities of fly dumping of domestic garbage and debris was observed, which represents a *de minimis* condition. No RECs were noted in connection with the Site.

### 5.4 Description of Site, Site Structures, Roadways and Other Improvements

The 9.92-acre Site consists of three lots: Kelly's Legacy, Bansal, and Sun. The Kelly's Legacy lot is on the east portion of the Site; the Bansal lot is on the west portion and bisects the Sun lot in a north/south direction; therefore, the Sun lot is on both the east and west portions of the Site. Kelly's Legacy and both Sun lots are vacant land, with scattered trees and grassy and exposed soil ground surfaces. Vehicular tracks were observed on the soil ground surface on the east portion of the Sun lot. The north portion of the Bansal lot is improved with seven, single-story, approximately 1,100 to 3,700 square foot residential homes of wood frame construction; two automobile garages; and landscaped areas. An asphalt paved driveway extends south onto the Bansal lot from Bay Avenue. The south portion of the Bansal lot is vacant land with a grassy and exposed soil ground surface. The Site can be accessed to the south from Bay Avenue and to the west from Day Street. The Site is located in a residential area.

### 5.5 Site Utilities

The following utility services are present at the Site:

<b>Electricity</b>	Moreno Valley Electric Utility
<b>Natural Gas</b>	The Gas Company
<b>Heating/Cooling-HVAC</b>	Window air conditioning units and presumed natural gas furnaces for the residences on the Bansal lot.
<b>Fuel Oil</b>	No
<b>Propane</b>	No
<b>Potable Water</b>	Municipal

<b>Source</b>	
<b>Sewage Disposal System</b>	Municipal

### 5.6 Hazardous Substances and Petroleum Products

Based on observations during the site visit and evidence from interviews and records review, hazardous substances and petroleum products were not used, treated, stored, disposed of, or generated at the Site.

### 5.7 Solid Waste Storage and Disposal

Solid waste, other than *de minimis* debris, was not observed. Small quantities of fly dumping of domestic garbage and broken concrete was observed on the east portion of the Site.

### 5.8 Stormwater/Wastewater

Type	Description
<b>Waste Water (other than sanitary)</b>	Not generated on site.
<b>Stormwater</b>	Stormwater runoff from the Site flows in a southerly direction. No environmental concerns were identified.

### 5.9 Floor Drains or Sumps

Floor drains or sumps were not observed.

### 5.10 Storage Tanks

The likely presence of underground storage tanks (USTs), aboveground storage tanks (ASTs), or vent pipes, fill pipes or access ways indicating USTs was evaluated based on observations during the site visit and from interviews and records review.

Evidence of USTs and ASTs was not observed. Furthermore, UST or AST regulatory records were not found for the Site address (See Section 4.2.1).

### 5.11 Polychlorinated Biphenyls (PCBs)

The presence of electrical or hydraulic equipment known to contain PCBs or likely to contain PCBs was evaluated based on observations during the site visit and from interviews and records review.

The following equipment that potentially contains PCBs was observed during V3's site visit and is tabulated below. Please note that this list is limited to common potential PCB sources observed during the Site visit, which include dielectric fluids used in electrical equipment such as transformers and capacitors, and is not intended to be a comprehensive list of potentially PCB-containing equipment. Dry transformers do not contain PCBs and are therefore are not listed.

Location	Equipment	PCB Labeling	Equipment Owner	Staining / Releases
<b>Along Bay Avenue</b>	Pole-mounted transformers	None observed	Moreno Valley Electric Utility	No

Prior to their federal ban in 1979, PCB compounds were widely used in various industrial and manufacturing applications due to their dielectric, lubricating, and fire-retardant properties. Transformers and PCB-containing equipment manufactured after July 1, 1979 are certified Non-PCB by the manufacturer as required by the US EPA. Under US EPA rules, mineral oil transformers manufactured prior to July 1, 1979 that have not been tested are classified as "PCB-contaminated transformers." If a transformer or PCB-containing equipment is unlabeled and manufactured prior to July 1, 1979, it is assumed to be PCB containing until tested and determined to be otherwise.

### 5.12 Pits, Ponds or Lagoons

Pits, ponds or lagoons were not observed on the Site.

### 5.13 Other Conditions Observed

Other conditions of concern based on observations during site reconnaissance of the Site are noted and described below, as warranted.

Visual and/or Physical Observations	Yes	No	Comment
Odors- Strong, Pungent, or Noxious		X	
Pools of Liquid or Standing Surface Water		X	
Drums		X	
Hazardous Substance and Petroleum Product Containers with unidentified uses		X	
Unidentified Substance Containers		X	
Stains or Corrosion		X	
Stressed Vegetation		X	
Wells		X	No on-site wells were listed on the EDR Geocheck map. No wells were observed while onsite.
Natural Gas Pipelines		X	
Oil Pipelines		X	
Raw Materials		X	

## 6.0 INTERVIEWS

The objective of interviews is to obtain information indicating RECs in connection with the Site.

### 6.1 Interviews with User, Owners and Occupants

The following *users*, owners, and occupants were interviewed. Relevant information obtained is incorporated in the report and in **Appendix D**.

Interviewee	Company / Entity Name	Representative Name	Comments / Documented Information
User	Molto Properties Fund III LLC	N/A	User Questionnaire Was not completed, which represents a significant data gap.

Site Owners	Kelly's Legacy	N/A	The Owner Questionnaire was not completed, which represents a significant data gap due to the unknown use of the on-site structures between 1949 and 1978.
	Sun	Thomas P. Harris	Refer to <b>Appendix D</b> for Owner Questionnaire.
	Bansal	N/A	The Owner Questionnaire was not completed, which represents a significant data gap since the interior of the residences could not be observed.
Site Occupants	Kelly's Legacy	N/A	The lot is vacant.
	Sun	N/A	The lot is vacant.
	Bansal Residents	N/A	Interviews not warranted based on information provided by other sources.
Past Site Owners	N/A	N/A	Interviews not warranted based on information provided by other sources.
Past Site Occupants	N/A	N/A	Interviews not warranted based on information provided by other sources.
Adjoining Property Owner or Occupant	N/A	N/A	Interviews not warranted based on information provided by other sources.

N/A - Not Applicable

## 6.2 Interviews with Federal, State and Local Government Officials

The following government officials were interviewed as part of this assessment. Relevant information obtained from these individuals is included in **Appendix D** and/or is documented in other sections herein or below in this section.

Title	Name	Agency	Documented Information
Federal Government Officials	Charnjit Bhullar	US EPA Superfund Division	Email sent on 12/21/2020 requesting information for March Air Force (MAF) Base. No response has been received to date.
	David Yogi		Voicemail left on 01/07 2021 requesting information for MAF. Mr. Yogi referred V3 to Mr. Bhullar.
	Harold Ball		Email sent on 12/21/2020 requesting information for MAF. Mr. Ball did not have information regarding the Site.

## 7.0 FINDINGS AND CONCLUSIONS

V3 has performed a Phase I ESA in conformance with the scope and limitations of ASTM Practice E1527-13 of the Edgemont Assemblage located at Southwest of Bay Avenue and Day Street, Moreno Valley, California. Exceptions to, or deletions from this practice are described in **Section 7.5** of this report.



The findings and conclusions of this assessment have revealed no evidence of RECs, CRECs, or HRECs in connection with the Site.

### **7.1 Recognized Environmental Conditions**

A *Recognized Environmental Condition (REC)* is defined by ASTM E1527-13 as “the presence or likely presence of any *hazardous substances or petroleum products* in, on, or at a *property*: (1) due to *release* to the *environment*; (2) under conditions indicative of a *release* to the *environment*; or (3) under conditions that pose a *material threat* of a future *release* to the *environment*. *De minimis* conditions are not *recognized environmental conditions*.” (Italics denote terms with specific ASTM definitions).

This assessment has revealed no evidence of RECs in connection with the Site.

### **7.2 Controlled Recognized Environmental Conditions**

A *Controlled Recognized Environmental Condition (CREC)* is defined by ASTM E1527-13 as “a *recognized environmental condition* resulting from a past *release of hazardous substances or petroleum products* that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority), with *hazardous substances or petroleum products* allowed to remain in place subject to the implementation of required controls (for example, *property use restrictions, activity and use limitations, institutional controls, or engineering controls*).”

This assessment has revealed no evidence of CRECs in connection with the Site.

### **7.3 Historical Recognized Environmental Conditions**

A *Historical Recognized Environmental Condition (HREC)* is defined by ASTM E 1527-13 as “a past *release of any hazardous substances or petroleum products* that has occurred in connection with the *property* and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted use criteria established by a regulatory authority, without subjecting the property to any required controls (for example *property use restrictions, activity and use limitations, institutional controls, or engineering controls*)” and is not considered a REC in connection with the past *release* at the time this *Phase I ESA* was conducted.

This assessment has revealed no evidence of HRECs in connection with the Site.

### **7.4 Identified Data Gaps**

Under the ASTM/AAI standards, if *data gaps* are identified during the ESA process, the *environmental professional (EP)* must comment on their significance and whether such gaps affect the overall findings. A *data gap* is defined by ASTM E1527-13 as “a lack of or inability to obtain information required this practice despite *good faith* efforts by the *environmental professional* to gather such information.” A *data gap* is significant if other information and/or professional experience raises reasonable concerns involving the *data gap*.

Identified significant *data gaps*:

- The *User* did not complete the *User* Questionnaire inquiries required by 40 CFR 312.25, 312.28, 312.29, 312.30 and 312.31 as part of “*All Appropriate Inquires*” and in order to qualify for one of the *Landowner Liability Protections* under *CERLCA*.
- The Owner Questionnaires for Kelly’s Legacy lot and the Bansal lot were not completed.

#### **7.5 Limiting Conditions or Deviations from Scope of Services**

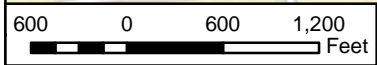
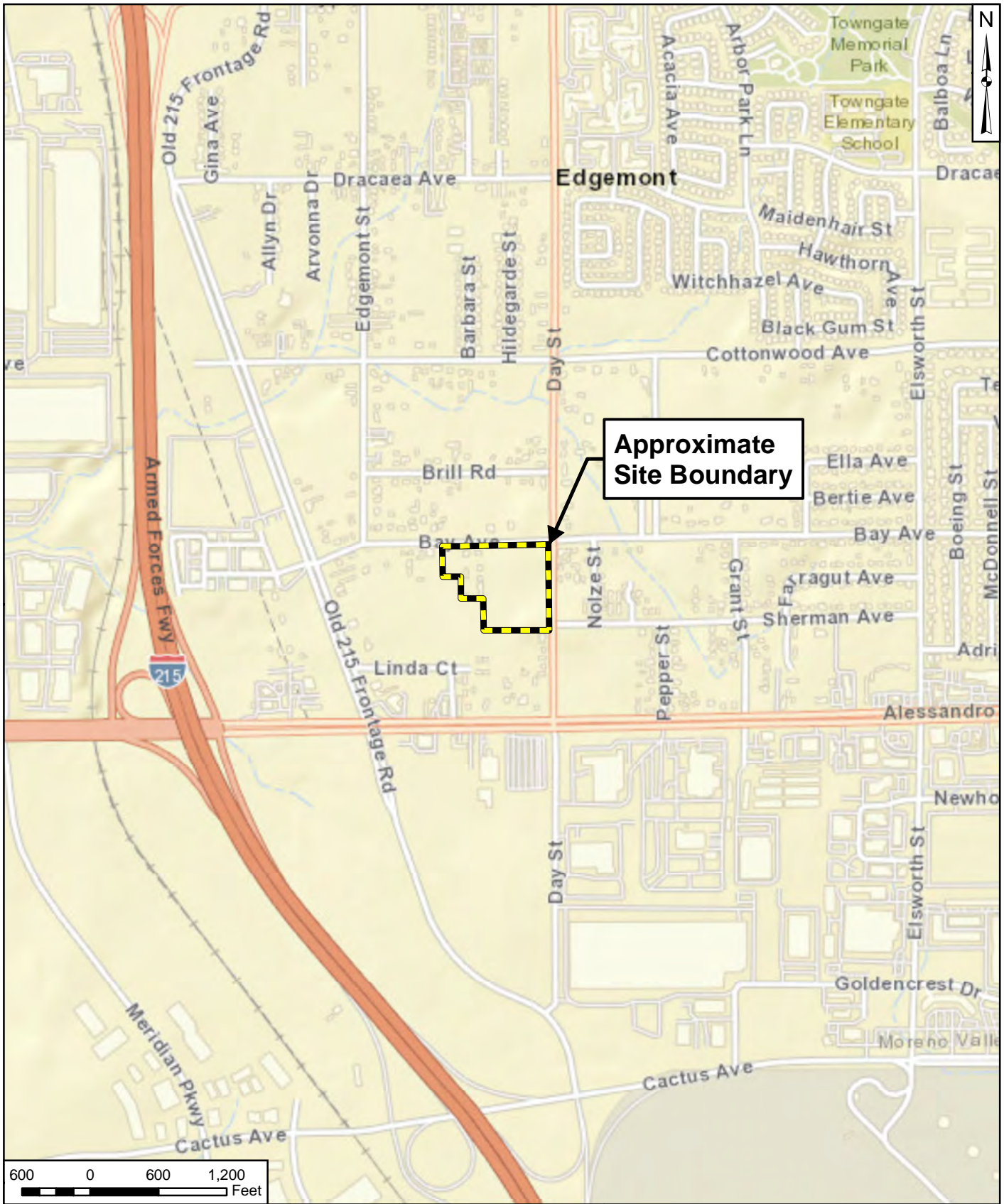
During the performance of this ESA, there were limiting conditions with site reconnaissance activities listed below:


- Access to the interior of the residences was not permitted; therefore, the interior of the residences was not viewed.

#### **8.0 ASTM E1527 NON-SCOPE SERVICES**

Issues such as asbestos, radon, lead-based paint, lead in drinking water, wetlands, regulatory compliance, cultural and historic resources, industrial hygiene, health and safety, ecological resources, endangered species, indoor air quality and high voltage power lines are beyond the scope of ASTM E 1527. Such services are considered additional services and have **not** been investigated in this assessment.

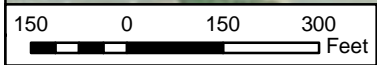
## FIGURES




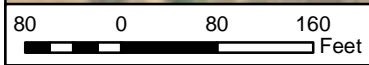
 <p>7325 Janes Avenue Woodridge, IL 60517 630.724.9200 phone www.v3co.com</p>	<p>PROJECT NO.: 20758</p>	<p>CLIENT: Molto Properties, LLC One Lincoln Centre 18W140 Butterfield Road Ste 750 Oakbrook Terrace, IL 60181</p>	<p><b>SITE LOCATION MAP</b></p>	
	<p>CREATED BY: KJW</p>			
<p>Visio, Vertere, Virtute... "The Vision To Transform with Excellence"</p>	<p>SCALE: See Scale Bar</p>	<p>BASE LAYER: ESRI World Street Map</p>	<p>SITE: Edgemont Assemblage Southwest of Bay Avenue and Day Street Moreno Valley, California 92553</p>	<p>FIGURE: <b>1</b></p>



**Approximate Site Boundary**



 <p>7325 Janes Avenue Woodridge, IL 60517 630.724.9200 phone www.v3co.com</p>	<p>PROJECT NO.: 20758</p>	<p>CLIENT: Molto Properties, LLC One Lincoln Centre 18W140 Butterfield Road Ste 750 Oakbrook Terrace, IL 60181</p>	<p>TITLE: <b>SURROUNDING PROPERTIES MAP</b></p>	
	<p>CREATED BY: KJW</p>		<p>DATE: 12/28/2020</p>	<p>BASE LAYER: ESRI World Imagery (2018)</p>
<p>Visio, Vertere, Virtute... "The Vision To Transform with Excellence"</p>	<p>SCALE: See Scale Bar</p>			



 <p>7325 Janes Avenue Woodridge, IL 60517 630.724.9200 phone www.v3co.com</p>	PROJECT NO.: 20758	CLIENT: Molto Properties, LLC One Lincoln Centre 18W140 Butterfield Road Ste 750 Oakbrook Terrace, IL 60181	<b>SITE DETAILS MAP</b>	
	CREATED BY: KJW			
Visio, Vertere, Virtute... "The Vision To Transform with Excellence"	SCALE: See Scale Bar	BASE LAYER: ESRI World Imagery (2018)		

# 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 **SWCT**  
**Stormwater & Water Conservation Tracking Tool**

Choose search item from list    Enter Value    Locate    Clear

Clear All    Metadata

**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



Identify Features  
Click on map to view data.

06065C\_515 (Fema FI

OBJECTID_1	4
OBJECTID	4
DFIRM_ID	0
VERSION_ID	1
FLD_AR_ID	0
STUDY_TYP	1
ZONE_SUBTY	4
SFHA_TF	1
STATIC_BFE	-
V_DATUM	-
DEPTH	-
LEN_UNIT	-
VELOCITY	-

**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 **10/10/2023**

Designed by **Vicky Li**

Case No

Company Project Number/Name

**Bay and Day, Moreno Valley (TEI 3930)**

**BMP Identification**

BMP NAME / ID **STC & MWS #1**

*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

$D_{85}$  = **0.62** 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)
1A	382,457	Roofs	1	0.89	341151.5			
1B	20,038	Ornamental Landscaping	0.1	0.11	2213.3			
	<b>402494.4</b>				<b>343364.8</b>	<b>0.62</b>	<b>17740.5</b>	<b>19,015</b>

Notes:

Tributary area = 9.24 acres  
 The underground detention chambers will be storing additional volume for HCOC mitigation.  
 DCV met at 20" above bottom of rock elevation.

# MWS VOLUME BASED SIZING SHEET

## Project Information

Project ID	
Project Name	Bay and Day Industrial Building
Project Location	Moreno Valley, California
Date	10/10/2023



**Horizontal Flow Biofiltration System**

## SIZING CALCULATIONS

### Impervious Area

	Inputs	Units
<b>BMP Drainage Area</b> <small>(not required - manual entry - not part of formula)</small>	<b>9.24</b>	<b>Acres</b>
<b>Watershed Impervious Ratio</b> <small>(not required - manual entry - not part of formula)</small>		
<b>Runoff Coefficient "C"</b> <small>(not required - manual entry - not part of formula)</small>		

### Notes/References

This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.

Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100

<b>Water Quality Volume (required)</b>	<b>17741</b>	<b>cubic feet</b>
<b>Design Storm Duration</b>	<b>0</b>	<b>hours</b>

Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.

Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.

### MWS Sizing

<b>WetlandMod Model Number (from matrix)</b>	<b>MWS-L-8-12</b>	
<b>HGL</b>	<b>3.4</b>	
<b># Of Units</b>	<b>1</b>	<b>quantity</b>
<b>Discharge Rate (from matrix)</b>	<b>39.25</b>	<b>gallons/minute</b>

Please choose size from "Model Size Matrix" Tab

Treatment Hydraulic Grade Line

Select the number of systems required to treat the water quality volume. Will vary depending on drain down time regulations.

Loading Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.

### Volume Treated During Event

Processed through MWS - Linear	<b>0</b>	<b>cubic feet</b>	<b>39.2496 gals/minute</b>
--------------------------------	----------	-------------------	----------------------------

### Volume Treated Following Event

<b>MWS Static Capacity (from matrix)</b>	<b>187.14</b>	<b>cubic feet</b>
<b>Volume Needed in Pre-Storage</b>	<b>17554</b>	<b>cubic feet</b>

Set at zero to start. Size pre-storage system to hold this volume

Sizing complete when equal to value of zero.

<b>TOTAL STORMWATER TREATED</b>	<b>17741</b>	<b>cubic feet</b>
<b>Drain Down Time</b>	<b>56.50</b>	<b>hours</b>

Note: This amount should be equal to the "Water Quality Volume"

Drain down time must be equal to or less than requirement of local jurisdiction. Default 48 hours.

Feel free to call or email proposed sizing calculations to Modular Wetlands Systems for assistance with sizing, compliance, and design.

Phone: 1-800-338-1122

Email: info@conteches.com



**Project Information:**

Project Name: Bay and Day Industrial Building  
 Location: Moreno Valley, CA  
 Date: 20-Apr  
 Engineer: Thienes Engineering Inc.  
 StormTech RPM:

**MC-3500 Site Calculator**

**System Requirements**

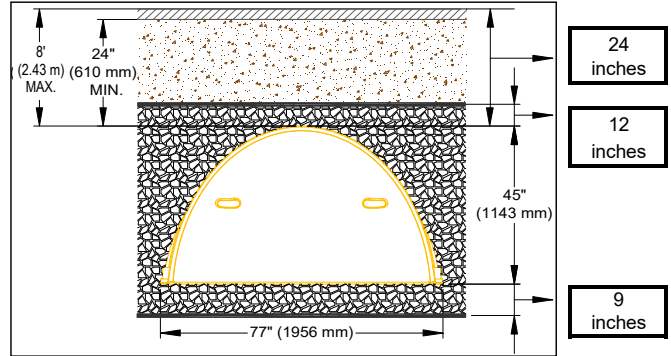
Units	Imperial	
Required Storage Volume	59403	CF
Stone Porosity (Industry Standard = 40%)	40	%
Stone Above Chambers (12 inch min.)	12	inches
Stone Foundation Depth (9 inch min.)	9	inches
Average Cover over Chambers (24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?	WIDTH	
Limiting WIDTH or LENGTH dimension	45	feet
Storage Volume per Chamber	178.9	CF
Storage Volume per End Cap	46.9	CF

**System Sizing**

Number of Chambers Required	329	each
Number of End Caps Required	12	each
Bed Size (including perimeter stone)	17,603	square feet
Stone Required (including perimeter stone)	3121	tons
Volume of Excavation	4238	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	5344	square yards
Length of Isolator Row	399.0	feet
Non-woven Isolator Row Fabric (20% Safety Factor)	692	square yards
Woven Isolator Row Fabric (20% Safety Factor)	878	square yards
Installed Storage Volume	59,421	cubic feet

**Controlled by Width (Rows)**

Maximum Width =	45	feet
5 rows of	55	chambers
1 row of	54	chambers
Maximum Length =	398.95	feet
Maximum Width =	44.25	feet



\*This represents the estimated material and site work costs (US dollars) for the project. Materials excluded from this estimate are conveyance pipe, pavement design, etc. It is always advisable to seek detailed construction costs from local installers. Please contact STORMTECH at 888-892-2694 for additional cost information.

**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 **10/11/2023**

Designed by **Vicky Li**

Case No

Company Project Number/Name

**Bay and Day, Moreno Valley (TEI 3930)**

**BMP Identification**

BMP NAME / ID **Bay Avenue Street BMP - BIO #2**

*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

$D_{85}$  = **0.62** 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)
2A-OFFSITE	11203.632	Concrete or Asphalt	1	0.89	9993.6			
2B-OFFSITE	993.168	Ornamental Landscaping	0.1	0.11	109.7			
2A-ONSITE	771.012	Concrete or Asphalt	1	0.89	687.7			
2B-ONSITE	5,327	Ornamental Landscaping	0.1	0.11	588.5			
	<b>18295.2</b>		<b>Total</b>		<b>11379.5</b>	<b>0.62</b>	<b>587.9</b>	<b>597</b>

Notes:  
 Total Offsite Area = 0.28 acres  
 Total Onsite Area = 0.14 acres  
 Total area = 0.42 acres

**Street BMP - Bioretention Calculations (using section view)**

Triangular Ponding North of Bioretention FL = 1.0417 SF  
 Triangular Ponding South of Bioretention FL = 1.3875 SF  
 Average Ponding Depth = 5.0000 INCHES

2.5' total width x 10" ponding ÷ 2  
 3.33' total width x 10" ponding ÷ 2  
 For reference only to compare to 6" min. Not used in calculations.  
 $\Sigma$  Ponding Surface Area ÷ Ponding Overall Width

Triangular Soil North of Bioretention FL = 1.250 SF  
 Trapezoidal Soil South of Bioretention FL = 2.835 SF  
 Soil Below FL = 6.125 SF  
 Soil Porosity = 0.30 unitless  
 Average Soil Depth = 18.15 INCHES

2.5' total width x 12" soil ÷ 2  
 4.5' total width  
 10.5" thick over 7.0' width  
 For reference only to compare to 18" min. Not used in calculations.  
 $\Sigma$  Soil Surface Area ÷ Bioretention Overall Width

Gravel Section = 7.00 SF  
 Gravel Porosity = 0.40 unitless

12" thick over 7.0' width

Volume Required (Vbmp) = 593 CF

Bioretention Section Effective Area = 8.292 SF

= (Ponding Area) + (Soil-Area x Soil-Porosity) + (Gravel-Area x Gravel-Porosity)

Min. Bioretention Length Required = 72 LF

= Vbmp ÷ Bioretention Section Effective Area

Bioretention Length Provided = 72 LF

Bioretention Quantity = 1 EA

Bioretention TOTAL Length Provided = 72 LF

= Bioretention Length Provided x Bioretention Quantity

Volume Provided = 597 cu-ft

= Bioretention TOTAL Length Provided x Bioretention Section Effective Area

**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 **10/11/2023**

Designed by **Vicky Li**

Case No

Company Project Number/Name

**Bay and Day, Moreno Valley (TEI 3930)**

**BMP Identification**

BMP NAME / ID **Bay Avenue Street BMP - BIO #3**

*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

$D_{85}$  = **0.62** 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)
3A (OFFSITE)	8507.268	Concrete or Asphalt	1	0.89	7588.5			
3B (OFFSITE)	1075.932	Ornamental Landscaping	0.1	0.11	118.8			
3A (ONSITE)	165.528	Concrete or Asphalt	1	0.89	147.7			
3B (ONSITE)	5,062	Ornamental Landscaping	0.1	0.11	559.1			
	<b>14810.4</b>		<b>Total</b>		<b>8414.1</b>	<b>0.62</b>	<b>434.7</b>	<b>448</b>

Notes:  
 Total Offsite Area = 0.22 acres  
 Total Onsite Area = 0.12 acres  
 Total area = 0.34 acres

**Street BMP - Bioretention Calculations (using section view)**

Triangular Ponding North of Bioretention FL = 1.0417 SF  
 Triangular Ponding South of Bioretention FL = 1.3875 SF  
 Average Ponding Depth = 5.0000 INCHES

2.5' total width x 10" ponding ÷ 2  
 3.33' total width x 10" ponding ÷ 2  
 For reference only to compare to 6" min. Not used in calculations.  
 $\Sigma$  Ponding Surface Area ÷ Ponding Overall Width

Triangular Soil North of Bioretention FL = 1.250 SF  
 Trapezoidal Soil South of Bioretention FL = 2.835 SF  
 Soil Below FL = 6.125 SF  
 Soil Porosity = 0.30 unitless  
 Average Soil Depth = 18.15 INCHES

2.5' total width x 12" soil ÷ 2  
 4.5' total width  
 10.5" thick over 7.0' width  
 For reference only to compare to 18" min. Not used in calculations.  
 $\Sigma$  Soil Surface Area ÷ Bioretention Overall Width

Gravel Section = 7.00 SF  
 Gravel Porosity = 0.40 unitless

12" thick over 7.0' width

Volume Required (Vbmp) = 431 CF

Bioretention Section Effective Area = 8.292 SF

= (Ponding Area) + (Soil-Area x Soil-Porosity) + (Gravel-Area x Gravel-Porosity)

Min. Bioretention Length Required = 52 LF

= Vbmp ÷ Bioretention Section Effective Area

Bioretention Length Provided = 54 LF

Bioretention Quantity = 1 EA

Bioretention TOTAL Length Provided = 54 LF

= Bioretention Length Provided x Bioretention Quantity

Volume Provided = 448 cu-ft

= Bioretention TOTAL Length Provided x Bioretention Section Effective Area



**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 10/11/2023  
 Designed by Vicky Li Case No \_\_\_\_\_  
 Company Project Number/Name Bay and Day, Moreno Valley (TEI 3930)

**BMP Identification**

BMP NAME / ID Bay Avenue Street BMP - BIO #4

*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

$D_{85}$  = 0.62 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)
4A (OFFSITE)	8651.016	Concrete or Asphalt	1	0.89	7716.7			
4B (OFFSITE)	932.184	Ornamental Landscaping	0.1	0.11	103			
4A (ONSITE)	287.496	Concrete or Asphalt	1	0.89	256.4			
4B (ONSITE)	2,762	Ornamental Landscaping	0.1	0.11	305.1			
<b>12632.4</b>		<b>Total</b>			<b>8381.2</b>	<b>0.62</b>	<b>433</b>	<b>448</b>

Notes:  
 Total Offsite Area = 0.22 acres  
 Total Onsite Area = 0.07 acres  
 Total area = 0.29 acres

**Street BMP - Bioretention Calculations (using section view)**

Triangular Ponding North of Bioretention FL = 1.0417 SF  
 Triangular Ponding South of Bioretention FL = 1.3875 SF  
 Average Ponding Depth = 5.0000 INCHES

2.5' total width x 10" ponding ÷ 2  
 3.33' total width x 10" ponding ÷ 2  
 For reference only to compare to 6" min. Not used in calculations.  
 $\Sigma$  Ponding Surface Area ÷ Ponding Overall Width

Triangular Soil North of Bioretention FL = 1.250 SF  
 Trapezoidal Soil South of Bioretention FL = 2.835 SF  
 Soil Below FL = 6.125 SF  
 Soil Porosity = 0.30 unitless  
 Average Soil Depth = 18.15 INCHES

2.5' total width x 12" soil ÷ 2  
 4.5' total width  
 10.5" thick over 7.0' width  
 For reference only to compare to 18" min. Not used in calculations.  
 $\Sigma$  Soil Surface Area ÷ Bioretention Overall Width

Gravel Section = 7.00 SF  
 Gravel Porosity = 0.40 unitless

12" thick over 7.0' width

Volume Required (Vbmp) = 436 CF

Bioretention Section Effective Area = 8.292 SF

= (Ponding Area) + (Soil-Area x Soil-Porosity) + (Gravel-Area x Gravel-Porosity)

Min. Bioretention Length Required = 53 LF

= Vbmp ÷ Bioretention Section Effective Area

Bioretention Length Provided = 54 LF

Bioretention Quantity = 1 EA

Bioretention TOTAL Length Provided = 54 LF

= Bioretention Length Provided x Bioretention Quantity

Volume Provided = 448 cu-ft

= Bioretention TOTAL Length Provided x Bioretention Section Effective Area

**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 **10/10/2023**

Designed by **Vicky Li**

Case No

Company Project Number/Name

**Bay and Day, Moreno Valley (TEI 3930)**

**BMP Identification**

BMP NAME / ID **Day Street - Street BMP - BIO #5**

*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

$D_{85}$  = **0.62** 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)
5A	7,802	Concrete or Asphalt	1	0.89	6959			
5B	910	Ornamental Landscaping	0.1	0.11	100.6			
	<b>8712</b>				<b>7059.6</b>	<b>0.62</b>	<b>364.7</b>	<b>415</b>

Notes:  
Total area = 0.20 acres

**Street BMP - Bioretention Calculations (using section view)**

Triangular Ponding East of Bioretention FL = 1.0417 SF  
 Triangular Ponding West of Bioretention FL = 1.3875 SF  
 Average Ponding Depth = 5.0000 INCHES

2.5' total width x 10" ponding ÷ 2  
 3.33' total width x 10" ponding ÷ 2  
 For reference only to compare to 6" min. Not used in calculations.  
 $\Sigma$  Ponding Surface Area ÷ Ponding Overall Width

Triangular Soil East of Bioretention FL = 1.250 SF  
 Trapezoidal Soil West of Bioretention FL = 2.835 SF  
 Soil Below FL = 6.125 SF  
 Soil Porosity = 0.30 unitless  
 Average Soil Depth = 18.15 INCHES

2.5' total width x 12" soil ÷ 2  
 4.5' total width  
 10.5" thick over 7.0' width  
 For reference only to compare to 18" min. Not used in calculations.  
 $\Sigma$  Soil Surface Area ÷ Bioretention Overall Width

Gravel Section = 7.00 SF  
 Gravel Porosity = 0.40 unitless

12" thick over 7.0' width

Volume Required (Vbmp) = 365 CF

Bioretention Section Effective Area = 8.292 SF

= (Ponding Area) + (Soil-Area x Soil-Porosity) + (Gravel-Area x Gravel-Porosity)

Min. Bioretention Length Required = 44 LF

= Vbmp ÷ Bioretention Section Effective Area

Bioretention Length Provided = 50 LF

Bioretention Quantity = 1 EA

Bioretention TOTAL Length Provided = 50 LF

= Bioretention Length Provided x Bioretention Quantity

Volume Provided = 415 cu-ft

= Bioretention TOTAL Length Provided x Bioretention Section Effective Area

**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 **10/10/2023**

Designed by **Vicky Li**

Case No

Company Project Number/Name

**Bay and Day, Moreno Valley (TEI 3930)**

**BMP Identification**

BMP NAME / ID **Day Street - Street BMP - BIO #6**

*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

$D_{85}$  = **0.62** 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)
6A	5,619	Concrete or Asphalt	1	0.89	5012.4			
6B	479	Ornamental Landscaping	0.1	0.11	52.9			
	<b>6098.4</b>				<b>5065.3</b>	<b>0.62</b>	<b>261.7</b>	<b>265</b>

Notes:  
Total area = 0.14 acres

**Street BMP - Bioretention Calculations (using section view)**

Triangular Ponding East of Bioretention FL = 1.0417 SF  
 Triangular Ponding West of Bioretention FL = 1.3875 SF  
 Average Ponding Depth = 5.0000 INCHES

2.5' total width x 10" ponding ÷ 2  
 3.33' total width x 10" ponding ÷ 2  
 For reference only to compare to 6" min. Not used in calculations.  
 $\Sigma$  Ponding Surface Area ÷ Ponding Overall Width

Triangular Soil East of Bioretention FL = 1.250 SF  
 Trapezoidal Soil West of Bioretention FL = 2.835 SF  
 Soil Below FL = 6.125 SF  
 Soil Porosity = 0.30 unitless  
 Average Soil Depth = 18.15 INCHES

2.5' total width x 12" soil ÷ 2  
 4.5' total width  
 10.5" thick over 7.0' width  
 For reference only to compare to 18" min. Not used in calculations.  
 $\Sigma$  Soil Surface Area ÷ Bioretention Overall Width

Gravel Section = 7.00 SF  
 Gravel Porosity = 0.40 unitless

12" thick over 7.0' width

Volume Required (Vbmp) = 262 CF

Bioretention Section Effective Area = 8.292 SF

= (Ponding Area) + (Soil-Area x Soil-Porosity) + (Gravel-Area x Gravel-Porosity)

Min. Bioretention Length Required = 32 LF

= Vbmp ÷ Bioretention Section Effective Area

Bioretention Length Provided = 32 LF

Bioretention Quantity = 1 EA

Bioretention TOTAL Length Provided = 32 LF

= Bioretention Length Provided x Bioretention Quantity

Volume Provided = 265 cu-ft

= Bioretention TOTAL Length Provided x Bioretention Section Effective Area

**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 **10/11/2023**

Designed by **Vicky Li**

Case No

Company Project Number/Name

**Bay and Day, Moreno Valley (TEI 3930)**

**BMP Identification**

BMP NAME / ID **Day Street - Street BMP - BIO #7**

*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

$D_{85}$  = **0.62** 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)
7A	8,416	Concrete or Asphalt	1	0.89	7506.9			
7B	1,167	Ornamental Landscaping	0.1	0.11	128.9			
	<b>9583.2</b>				<b>7635.8</b>	<b>0.62</b>	<b>394.5</b>	<b>415</b>

Notes:  
Total area = 0.22 acres

**Street BMP - Bioretention Calculations (using section view)**

Triangular Ponding East of Bioretention FL = 1.0417 SF  
 Triangular Ponding West of Bioretention FL = 1.3875 SF  
 Average Ponding Depth = 5.0000 INCHES

2.5' total width x 10" ponding ÷ 2  
 3.33' total width x 10" ponding ÷ 2  
 For reference only to compare to 6" min. Not used in calculations.  
 $\Sigma$  Ponding Surface Area ÷ Ponding Overall Width

Triangular Soil East of Bioretention FL = 1.250 SF  
 Trapezoidal Soil West of Bioretention FL = 2.835 SF  
 Soil Below FL = 6.125 SF  
 Soil Porosity = 0.30 unitless  
 Average Soil Depth = 18.15 INCHES

2.5' total width x 12" soil ÷ 2  
 4.5' total width  
 10.5" thick over 7.0' width  
 For reference only to compare to 18" min. Not used in calculations.  
 $\Sigma$  Soil Surface Area ÷ Bioretention Overall Width

Gravel Section = 7.00 SF  
 Gravel Porosity = 0.40 unitless

12" thick over 7.0' width

Volume Required (Vbmp) = 395 CF

Bioretention Section Effective Area = 8.292 SF

= (Ponding Area) + (Soil-Area x Soil-Porosity) + (Gravel-Area x Gravel-Porosity)

Min. Bioretention Length Required = 48 LF

= Vbmp ÷ Bioretention Section Effective Area

Bioretention Length Provided = 50 LF

Bioretention Quantity = 1 EA

Bioretention TOTAL Length Provided = 50 LF

= Bioretention Length Provided x Bioretention Quantity

Volume Provided = 415 cu-ft

= Bioretention TOTAL Length Provided x Bioretention Section Effective Area



# Appendix 7: Hydromodification

*Supporting Detail Relating to Hydrologic Conditions of Concern*

Riverside County **SWCT**  
**Stormwater & Water Conservation Tracking Tool**

Stormwater Data

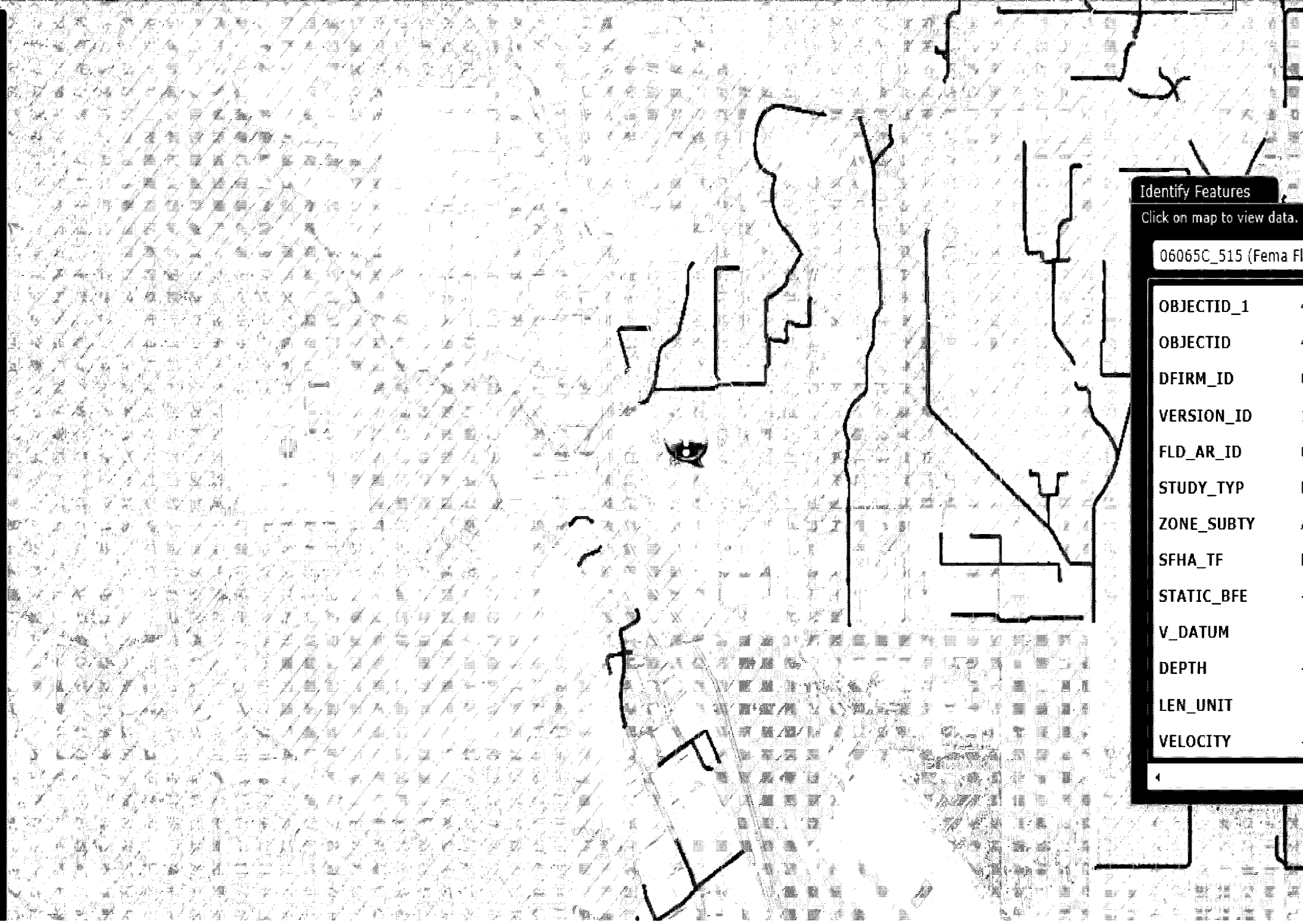
- Hydromodification Susceptibility Mapping
- 2010 - 303d/TMDL
- 

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

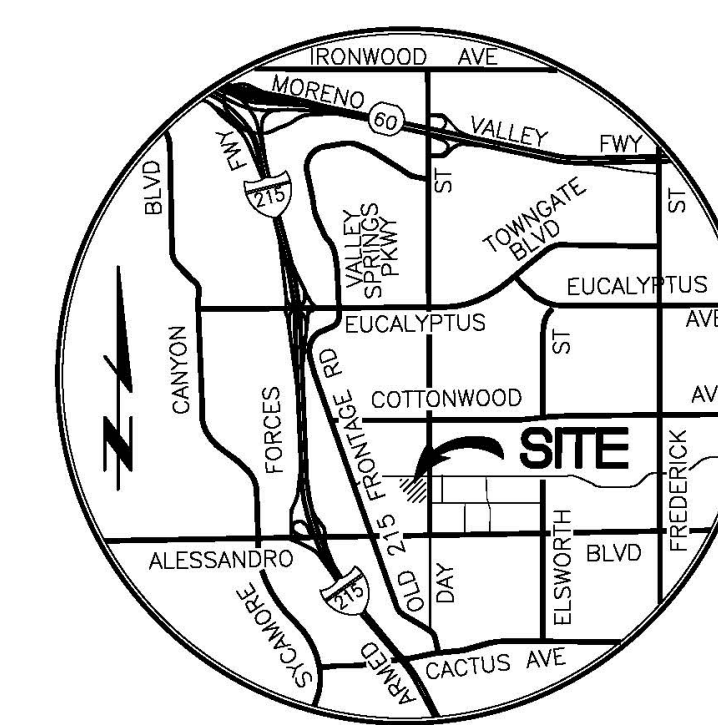


Identify Features  
Click on map to view data.

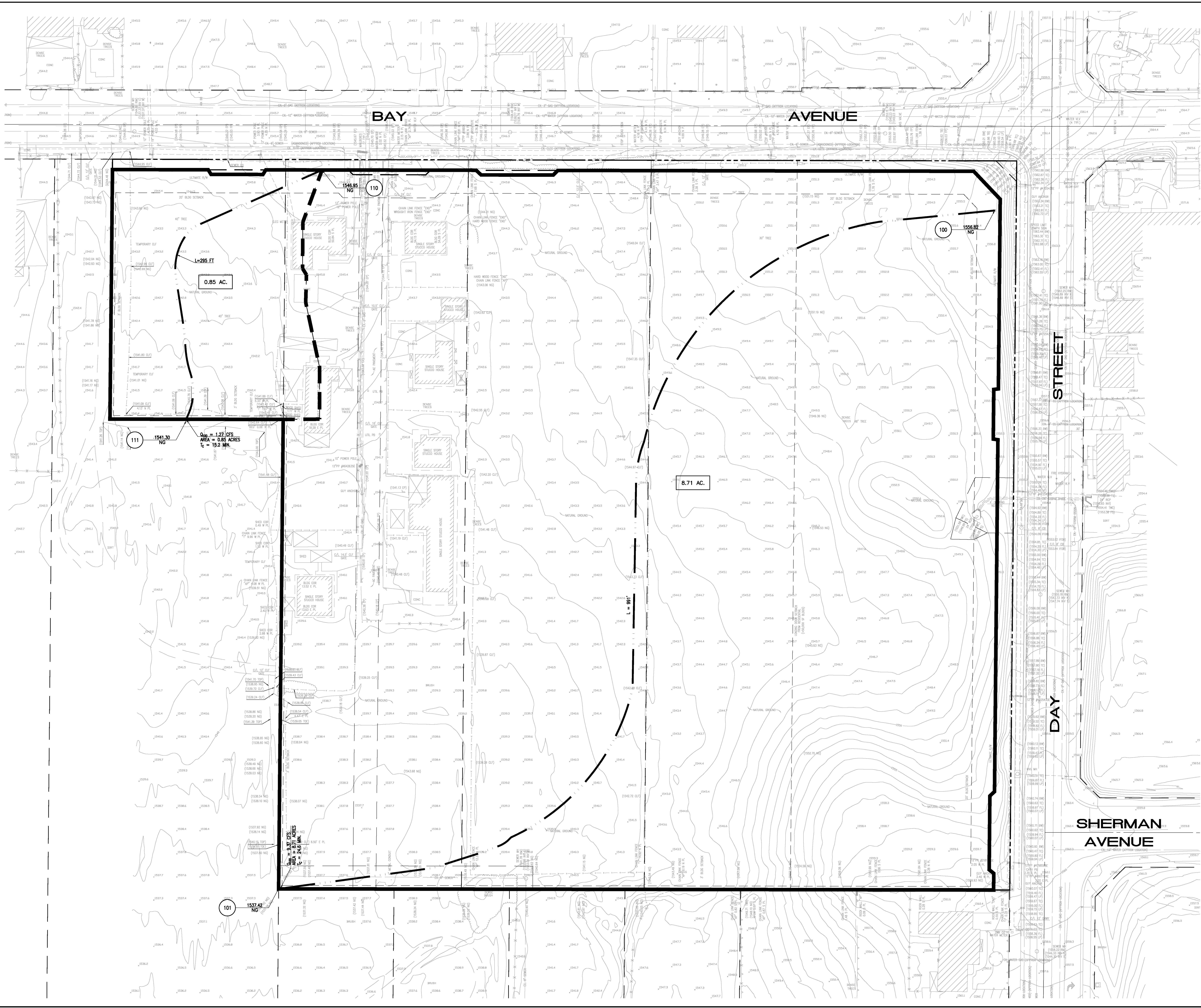
06065C\_515 (Fema Fl

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OBJECTID	4
DFIRM_ID	0
VERSION_ID	1
FLD_AR_ID	0
STUDY_TYP	1
ZONE_SUBTY	4
SFHA_TF	0
STATIC_BFE	-
V_DATUM	-
DEPTH	-
LEN_UNIT	-
VELOCITY	-

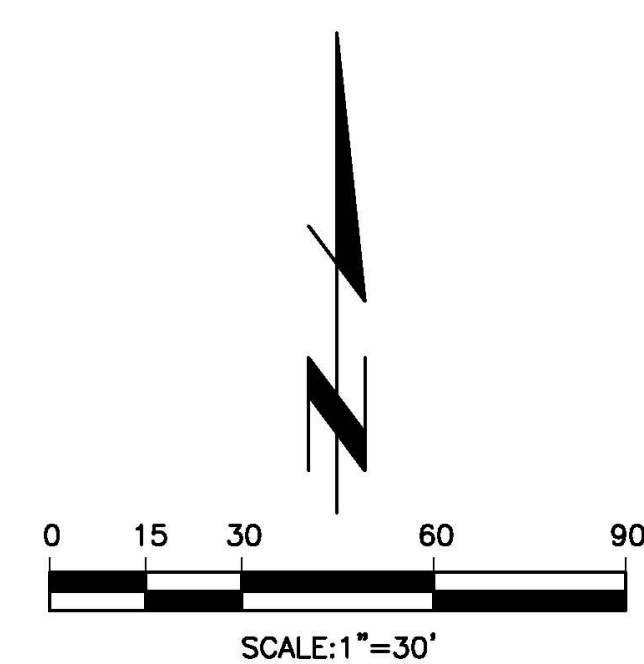
# **PRE-DEVELOPED CONDITION**



VICINITY MAP  
N.T.S.



LEGEND	
	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	FLOW PATH
	SUBAREA AREA
	NODE NUMBER
	LENGTH OF FLOW PATH
	TIME OF CONCENTRATION
	DISCHARGE (CUBIC FEET PER SECOND) NUMBER DESIGNATE YEAR OF FREQUENCY



OWNER:  
MOLTO PROPERTIES, LLC  
ONE LINCOLN CENTRE  
18W140 BUTTERFIELD ROAD, #750  
OAKBROOK TERRACE, CA 92511  
TEL: 949-226-4601

ENGINEER:  
Thienes Engineering, Inc.  
CIVIL ENGINEERING & LAND SURVEYING  
14810 FORESTONE BOULEVARD  
LA BREA, CALIFORNIA 90038  
PH: 310-571-1111 FAX: 310-571-4172  
EMAIL: GIVE@THIENES.COM

CITY OF MORENO VALLEY  
PUBLIC WORKS DEPARTMENT  
EXISTING CONDITION HYDROLOGY MAP  
PEN21-0123 / LWQ23-0013  
BAY AND DAY INDUSTRIAL BUILDING  
SOUTHWEST CORNER  
OF  
BAY AVENUE AND DAY STREET  
MORENO VALLEY, CALIFORNIA

1 of 1 Sheets

JUN 30 2023  
POST DATE: 10/10/2023

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0  
Study date 04/18/23 File: 3930EX2242.out

+++++

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6400

-----

English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----

BAY AND DAY INDUSTRIAL BUILDING  
EXISTING CONDITION  
2-YEAR

-----

Drainage Area = 9.57(Ac.) = 0.015 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 9.57(Ac.) =  
0.015 Sq. Mi.  
Length along longest watercourse = 991.00(Ft.)  
Length along longest watercourse measured to centroid =  
533.00(Ft.)  
Length along longest watercourse = 0.188 Mi.  
Length along longest watercourse measured to centroid = 0.101 Mi.  
Difference in elevation = 19.40(Ft.)  
Slope along watercourse = 103.3623 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.066 Hr.  
Lag time = 3.96 Min.  
25% of lag time = 0.99 Min.  
40% of lag time = 1.59 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	1.90	18.18

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	4.20	40.19

STORM EVENT (YEAR) = 2.00  
Area Averaged 2-Year Rainfall = 1.900(In)  
Area Averaged 100-Year Rainfall = 4.200(In)

Point rain (area averaged) = 1.900(In)  
Areal adjustment factor = 100.00 %  
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
1.750	69.00	0.500
7.820	77.00	0.000
Total Area Entered = 9.57(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
69.0	49.8	0.574	0.500	0.316	0.183	0.058
77.0	59.4	0.476	0.000	0.476	0.817	0.389
Sum (F) =						0.447

Area averaged mean soil loss (F) (In/Hr) = 0.447  
Minimum soil loss rate ((In/Hr)) = 0.223  
(for 24 hour storm duration)  
Soil low loss rate (decimal) = 0.900

-----  
U n i t H y d r o g r a p h  
VALLEY S-Curve  
-----

Unit Hydrograph Data  
-----

Unit time period	Time % of lag	Distribution	Unit Hydrograph
(hrs)		Graph %	(CFS)
1	0.083	126.111	2.599
2	0.167	252.222	4.676
3	0.250	378.333	1.234

4	0.333	504.443	5.754	0.555
5	0.417	630.554	3.189	0.308
6	0.500	756.665	1.763	0.170
7	0.583	882.776	1.070	0.103
			Sum = 100.000	Sum= 9.645

-----

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr)		Effective (In/Hr)
				Max	Low	
1	0.08	0.07	0.015	( 0.792)	0.014	0.002
2	0.17	0.07	0.015	( 0.789)	0.014	0.002
3	0.25	0.07	0.015	( 0.786)	0.014	0.002
4	0.33	0.10	0.023	( 0.783)	0.021	0.002
5	0.42	0.10	0.023	( 0.780)	0.021	0.002
6	0.50	0.10	0.023	( 0.777)	0.021	0.002
7	0.58	0.10	0.023	( 0.774)	0.021	0.002
8	0.67	0.10	0.023	( 0.771)	0.021	0.002
9	0.75	0.10	0.023	( 0.768)	0.021	0.002
10	0.83	0.13	0.030	( 0.765)	0.027	0.003
11	0.92	0.13	0.030	( 0.762)	0.027	0.003
12	1.00	0.13	0.030	( 0.759)	0.027	0.003
13	1.08	0.10	0.023	( 0.756)	0.021	0.002
14	1.17	0.10	0.023	( 0.753)	0.021	0.002
15	1.25	0.10	0.023	( 0.750)	0.021	0.002
16	1.33	0.10	0.023	( 0.747)	0.021	0.002
17	1.42	0.10	0.023	( 0.744)	0.021	0.002
18	1.50	0.10	0.023	( 0.741)	0.021	0.002
19	1.58	0.10	0.023	( 0.738)	0.021	0.002
20	1.67	0.10	0.023	( 0.735)	0.021	0.002
21	1.75	0.10	0.023	( 0.732)	0.021	0.002
22	1.83	0.13	0.030	( 0.729)	0.027	0.003
23	1.92	0.13	0.030	( 0.726)	0.027	0.003
24	2.00	0.13	0.030	( 0.723)	0.027	0.003
25	2.08	0.13	0.030	( 0.720)	0.027	0.003
26	2.17	0.13	0.030	( 0.717)	0.027	0.003
27	2.25	0.13	0.030	( 0.714)	0.027	0.003
28	2.33	0.13	0.030	( 0.711)	0.027	0.003
29	2.42	0.13	0.030	( 0.709)	0.027	0.003
30	2.50	0.13	0.030	( 0.706)	0.027	0.003
31	2.58	0.17	0.038	( 0.703)	0.034	0.004
32	2.67	0.17	0.038	( 0.700)	0.034	0.004
33	2.75	0.17	0.038	( 0.697)	0.034	0.004
34	2.83	0.17	0.038	( 0.694)	0.034	0.004
35	2.92	0.17	0.038	( 0.691)	0.034	0.004

36	3.00	0.17	0.038	( 0.688)	0.034	0.004
37	3.08	0.17	0.038	( 0.686)	0.034	0.004
38	3.17	0.17	0.038	( 0.683)	0.034	0.004
39	3.25	0.17	0.038	( 0.680)	0.034	0.004
40	3.33	0.17	0.038	( 0.677)	0.034	0.004
41	3.42	0.17	0.038	( 0.674)	0.034	0.004
42	3.50	0.17	0.038	( 0.671)	0.034	0.004
43	3.58	0.17	0.038	( 0.669)	0.034	0.004
44	3.67	0.17	0.038	( 0.666)	0.034	0.004
45	3.75	0.17	0.038	( 0.663)	0.034	0.004
46	3.83	0.20	0.046	( 0.660)	0.041	0.005
47	3.92	0.20	0.046	( 0.657)	0.041	0.005
48	4.00	0.20	0.046	( 0.655)	0.041	0.005
49	4.08	0.20	0.046	( 0.652)	0.041	0.005
50	4.17	0.20	0.046	( 0.649)	0.041	0.005
51	4.25	0.20	0.046	( 0.646)	0.041	0.005
52	4.33	0.23	0.053	( 0.644)	0.048	0.005
53	4.42	0.23	0.053	( 0.641)	0.048	0.005
54	4.50	0.23	0.053	( 0.638)	0.048	0.005
55	4.58	0.23	0.053	( 0.635)	0.048	0.005
56	4.67	0.23	0.053	( 0.633)	0.048	0.005
57	4.75	0.23	0.053	( 0.630)	0.048	0.005
58	4.83	0.27	0.061	( 0.627)	0.055	0.006
59	4.92	0.27	0.061	( 0.624)	0.055	0.006
60	5.00	0.27	0.061	( 0.622)	0.055	0.006
61	5.08	0.20	0.046	( 0.619)	0.041	0.005
62	5.17	0.20	0.046	( 0.616)	0.041	0.005
63	5.25	0.20	0.046	( 0.614)	0.041	0.005
64	5.33	0.23	0.053	( 0.611)	0.048	0.005
65	5.42	0.23	0.053	( 0.608)	0.048	0.005
66	5.50	0.23	0.053	( 0.606)	0.048	0.005
67	5.58	0.27	0.061	( 0.603)	0.055	0.006
68	5.67	0.27	0.061	( 0.600)	0.055	0.006
69	5.75	0.27	0.061	( 0.598)	0.055	0.006
70	5.83	0.27	0.061	( 0.595)	0.055	0.006
71	5.92	0.27	0.061	( 0.592)	0.055	0.006
72	6.00	0.27	0.061	( 0.590)	0.055	0.006
73	6.08	0.30	0.068	( 0.587)	0.062	0.007
74	6.17	0.30	0.068	( 0.585)	0.062	0.007
75	6.25	0.30	0.068	( 0.582)	0.062	0.007
76	6.33	0.30	0.068	( 0.579)	0.062	0.007
77	6.42	0.30	0.068	( 0.577)	0.062	0.007
78	6.50	0.30	0.068	( 0.574)	0.062	0.007
79	6.58	0.33	0.076	( 0.572)	0.068	0.008
80	6.67	0.33	0.076	( 0.569)	0.068	0.008
81	6.75	0.33	0.076	( 0.566)	0.068	0.008
82	6.83	0.33	0.076	( 0.564)	0.068	0.008
83	6.92	0.33	0.076	( 0.561)	0.068	0.008
84	7.00	0.33	0.076	( 0.559)	0.068	0.008
85	7.08	0.33	0.076	( 0.556)	0.068	0.008



86	7.17	0.33	0.076	( 0.554)	0.068	0.008
87	7.25	0.33	0.076	( 0.551)	0.068	0.008
88	7.33	0.37	0.084	( 0.549)	0.075	0.008
89	7.42	0.37	0.084	( 0.546)	0.075	0.008
90	7.50	0.37	0.084	( 0.544)	0.075	0.008
91	7.58	0.40	0.091	( 0.541)	0.082	0.009
92	7.67	0.40	0.091	( 0.539)	0.082	0.009
93	7.75	0.40	0.091	( 0.536)	0.082	0.009
94	7.83	0.43	0.099	( 0.534)	0.089	0.010
95	7.92	0.43	0.099	( 0.531)	0.089	0.010
96	8.00	0.43	0.099	( 0.529)	0.089	0.010
97	8.08	0.50	0.114	( 0.526)	0.103	0.011
98	8.17	0.50	0.114	( 0.524)	0.103	0.011
99	8.25	0.50	0.114	( 0.521)	0.103	0.011
100	8.33	0.50	0.114	( 0.519)	0.103	0.011
101	8.42	0.50	0.114	( 0.517)	0.103	0.011
102	8.50	0.50	0.114	( 0.514)	0.103	0.011
103	8.58	0.53	0.122	( 0.512)	0.109	0.012
104	8.67	0.53	0.122	( 0.509)	0.109	0.012
105	8.75	0.53	0.122	( 0.507)	0.109	0.012
106	8.83	0.57	0.129	( 0.505)	0.116	0.013
107	8.92	0.57	0.129	( 0.502)	0.116	0.013
108	9.00	0.57	0.129	( 0.500)	0.116	0.013
109	9.08	0.63	0.144	( 0.497)	0.130	0.014
110	9.17	0.63	0.144	( 0.495)	0.130	0.014
111	9.25	0.63	0.144	( 0.493)	0.130	0.014
112	9.33	0.67	0.152	( 0.490)	0.137	0.015
113	9.42	0.67	0.152	( 0.488)	0.137	0.015
114	9.50	0.67	0.152	( 0.486)	0.137	0.015
115	9.58	0.70	0.160	( 0.483)	0.144	0.016
116	9.67	0.70	0.160	( 0.481)	0.144	0.016
117	9.75	0.70	0.160	( 0.479)	0.144	0.016
118	9.83	0.73	0.167	( 0.476)	0.150	0.017
119	9.92	0.73	0.167	( 0.474)	0.150	0.017
120	10.00	0.73	0.167	( 0.472)	0.150	0.017
121	10.08	0.50	0.114	( 0.470)	0.103	0.011
122	10.17	0.50	0.114	( 0.467)	0.103	0.011
123	10.25	0.50	0.114	( 0.465)	0.103	0.011
124	10.33	0.50	0.114	( 0.463)	0.103	0.011
125	10.42	0.50	0.114	( 0.460)	0.103	0.011
126	10.50	0.50	0.114	( 0.458)	0.103	0.011
127	10.58	0.67	0.152	( 0.456)	0.137	0.015
128	10.67	0.67	0.152	( 0.454)	0.137	0.015
129	10.75	0.67	0.152	( 0.452)	0.137	0.015
130	10.83	0.67	0.152	( 0.449)	0.137	0.015
131	10.92	0.67	0.152	( 0.447)	0.137	0.015
132	11.00	0.67	0.152	( 0.445)	0.137	0.015
133	11.08	0.63	0.144	( 0.443)	0.130	0.014
134	11.17	0.63	0.144	( 0.441)	0.130	0.014
135	11.25	0.63	0.144	( 0.438)	0.130	0.014

136	11.33	0.63	0.144	( 0.436)	0.130	0.014
137	11.42	0.63	0.144	( 0.434)	0.130	0.014
138	11.50	0.63	0.144	( 0.432)	0.130	0.014
139	11.58	0.57	0.129	( 0.430)	0.116	0.013
140	11.67	0.57	0.129	( 0.428)	0.116	0.013
141	11.75	0.57	0.129	( 0.425)	0.116	0.013
142	11.83	0.60	0.137	( 0.423)	0.123	0.014
143	11.92	0.60	0.137	( 0.421)	0.123	0.014
144	12.00	0.60	0.137	( 0.419)	0.123	0.014
145	12.08	0.83	0.190	( 0.417)	0.171	0.019
146	12.17	0.83	0.190	( 0.415)	0.171	0.019
147	12.25	0.83	0.190	( 0.413)	0.171	0.019
148	12.33	0.87	0.198	( 0.411)	0.178	0.020
149	12.42	0.87	0.198	( 0.409)	0.178	0.020
150	12.50	0.87	0.198	( 0.407)	0.178	0.020
151	12.58	0.93	0.213	( 0.405)	0.192	0.021
152	12.67	0.93	0.213	( 0.403)	0.192	0.021
153	12.75	0.93	0.213	( 0.401)	0.192	0.021
154	12.83	0.97	0.220	( 0.399)	0.198	0.022
155	12.92	0.97	0.220	( 0.397)	0.198	0.022
156	13.00	0.97	0.220	( 0.395)	0.198	0.022
157	13.08	1.13	0.258	( 0.393)	0.233	0.026
158	13.17	1.13	0.258	( 0.391)	0.233	0.026
159	13.25	1.13	0.258	( 0.389)	0.233	0.026
160	13.33	1.13	0.258	( 0.387)	0.233	0.026
161	13.42	1.13	0.258	( 0.385)	0.233	0.026
162	13.50	1.13	0.258	( 0.383)	0.233	0.026
163	13.58	0.77	0.175	( 0.381)	0.157	0.017
164	13.67	0.77	0.175	( 0.379)	0.157	0.017
165	13.75	0.77	0.175	( 0.377)	0.157	0.017
166	13.83	0.77	0.175	( 0.375)	0.157	0.017
167	13.92	0.77	0.175	( 0.373)	0.157	0.017
168	14.00	0.77	0.175	( 0.371)	0.157	0.017
169	14.08	0.90	0.205	( 0.369)	0.185	0.021
170	14.17	0.90	0.205	( 0.367)	0.185	0.021
171	14.25	0.90	0.205	( 0.365)	0.185	0.021
172	14.33	0.87	0.198	( 0.364)	0.178	0.020
173	14.42	0.87	0.198	( 0.362)	0.178	0.020
174	14.50	0.87	0.198	( 0.360)	0.178	0.020
175	14.58	0.87	0.198	( 0.358)	0.178	0.020
176	14.67	0.87	0.198	( 0.356)	0.178	0.020
177	14.75	0.87	0.198	( 0.354)	0.178	0.020
178	14.83	0.83	0.190	( 0.353)	0.171	0.019
179	14.92	0.83	0.190	( 0.351)	0.171	0.019
180	15.00	0.83	0.190	( 0.349)	0.171	0.019
181	15.08	0.80	0.182	( 0.347)	0.164	0.018
182	15.17	0.80	0.182	( 0.345)	0.164	0.018
183	15.25	0.80	0.182	( 0.344)	0.164	0.018
184	15.33	0.77	0.175	( 0.342)	0.157	0.017
185	15.42	0.77	0.175	( 0.340)	0.157	0.017

186	15.50	0.77	0.175	( 0.338)	0.157	0.017
187	15.58	0.63	0.144	( 0.337)	0.130	0.014
188	15.67	0.63	0.144	( 0.335)	0.130	0.014
189	15.75	0.63	0.144	( 0.333)	0.130	0.014
190	15.83	0.63	0.144	( 0.331)	0.130	0.014
191	15.92	0.63	0.144	( 0.330)	0.130	0.014
192	16.00	0.63	0.144	( 0.328)	0.130	0.014
193	16.08	0.13	0.030	( 0.326)	0.027	0.003
194	16.17	0.13	0.030	( 0.325)	0.027	0.003
195	16.25	0.13	0.030	( 0.323)	0.027	0.003
196	16.33	0.13	0.030	( 0.321)	0.027	0.003
197	16.42	0.13	0.030	( 0.320)	0.027	0.003
198	16.50	0.13	0.030	( 0.318)	0.027	0.003
199	16.58	0.10	0.023	( 0.317)	0.021	0.002
200	16.67	0.10	0.023	( 0.315)	0.021	0.002
201	16.75	0.10	0.023	( 0.313)	0.021	0.002
202	16.83	0.10	0.023	( 0.312)	0.021	0.002
203	16.92	0.10	0.023	( 0.310)	0.021	0.002
204	17.00	0.10	0.023	( 0.309)	0.021	0.002
205	17.08	0.17	0.038	( 0.307)	0.034	0.004
206	17.17	0.17	0.038	( 0.306)	0.034	0.004
207	17.25	0.17	0.038	( 0.304)	0.034	0.004
208	17.33	0.17	0.038	( 0.302)	0.034	0.004
209	17.42	0.17	0.038	( 0.301)	0.034	0.004
210	17.50	0.17	0.038	( 0.299)	0.034	0.004
211	17.58	0.17	0.038	( 0.298)	0.034	0.004
212	17.67	0.17	0.038	( 0.296)	0.034	0.004
213	17.75	0.17	0.038	( 0.295)	0.034	0.004
214	17.83	0.13	0.030	( 0.294)	0.027	0.003
215	17.92	0.13	0.030	( 0.292)	0.027	0.003
216	18.00	0.13	0.030	( 0.291)	0.027	0.003
217	18.08	0.13	0.030	( 0.289)	0.027	0.003
218	18.17	0.13	0.030	( 0.288)	0.027	0.003
219	18.25	0.13	0.030	( 0.286)	0.027	0.003
220	18.33	0.13	0.030	( 0.285)	0.027	0.003
221	18.42	0.13	0.030	( 0.284)	0.027	0.003
222	18.50	0.13	0.030	( 0.282)	0.027	0.003
223	18.58	0.10	0.023	( 0.281)	0.021	0.002
224	18.67	0.10	0.023	( 0.279)	0.021	0.002
225	18.75	0.10	0.023	( 0.278)	0.021	0.002
226	18.83	0.07	0.015	( 0.277)	0.014	0.002
227	18.92	0.07	0.015	( 0.275)	0.014	0.002
228	19.00	0.07	0.015	( 0.274)	0.014	0.002
229	19.08	0.10	0.023	( 0.273)	0.021	0.002
230	19.17	0.10	0.023	( 0.272)	0.021	0.002
231	19.25	0.10	0.023	( 0.270)	0.021	0.002
232	19.33	0.13	0.030	( 0.269)	0.027	0.003
233	19.42	0.13	0.030	( 0.268)	0.027	0.003
234	19.50	0.13	0.030	( 0.267)	0.027	0.003
235	19.58	0.10	0.023	( 0.265)	0.021	0.002

236	19.67	0.10	0.023	( 0.264)	0.021	0.002
237	19.75	0.10	0.023	( 0.263)	0.021	0.002
238	19.83	0.07	0.015	( 0.262)	0.014	0.002
239	19.92	0.07	0.015	( 0.261)	0.014	0.002
240	20.00	0.07	0.015	( 0.259)	0.014	0.002
241	20.08	0.10	0.023	( 0.258)	0.021	0.002
242	20.17	0.10	0.023	( 0.257)	0.021	0.002
243	20.25	0.10	0.023	( 0.256)	0.021	0.002
244	20.33	0.10	0.023	( 0.255)	0.021	0.002
245	20.42	0.10	0.023	( 0.254)	0.021	0.002
246	20.50	0.10	0.023	( 0.253)	0.021	0.002
247	20.58	0.10	0.023	( 0.252)	0.021	0.002
248	20.67	0.10	0.023	( 0.251)	0.021	0.002
249	20.75	0.10	0.023	( 0.250)	0.021	0.002
250	20.83	0.07	0.015	( 0.249)	0.014	0.002
251	20.92	0.07	0.015	( 0.248)	0.014	0.002
252	21.00	0.07	0.015	( 0.247)	0.014	0.002
253	21.08	0.10	0.023	( 0.246)	0.021	0.002
254	21.17	0.10	0.023	( 0.245)	0.021	0.002
255	21.25	0.10	0.023	( 0.244)	0.021	0.002
256	21.33	0.07	0.015	( 0.243)	0.014	0.002
257	21.42	0.07	0.015	( 0.242)	0.014	0.002
258	21.50	0.07	0.015	( 0.241)	0.014	0.002
259	21.58	0.10	0.023	( 0.240)	0.021	0.002
260	21.67	0.10	0.023	( 0.239)	0.021	0.002
261	21.75	0.10	0.023	( 0.238)	0.021	0.002
262	21.83	0.07	0.015	( 0.238)	0.014	0.002
263	21.92	0.07	0.015	( 0.237)	0.014	0.002
264	22.00	0.07	0.015	( 0.236)	0.014	0.002
265	22.08	0.10	0.023	( 0.235)	0.021	0.002
266	22.17	0.10	0.023	( 0.234)	0.021	0.002
267	22.25	0.10	0.023	( 0.234)	0.021	0.002
268	22.33	0.07	0.015	( 0.233)	0.014	0.002
269	22.42	0.07	0.015	( 0.232)	0.014	0.002
270	22.50	0.07	0.015	( 0.231)	0.014	0.002
271	22.58	0.07	0.015	( 0.231)	0.014	0.002
272	22.67	0.07	0.015	( 0.230)	0.014	0.002
273	22.75	0.07	0.015	( 0.230)	0.014	0.002
274	22.83	0.07	0.015	( 0.229)	0.014	0.002
275	22.92	0.07	0.015	( 0.228)	0.014	0.002
276	23.00	0.07	0.015	( 0.228)	0.014	0.002
277	23.08	0.07	0.015	( 0.227)	0.014	0.002
278	23.17	0.07	0.015	( 0.227)	0.014	0.002
279	23.25	0.07	0.015	( 0.226)	0.014	0.002
280	23.33	0.07	0.015	( 0.226)	0.014	0.002
281	23.42	0.07	0.015	( 0.225)	0.014	0.002
282	23.50	0.07	0.015	( 0.225)	0.014	0.002
283	23.58	0.07	0.015	( 0.225)	0.014	0.002
284	23.67	0.07	0.015	( 0.224)	0.014	0.002
285	23.75	0.07	0.015	( 0.224)	0.014	0.002

286 23.83 0.07 0.015 ( 0.224) 0.014 0.002  
 287 23.92 0.07 0.015 ( 0.224) 0.014 0.002  
 288 24.00 0.07 0.015 ( 0.223) 0.014 0.002

(Loss Rate Not Used)

Sum = 100.0 Sum = 2.3

Flood volume = Effective rainfall 0.19(In)  
 times area 9.6(Ac.)/[(In)/(Ft.)] = 0.2(Ac.Ft)  
 Total soil loss = 1.71(In)  
 Total soil loss = 1.364(Ac.Ft)  
 Total rainfall = 1.90(In)  
 Flood volume = 6600.3 Cubic Feet  
 Total soil loss = 59402.8 Cubic Feet

-----  
 Peak flow rate of this hydrograph = 0.249(CFS)  
 -----

++++  
 24 - H O U R S T O R M  
 R u n o f f H y d r o g r a p h  
 -----

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0000	0.00	Q				
0+10	0.0001	0.01	Q				
0+15	0.0002	0.01	Q				
0+20	0.0003	0.02	Q				
0+25	0.0004	0.02	Q				
0+30	0.0006	0.02	Q				
0+35	0.0007	0.02	Q				
0+40	0.0009	0.02	Q				
0+45	0.0010	0.02	Q				
0+50	0.0012	0.02	Q				
0+55	0.0014	0.03	Q				
1+ 0	0.0016	0.03	Q				
1+ 5	0.0018	0.03	Q				
1+10	0.0019	0.02	Q				
1+15	0.0021	0.02	Q				
1+20	0.0022	0.02	Q				
1+25	0.0024	0.02	Q				
1+30	0.0025	0.02	Q				
1+35	0.0027	0.02	Q				
1+40	0.0028	0.02	Q				
1+45	0.0030	0.02	Q				
1+50	0.0032	0.02	Q				
1+55	0.0034	0.03	Q				
2+ 0	0.0036	0.03	Q				
2+ 5	0.0038	0.03	Q				
2+10	0.0040	0.03	QV				

2+15	0.0042	0.03	QV
2+20	0.0044	0.03	QV
2+25	0.0046	0.03	QV
2+30	0.0048	0.03	QV
2+35	0.0050	0.03	QV
2+40	0.0052	0.03	QV
2+45	0.0055	0.04	QV
2+50	0.0057	0.04	QV
2+55	0.0060	0.04	QV
3+ 0	0.0062	0.04	QV
3+ 5	0.0065	0.04	QV
3+10	0.0067	0.04	QV
3+15	0.0070	0.04	QV
3+20	0.0072	0.04	QV
3+25	0.0075	0.04	QV
3+30	0.0077	0.04	Q V
3+35	0.0080	0.04	Q V
3+40	0.0082	0.04	Q V
3+45	0.0085	0.04	Q V
3+50	0.0088	0.04	Q V
3+55	0.0090	0.04	Q V
4+ 0	0.0093	0.04	Q V
4+ 5	0.0096	0.04	Q V
4+10	0.0099	0.04	Q V
4+15	0.0102	0.04	Q V
4+20	0.0106	0.05	Q V
4+25	0.0109	0.05	Q V
4+30	0.0113	0.05	Q V
4+35	0.0116	0.05	Q V
4+40	0.0120	0.05	Q V
4+45	0.0123	0.05	Q V
4+50	0.0127	0.05	Q V
4+55	0.0131	0.06	Q V
5+ 0	0.0135	0.06	Q V
5+ 5	0.0138	0.05	Q V
5+10	0.0142	0.05	Q V
5+15	0.0145	0.05	Q V
5+20	0.0148	0.05	Q V
5+25	0.0151	0.05	Q V
5+30	0.0155	0.05	Q V
5+35	0.0159	0.05	Q V
5+40	0.0162	0.06	Q V
5+45	0.0166	0.06	Q V
5+50	0.0170	0.06	Q V
5+55	0.0174	0.06	Q V
6+ 0	0.0179	0.06	Q V
6+ 5	0.0183	0.06	Q V
6+10	0.0187	0.06	Q V
6+15	0.0192	0.07	Q V
6+20	0.0196	0.07	Q V

6+25	0.0201	0.07	Q	V				
6+30	0.0205	0.07	Q	V				
6+35	0.0210	0.07	Q	V				
6+40	0.0215	0.07	Q	V				
6+45	0.0220	0.07	Q	V				
6+50	0.0225	0.07	Q	V				
6+55	0.0230	0.07	Q	V				
7+ 0	0.0235	0.07	Q	V				
7+ 5	0.0240	0.07	Q	V				
7+10	0.0245	0.07	Q	V				
7+15	0.0250	0.07	Q	V				
7+20	0.0255	0.08	Q	V				
7+25	0.0261	0.08	Q	V				
7+30	0.0266	0.08	Q	V				
7+35	0.0272	0.08	Q	V				
7+40	0.0278	0.09	Q	V				
7+45	0.0284	0.09	Q	V				
7+50	0.0290	0.09	Q	V				
7+55	0.0296	0.09	Q	V				
8+ 0	0.0303	0.09	Q	V				
8+ 5	0.0310	0.10	Q	V				
8+10	0.0317	0.11	Q	V				
8+15	0.0324	0.11	Q	V				
8+20	0.0332	0.11	Q	V				
8+25	0.0339	0.11	Q	V				
8+30	0.0347	0.11	Q	V				
8+35	0.0355	0.11	Q	V				
8+40	0.0363	0.12	Q	V				
8+45	0.0371	0.12	Q	V				
8+50	0.0379	0.12	Q	V				
8+55	0.0387	0.12	Q	V				
9+ 0	0.0396	0.12	Q	V				
9+ 5	0.0405	0.13	Q	V				
9+10	0.0414	0.14	Q	V				
9+15	0.0424	0.14	Q	V				
9+20	0.0433	0.14	Q	V				
9+25	0.0443	0.14	Q	V				
9+30	0.0453	0.15	Q	V				
9+35	0.0463	0.15	Q	V				
9+40	0.0474	0.15	Q	V				
9+45	0.0484	0.15	Q	V				
9+50	0.0495	0.16	Q	V				
9+55	0.0506	0.16	Q	V				
10+ 0	0.0517	0.16	Q	V				
10+ 5	0.0527	0.15	Q	V				
10+10	0.0536	0.12	Q	V				
10+15	0.0544	0.12	Q	V				
10+20	0.0551	0.11	Q	V				
10+25	0.0559	0.11	Q	V				
10+30	0.0567	0.11	Q	V				

10+35	0.0575	0.12	Q	V		
10+40	0.0584	0.14	Q	V		
10+45	0.0594	0.14	Q	V		
10+50	0.0604	0.14	Q	V		
10+55	0.0614	0.15	Q	V		
11+ 0	0.0624	0.15	Q	V		
11+ 5	0.0634	0.14	Q	V		
11+10	0.0644	0.14	Q	V		
11+15	0.0654	0.14	Q	V		
11+20	0.0663	0.14	Q	V		
11+25	0.0673	0.14	Q	V		
11+30	0.0683	0.14	Q	V		
11+35	0.0692	0.14	Q	V		
11+40	0.0701	0.13	Q	V		
11+45	0.0709	0.13	Q	V		
11+50	0.0718	0.13	Q	V		
11+55	0.0727	0.13	Q	V		
12+ 0	0.0736	0.13	Q	V		
12+ 5	0.0746	0.15	Q	V		
12+10	0.0758	0.17	Q	V		
12+15	0.0770	0.18	Q	V		
12+20	0.0783	0.18	Q	V		
12+25	0.0796	0.19	Q	V		
12+30	0.0809	0.19	Q	V		
12+35	0.0822	0.19	Q	V		
12+40	0.0836	0.20	Q	V		
12+45	0.0850	0.20	Q	V		
12+50	0.0864	0.21	Q	V		
12+55	0.0879	0.21	Q	V		
13+ 0	0.0893	0.21	Q	V		
13+ 5	0.0909	0.22	Q	V		
13+10	0.0925	0.24	Q	V		
13+15	0.0942	0.24	Q	V		
13+20	0.0959	0.25	Q	V		
13+25	0.0976	0.25	Q	V		
13+30	0.0993	0.25	Q	V		
13+35	0.1009	0.23	Q	V		
13+40	0.1022	0.19	Q	V		
13+45	0.1034	0.18	Q	V		
13+50	0.1046	0.17	Q	V		
13+55	0.1058	0.17	Q	V		
14+ 0	0.1070	0.17	Q	V		
14+ 5	0.1082	0.18	Q	V		
14+10	0.1095	0.19	Q	V		
14+15	0.1108	0.19	Q	V		
14+20	0.1122	0.19	Q	V		
14+25	0.1135	0.19	Q	V		
14+30	0.1148	0.19	Q	V		
14+35	0.1161	0.19	Q	V		
14+40	0.1174	0.19	Q	V		



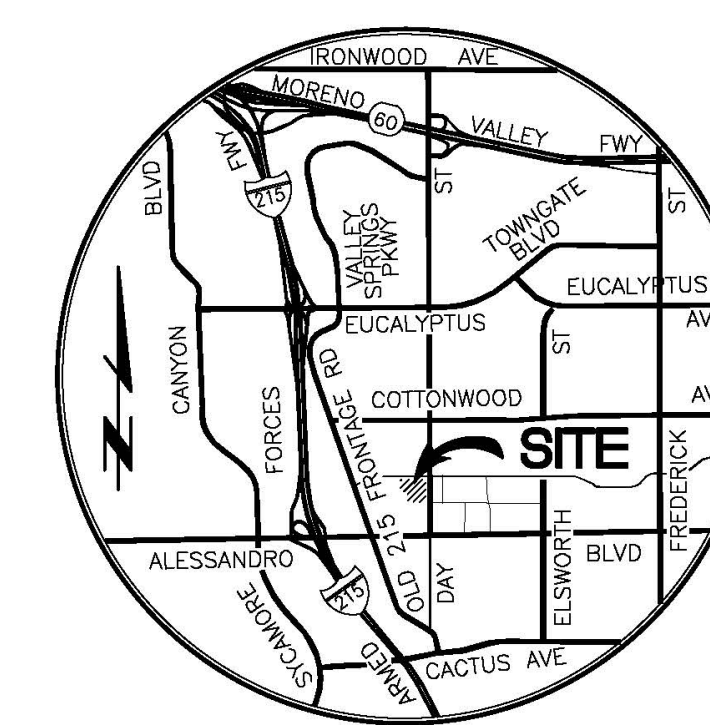
14+45	0.1187	0.19	Q	V
14+50	0.1200	0.19	Q	V
14+55	0.1213	0.19	Q	V
15+ 0	0.1226	0.18	Q	V
15+ 5	0.1238	0.18	Q	V
15+10	0.1251	0.18	Q	V
15+15	0.1263	0.18	Q	V
15+20	0.1275	0.17	Q	V
15+25	0.1287	0.17	Q	V
15+30	0.1298	0.17	Q	V
15+35	0.1309	0.16	Q	V
15+40	0.1319	0.15	Q	V
15+45	0.1329	0.14	Q	V
15+50	0.1339	0.14	Q	V
15+55	0.1349	0.14	Q	V
16+ 0	0.1358	0.14	Q	V
16+ 5	0.1366	0.11	Q	V
16+10	0.1370	0.06	Q	V
16+15	0.1373	0.04	Q	V
16+20	0.1375	0.04	Q	V
16+25	0.1377	0.03	Q	V
16+30	0.1379	0.03	Q	V
16+35	0.1381	0.03	Q	V
16+40	0.1383	0.02	Q	V
16+45	0.1385	0.02	Q	V
16+50	0.1386	0.02	Q	V
16+55	0.1388	0.02	Q	V
17+ 0	0.1389	0.02	Q	V
17+ 5	0.1391	0.03	Q	V
17+10	0.1393	0.03	Q	V
17+15	0.1396	0.03	Q	V
17+20	0.1398	0.04	Q	V
17+25	0.1401	0.04	Q	V
17+30	0.1403	0.04	Q	V
17+35	0.1406	0.04	Q	V
17+40	0.1408	0.04	Q	V
17+45	0.1411	0.04	Q	V
17+50	0.1413	0.03	Q	V
17+55	0.1415	0.03	Q	V
18+ 0	0.1417	0.03	Q	V
18+ 5	0.1419	0.03	Q	V
18+10	0.1421	0.03	Q	V
18+15	0.1423	0.03	Q	V
18+20	0.1425	0.03	Q	V
18+25	0.1427	0.03	Q	V
18+30	0.1429	0.03	Q	V
18+35	0.1431	0.03	Q	V
18+40	0.1433	0.02	Q	V
18+45	0.1435	0.02	Q	V
18+50	0.1436	0.02	Q	V

18+55	0.1437	0.02	Q	V
19+ 0	0.1438	0.02	Q	V
19+ 5	0.1439	0.02	Q	V
19+10	0.1441	0.02	Q	V
19+15	0.1442	0.02	Q	V
19+20	0.1444	0.02	Q	V
19+25	0.1446	0.03	Q	V
19+30	0.1448	0.03	Q	V
19+35	0.1450	0.03	Q	V
19+40	0.1451	0.02	Q	V
19+45	0.1453	0.02	Q	V
19+50	0.1454	0.02	Q	V
19+55	0.1455	0.02	Q	V
20+ 0	0.1456	0.02	Q	V
20+ 5	0.1458	0.02	Q	V
20+10	0.1459	0.02	Q	V
20+15	0.1460	0.02	Q	V
20+20	0.1462	0.02	Q	V
20+25	0.1463	0.02	Q	V
20+30	0.1465	0.02	Q	V
20+35	0.1466	0.02	Q	V
20+40	0.1468	0.02	Q	V
20+45	0.1469	0.02	Q	V
20+50	0.1471	0.02	Q	V
20+55	0.1472	0.02	Q	V
21+ 0	0.1473	0.02	Q	V
21+ 5	0.1474	0.02	Q	V
21+10	0.1476	0.02	Q	V
21+15	0.1477	0.02	Q	V
21+20	0.1478	0.02	Q	V
21+25	0.1480	0.02	Q	V
21+30	0.1481	0.02	Q	V
21+35	0.1482	0.02	Q	V
21+40	0.1483	0.02	Q	V
21+45	0.1485	0.02	Q	V
21+50	0.1486	0.02	Q	V
21+55	0.1487	0.02	Q	V
22+ 0	0.1488	0.02	Q	V
22+ 5	0.1489	0.02	Q	V
22+10	0.1491	0.02	Q	V
22+15	0.1492	0.02	Q	V
22+20	0.1494	0.02	Q	V
22+25	0.1495	0.02	Q	V
22+30	0.1496	0.02	Q	V
22+35	0.1497	0.02	Q	V
22+40	0.1498	0.01	Q	V
22+45	0.1499	0.01	Q	V
22+50	0.1500	0.01	Q	V
22+55	0.1501	0.01	Q	V
23+ 0	0.1502	0.01	Q	V

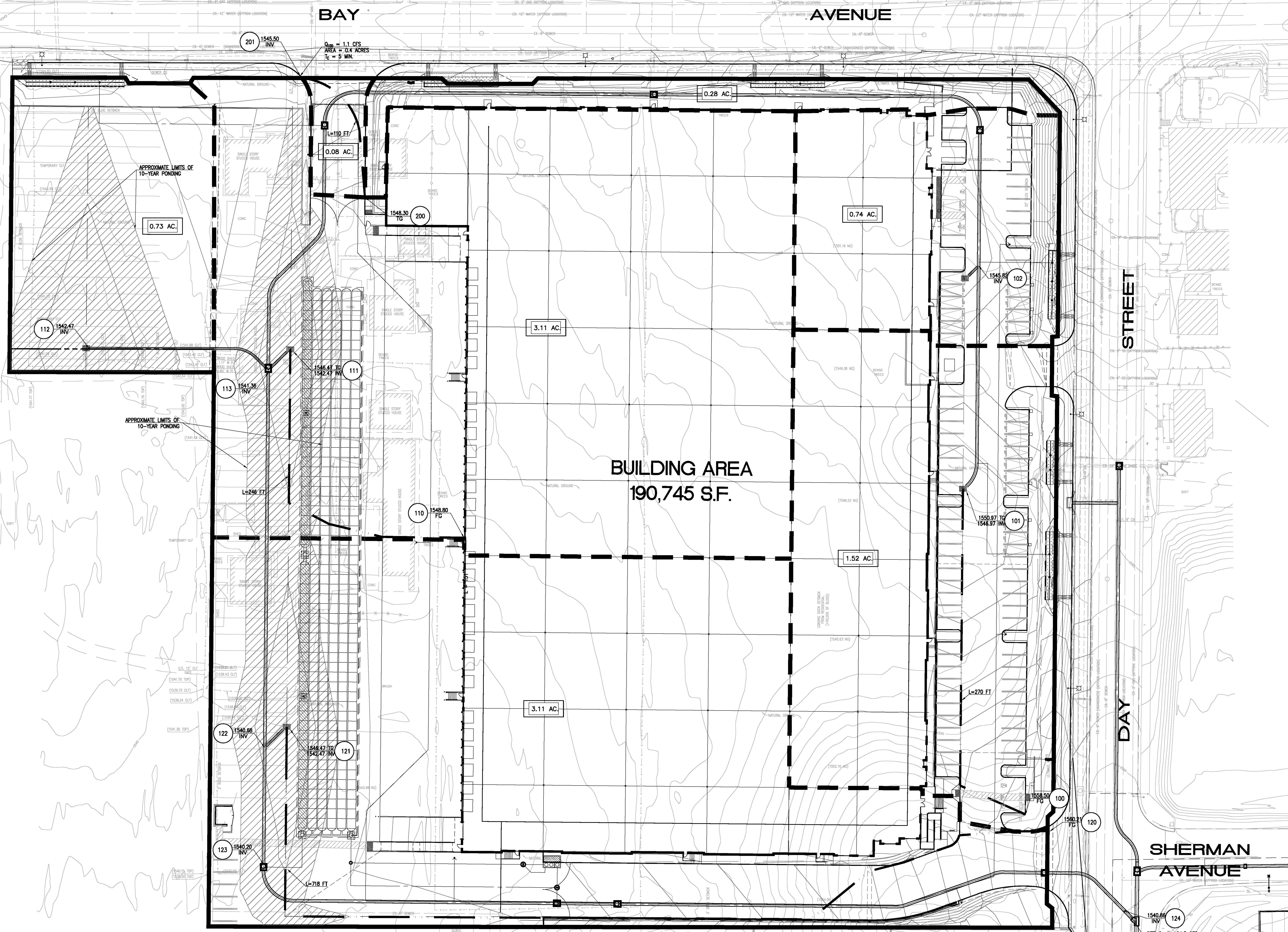
23+ 5	0.1503	0.01	Q				V
23+10	0.1504	0.01	Q				V
23+15	0.1505	0.01	Q				V
23+20	0.1506	0.01	Q				V
23+25	0.1507	0.01	Q				V
23+30	0.1508	0.01	Q				V
23+35	0.1509	0.01	Q				V
23+40	0.1510	0.01	Q				V
23+45	0.1511	0.01	Q				V
23+50	0.1512	0.01	Q				V
23+55	0.1513	0.01	Q				V
24+ 0	0.1514	0.01	Q				V
24+ 5	0.1515	0.01	Q				V
24+10	0.1515	0.00	Q				V
24+15	0.1515	0.00	Q				V
24+20	0.1515	0.00	Q				V
24+25	0.1515	0.00	Q				V
24+30	0.1515	0.00	Q				V

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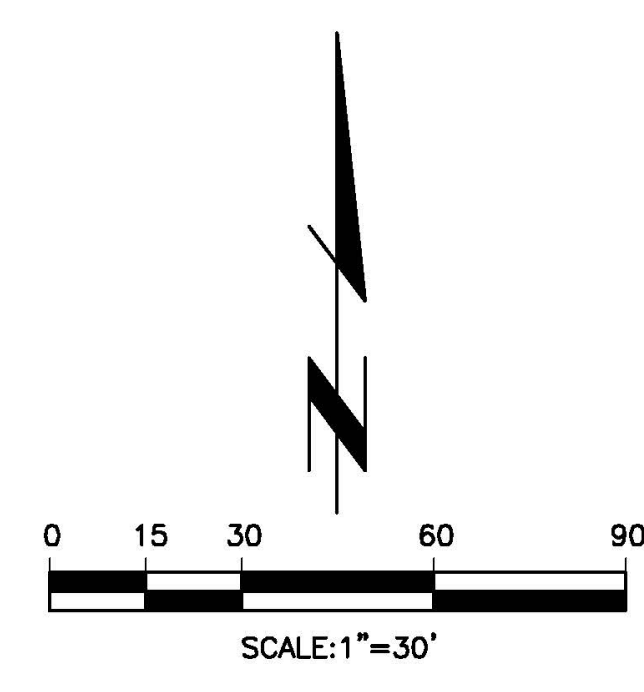
# **POST-DEVELOPED CONDITION**



VICINITY MAP  
N.T.S.



LEGEND	
	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	FLOW PATH
	SUBAREA AREA
	NODE NUMBER
	LENGTH OF FLOW PATH
	TIME OF CONCENTRATION
	DISCHARGE (CUBIC FEET PER SECOND) NUMBER DESIGNATE YEAR OF FREQUENCY
	APPROXIMATE LIMITS OF 10-YEAR PONDING



1540.66 INV 124  
SITE  $Q_{100} = 24.3$  CFS  
SITE  $Q_{100} = 8.2$  CFS  
TOTAL  $Q_{100} = 22.0$  CFS  
AREA = 9.2 ACRES  
 $T_c = 12.5$  MIN.  
EXISTING STORM DRAIN

PEN21-0123  
OWNER:  
MOLTO PROPERTIES, LLC  
ONE LINCOLN CENTRE  
18W140 BUTTERFIELD ROAD, #750  
OAKBROOK TERRACE, CA 91761  
TEL: 949-226-4601

ENGINEER:  
**Thienes Engineering, Inc.**  
CIVIL ENGINEERING & LAND SURVEYING  
14305 FIRESTONE BOULEVARD  
LA MIRADA, CALIFORNIA 90638  
PH: 714-837-4172 FAX: 714-837-4173  
EMAIL: GORDON@THIENES.COM

CITY OF MORENO VALLEY  
PUBLIC WORKS DEPARTMENT  
PROPOSED CONDITION HYDROLOGY MAP  
PEN21-0123 / LWQ23-0013  
BAY AND DAY INDUSTRIAL BUILDING  
SOUTHWEST CORNER  
OF  
BAY AVENUE AND DAY STREET  
MORENO VALLEY, CALIFORNIA

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0  
Study date 04/18/23 File: 3930PR2242.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6400

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used  
  
English Units used in output format

-----  
BAY AND DAY INDUSTRIAL BUILDING  
PROPOSED CONDITION  
2-YEAR  
DETENTION CALCULATIONS

-----  
Drainage Area = 9.57(Ac.) = 0.015 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 9.57(Ac.) =  
0.015 Sq. Mi.  
Length along longest watercourse = 991.00(Ft.)  
Length along longest watercourse measured to centroid =  
533.00(Ft.)  
Length along longest watercourse = 0.188 Mi.  
Length along longest watercourse measured to centroid = 0.101 Mi.  
Difference in elevation = 19.40(Ft.)  
Slope along watercourse = 103.3623 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.033 Hr.  
Lag time = 1.98 Min.  
25% of lag time = 0.50 Min.  
40% of lag time = 0.79 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	1.90	18.18

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	4.20	40.19

STORM EVENT (YEAR) = 2.00  
 Area Averaged 2-Year Rainfall = 1.900(In)  
 Area Averaged 100-Year Rainfall = 4.200(In)

Point rain (area averaged) = 1.900(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.570	69.00	0.900
Total Area Entered = 9.57(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
69.0	49.8	0.574	0.900	0.109	1.000	0.109
Sum (F) =						0.109

Area averaged mean soil loss (F) (In/Hr) = 0.109  
 Minimum soil loss rate ((In/Hr)) = 0.055  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.100

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 U n i t H y d r o g r a p h  
 VALLEY S-Curve  
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Unit Hydrograph Data  
 -----

Unit time period	Time % of lag	Distribution	Unit Hydrograph
(hrs)		Graph %	(CFS)

1	0.083	252.222	51.184	4.937
2	0.167	504.443	39.917	3.850
3	0.250	756.665	6.948	0.670
4	0.333	1008.887	1.951	0.188
Sum =			100.000	Sum= 9.645

-----

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr)		Effective (In/Hr)
				Max	Low	
1	0.08	0.07	0.015	( 0.193)	0.002	0.014
2	0.17	0.07	0.015	( 0.193)	0.002	0.014
3	0.25	0.07	0.015	( 0.192)	0.002	0.014
4	0.33	0.10	0.023	( 0.191)	0.002	0.021
5	0.42	0.10	0.023	( 0.190)	0.002	0.021
6	0.50	0.10	0.023	( 0.190)	0.002	0.021
7	0.58	0.10	0.023	( 0.189)	0.002	0.021
8	0.67	0.10	0.023	( 0.188)	0.002	0.021
9	0.75	0.10	0.023	( 0.187)	0.002	0.021
10	0.83	0.13	0.030	( 0.187)	0.003	0.027
11	0.92	0.13	0.030	( 0.186)	0.003	0.027
12	1.00	0.13	0.030	( 0.185)	0.003	0.027
13	1.08	0.10	0.023	( 0.184)	0.002	0.021
14	1.17	0.10	0.023	( 0.184)	0.002	0.021
15	1.25	0.10	0.023	( 0.183)	0.002	0.021
16	1.33	0.10	0.023	( 0.182)	0.002	0.021
17	1.42	0.10	0.023	( 0.182)	0.002	0.021
18	1.50	0.10	0.023	( 0.181)	0.002	0.021
19	1.58	0.10	0.023	( 0.180)	0.002	0.021
20	1.67	0.10	0.023	( 0.179)	0.002	0.021
21	1.75	0.10	0.023	( 0.179)	0.002	0.021
22	1.83	0.13	0.030	( 0.178)	0.003	0.027
23	1.92	0.13	0.030	( 0.177)	0.003	0.027
24	2.00	0.13	0.030	( 0.176)	0.003	0.027
25	2.08	0.13	0.030	( 0.176)	0.003	0.027
26	2.17	0.13	0.030	( 0.175)	0.003	0.027
27	2.25	0.13	0.030	( 0.174)	0.003	0.027
28	2.33	0.13	0.030	( 0.174)	0.003	0.027
29	2.42	0.13	0.030	( 0.173)	0.003	0.027
30	2.50	0.13	0.030	( 0.172)	0.003	0.027
31	2.58	0.17	0.038	( 0.172)	0.004	0.034
32	2.67	0.17	0.038	( 0.171)	0.004	0.034
33	2.75	0.17	0.038	( 0.170)	0.004	0.034
34	2.83	0.17	0.038	( 0.169)	0.004	0.034
35	2.92	0.17	0.038	( 0.169)	0.004	0.034
36	3.00	0.17	0.038	( 0.168)	0.004	0.034
37	3.08	0.17	0.038	( 0.167)	0.004	0.034
38	3.17	0.17	0.038	( 0.167)	0.004	0.034
39	3.25	0.17	0.038	( 0.166)	0.004	0.034
40	3.33	0.17	0.038	( 0.165)	0.004	0.034



41	3.42	0.17	0.038	( 0.165)	0.004	0.034
42	3.50	0.17	0.038	( 0.164)	0.004	0.034
43	3.58	0.17	0.038	( 0.163)	0.004	0.034
44	3.67	0.17	0.038	( 0.162)	0.004	0.034
45	3.75	0.17	0.038	( 0.162)	0.004	0.034
46	3.83	0.20	0.046	( 0.161)	0.005	0.041
47	3.92	0.20	0.046	( 0.160)	0.005	0.041
48	4.00	0.20	0.046	( 0.160)	0.005	0.041
49	4.08	0.20	0.046	( 0.159)	0.005	0.041
50	4.17	0.20	0.046	( 0.158)	0.005	0.041
51	4.25	0.20	0.046	( 0.158)	0.005	0.041
52	4.33	0.23	0.053	( 0.157)	0.005	0.048
53	4.42	0.23	0.053	( 0.156)	0.005	0.048
54	4.50	0.23	0.053	( 0.156)	0.005	0.048
55	4.58	0.23	0.053	( 0.155)	0.005	0.048
56	4.67	0.23	0.053	( 0.154)	0.005	0.048
57	4.75	0.23	0.053	( 0.154)	0.005	0.048
58	4.83	0.27	0.061	( 0.153)	0.006	0.055
59	4.92	0.27	0.061	( 0.152)	0.006	0.055
60	5.00	0.27	0.061	( 0.152)	0.006	0.055
61	5.08	0.20	0.046	( 0.151)	0.005	0.041
62	5.17	0.20	0.046	( 0.150)	0.005	0.041
63	5.25	0.20	0.046	( 0.150)	0.005	0.041
64	5.33	0.23	0.053	( 0.149)	0.005	0.048
65	5.42	0.23	0.053	( 0.148)	0.005	0.048
66	5.50	0.23	0.053	( 0.148)	0.005	0.048
67	5.58	0.27	0.061	( 0.147)	0.006	0.055
68	5.67	0.27	0.061	( 0.147)	0.006	0.055
69	5.75	0.27	0.061	( 0.146)	0.006	0.055
70	5.83	0.27	0.061	( 0.145)	0.006	0.055
71	5.92	0.27	0.061	( 0.145)	0.006	0.055
72	6.00	0.27	0.061	( 0.144)	0.006	0.055
73	6.08	0.30	0.068	( 0.143)	0.007	0.062
74	6.17	0.30	0.068	( 0.143)	0.007	0.062
75	6.25	0.30	0.068	( 0.142)	0.007	0.062
76	6.33	0.30	0.068	( 0.141)	0.007	0.062
77	6.42	0.30	0.068	( 0.141)	0.007	0.062
78	6.50	0.30	0.068	( 0.140)	0.007	0.062
79	6.58	0.33	0.076	( 0.140)	0.008	0.068
80	6.67	0.33	0.076	( 0.139)	0.008	0.068
81	6.75	0.33	0.076	( 0.138)	0.008	0.068
82	6.83	0.33	0.076	( 0.138)	0.008	0.068
83	6.92	0.33	0.076	( 0.137)	0.008	0.068
84	7.00	0.33	0.076	( 0.136)	0.008	0.068
85	7.08	0.33	0.076	( 0.136)	0.008	0.068
86	7.17	0.33	0.076	( 0.135)	0.008	0.068
87	7.25	0.33	0.076	( 0.135)	0.008	0.068
88	7.33	0.37	0.084	( 0.134)	0.008	0.075
89	7.42	0.37	0.084	( 0.133)	0.008	0.075
90	7.50	0.37	0.084	( 0.133)	0.008	0.075

91	7.58	0.40	0.091	( 0.132)	0.009	0.082
92	7.67	0.40	0.091	( 0.131)	0.009	0.082
93	7.75	0.40	0.091	( 0.131)	0.009	0.082
94	7.83	0.43	0.099	( 0.130)	0.010	0.089
95	7.92	0.43	0.099	( 0.130)	0.010	0.089
96	8.00	0.43	0.099	( 0.129)	0.010	0.089
97	8.08	0.50	0.114	( 0.128)	0.011	0.103
98	8.17	0.50	0.114	( 0.128)	0.011	0.103
99	8.25	0.50	0.114	( 0.127)	0.011	0.103
100	8.33	0.50	0.114	( 0.127)	0.011	0.103
101	8.42	0.50	0.114	( 0.126)	0.011	0.103
102	8.50	0.50	0.114	( 0.125)	0.011	0.103
103	8.58	0.53	0.122	( 0.125)	0.012	0.109
104	8.67	0.53	0.122	( 0.124)	0.012	0.109
105	8.75	0.53	0.122	( 0.124)	0.012	0.109
106	8.83	0.57	0.129	( 0.123)	0.013	0.116
107	8.92	0.57	0.129	( 0.123)	0.013	0.116
108	9.00	0.57	0.129	( 0.122)	0.013	0.116
109	9.08	0.63	0.144	( 0.121)	0.014	0.130
110	9.17	0.63	0.144	( 0.121)	0.014	0.130
111	9.25	0.63	0.144	( 0.120)	0.014	0.130
112	9.33	0.67	0.152	( 0.120)	0.015	0.137
113	9.42	0.67	0.152	( 0.119)	0.015	0.137
114	9.50	0.67	0.152	( 0.119)	0.015	0.137
115	9.58	0.70	0.160	( 0.118)	0.016	0.144
116	9.67	0.70	0.160	( 0.117)	0.016	0.144
117	9.75	0.70	0.160	( 0.117)	0.016	0.144
118	9.83	0.73	0.167	( 0.116)	0.017	0.150
119	9.92	0.73	0.167	( 0.116)	0.017	0.150
120	10.00	0.73	0.167	( 0.115)	0.017	0.150
121	10.08	0.50	0.114	( 0.115)	0.011	0.103
122	10.17	0.50	0.114	( 0.114)	0.011	0.103
123	10.25	0.50	0.114	( 0.113)	0.011	0.103
124	10.33	0.50	0.114	( 0.113)	0.011	0.103
125	10.42	0.50	0.114	( 0.112)	0.011	0.103
126	10.50	0.50	0.114	( 0.112)	0.011	0.103
127	10.58	0.67	0.152	( 0.111)	0.015	0.137
128	10.67	0.67	0.152	( 0.111)	0.015	0.137
129	10.75	0.67	0.152	( 0.110)	0.015	0.137
130	10.83	0.67	0.152	( 0.110)	0.015	0.137
131	10.92	0.67	0.152	( 0.109)	0.015	0.137
132	11.00	0.67	0.152	( 0.109)	0.015	0.137
133	11.08	0.63	0.144	( 0.108)	0.014	0.130
134	11.17	0.63	0.144	( 0.108)	0.014	0.130
135	11.25	0.63	0.144	( 0.107)	0.014	0.130
136	11.33	0.63	0.144	( 0.106)	0.014	0.130
137	11.42	0.63	0.144	( 0.106)	0.014	0.130
138	11.50	0.63	0.144	( 0.105)	0.014	0.130
139	11.58	0.57	0.129	( 0.105)	0.013	0.116
140	11.67	0.57	0.129	( 0.104)	0.013	0.116

141	11.75	0.57	0.129	( 0.104)	0.013	0.116
142	11.83	0.60	0.137	( 0.103)	0.014	0.123
143	11.92	0.60	0.137	( 0.103)	0.014	0.123
144	12.00	0.60	0.137	( 0.102)	0.014	0.123
145	12.08	0.83	0.190	( 0.102)	0.019	0.171
146	12.17	0.83	0.190	( 0.101)	0.019	0.171
147	12.25	0.83	0.190	( 0.101)	0.019	0.171
148	12.33	0.87	0.198	( 0.100)	0.020	0.178
149	12.42	0.87	0.198	( 0.100)	0.020	0.178
150	12.50	0.87	0.198	( 0.099)	0.020	0.178
151	12.58	0.93	0.213	( 0.099)	0.021	0.192
152	12.67	0.93	0.213	( 0.098)	0.021	0.192
153	12.75	0.93	0.213	( 0.098)	0.021	0.192
154	12.83	0.97	0.220	( 0.097)	0.022	0.198
155	12.92	0.97	0.220	( 0.097)	0.022	0.198
156	13.00	0.97	0.220	( 0.096)	0.022	0.198
157	13.08	1.13	0.258	( 0.096)	0.026	0.233
158	13.17	1.13	0.258	( 0.095)	0.026	0.233
159	13.25	1.13	0.258	( 0.095)	0.026	0.233
160	13.33	1.13	0.258	( 0.094)	0.026	0.233
161	13.42	1.13	0.258	( 0.094)	0.026	0.233
162	13.50	1.13	0.258	( 0.093)	0.026	0.233
163	13.58	0.77	0.175	( 0.093)	0.017	0.157
164	13.67	0.77	0.175	( 0.092)	0.017	0.157
165	13.75	0.77	0.175	( 0.092)	0.017	0.157
166	13.83	0.77	0.175	( 0.092)	0.017	0.157
167	13.92	0.77	0.175	( 0.091)	0.017	0.157
168	14.00	0.77	0.175	( 0.091)	0.017	0.157
169	14.08	0.90	0.205	( 0.090)	0.021	0.185
170	14.17	0.90	0.205	( 0.090)	0.021	0.185
171	14.25	0.90	0.205	( 0.089)	0.021	0.185
172	14.33	0.87	0.198	( 0.089)	0.020	0.178
173	14.42	0.87	0.198	( 0.088)	0.020	0.178
174	14.50	0.87	0.198	( 0.088)	0.020	0.178
175	14.58	0.87	0.198	( 0.087)	0.020	0.178
176	14.67	0.87	0.198	( 0.087)	0.020	0.178
177	14.75	0.87	0.198	( 0.086)	0.020	0.178
178	14.83	0.83	0.190	( 0.086)	0.019	0.171
179	14.92	0.83	0.190	( 0.086)	0.019	0.171
180	15.00	0.83	0.190	( 0.085)	0.019	0.171
181	15.08	0.80	0.182	( 0.085)	0.018	0.164
182	15.17	0.80	0.182	( 0.084)	0.018	0.164
183	15.25	0.80	0.182	( 0.084)	0.018	0.164
184	15.33	0.77	0.175	( 0.083)	0.017	0.157
185	15.42	0.77	0.175	( 0.083)	0.017	0.157
186	15.50	0.77	0.175	( 0.083)	0.017	0.157
187	15.58	0.63	0.144	( 0.082)	0.014	0.130
188	15.67	0.63	0.144	( 0.082)	0.014	0.130
189	15.75	0.63	0.144	( 0.081)	0.014	0.130
190	15.83	0.63	0.144	( 0.081)	0.014	0.130

191	15.92	0.63	0.144	( 0.080)	0.014	0.130
192	16.00	0.63	0.144	( 0.080)	0.014	0.130
193	16.08	0.13	0.030	( 0.080)	0.003	0.027
194	16.17	0.13	0.030	( 0.079)	0.003	0.027
195	16.25	0.13	0.030	( 0.079)	0.003	0.027
196	16.33	0.13	0.030	( 0.078)	0.003	0.027
197	16.42	0.13	0.030	( 0.078)	0.003	0.027
198	16.50	0.13	0.030	( 0.078)	0.003	0.027
199	16.58	0.10	0.023	( 0.077)	0.002	0.021
200	16.67	0.10	0.023	( 0.077)	0.002	0.021
201	16.75	0.10	0.023	( 0.076)	0.002	0.021
202	16.83	0.10	0.023	( 0.076)	0.002	0.021
203	16.92	0.10	0.023	( 0.076)	0.002	0.021
204	17.00	0.10	0.023	( 0.075)	0.002	0.021
205	17.08	0.17	0.038	( 0.075)	0.004	0.034
206	17.17	0.17	0.038	( 0.075)	0.004	0.034
207	17.25	0.17	0.038	( 0.074)	0.004	0.034
208	17.33	0.17	0.038	( 0.074)	0.004	0.034
209	17.42	0.17	0.038	( 0.073)	0.004	0.034
210	17.50	0.17	0.038	( 0.073)	0.004	0.034
211	17.58	0.17	0.038	( 0.073)	0.004	0.034
212	17.67	0.17	0.038	( 0.072)	0.004	0.034
213	17.75	0.17	0.038	( 0.072)	0.004	0.034
214	17.83	0.13	0.030	( 0.072)	0.003	0.027
215	17.92	0.13	0.030	( 0.071)	0.003	0.027
216	18.00	0.13	0.030	( 0.071)	0.003	0.027
217	18.08	0.13	0.030	( 0.071)	0.003	0.027
218	18.17	0.13	0.030	( 0.070)	0.003	0.027
219	18.25	0.13	0.030	( 0.070)	0.003	0.027
220	18.33	0.13	0.030	( 0.070)	0.003	0.027
221	18.42	0.13	0.030	( 0.069)	0.003	0.027
222	18.50	0.13	0.030	( 0.069)	0.003	0.027
223	18.58	0.10	0.023	( 0.069)	0.002	0.021
224	18.67	0.10	0.023	( 0.068)	0.002	0.021
225	18.75	0.10	0.023	( 0.068)	0.002	0.021
226	18.83	0.07	0.015	( 0.068)	0.002	0.014
227	18.92	0.07	0.015	( 0.067)	0.002	0.014
228	19.00	0.07	0.015	( 0.067)	0.002	0.014
229	19.08	0.10	0.023	( 0.067)	0.002	0.021
230	19.17	0.10	0.023	( 0.066)	0.002	0.021
231	19.25	0.10	0.023	( 0.066)	0.002	0.021
232	19.33	0.13	0.030	( 0.066)	0.003	0.027
233	19.42	0.13	0.030	( 0.065)	0.003	0.027
234	19.50	0.13	0.030	( 0.065)	0.003	0.027
235	19.58	0.10	0.023	( 0.065)	0.002	0.021
236	19.67	0.10	0.023	( 0.064)	0.002	0.021
237	19.75	0.10	0.023	( 0.064)	0.002	0.021
238	19.83	0.07	0.015	( 0.064)	0.002	0.014
239	19.92	0.07	0.015	( 0.064)	0.002	0.014
240	20.00	0.07	0.015	( 0.063)	0.002	0.014

241	20.08	0.10	0.023	( 0.063)	0.002	0.021
242	20.17	0.10	0.023	( 0.063)	0.002	0.021
243	20.25	0.10	0.023	( 0.062)	0.002	0.021
244	20.33	0.10	0.023	( 0.062)	0.002	0.021
245	20.42	0.10	0.023	( 0.062)	0.002	0.021
246	20.50	0.10	0.023	( 0.062)	0.002	0.021
247	20.58	0.10	0.023	( 0.061)	0.002	0.021
248	20.67	0.10	0.023	( 0.061)	0.002	0.021
249	20.75	0.10	0.023	( 0.061)	0.002	0.021
250	20.83	0.07	0.015	( 0.061)	0.002	0.014
251	20.92	0.07	0.015	( 0.060)	0.002	0.014
252	21.00	0.07	0.015	( 0.060)	0.002	0.014
253	21.08	0.10	0.023	( 0.060)	0.002	0.021
254	21.17	0.10	0.023	( 0.060)	0.002	0.021
255	21.25	0.10	0.023	( 0.059)	0.002	0.021
256	21.33	0.07	0.015	( 0.059)	0.002	0.014
257	21.42	0.07	0.015	( 0.059)	0.002	0.014
258	21.50	0.07	0.015	( 0.059)	0.002	0.014
259	21.58	0.10	0.023	( 0.059)	0.002	0.021
260	21.67	0.10	0.023	( 0.058)	0.002	0.021
261	21.75	0.10	0.023	( 0.058)	0.002	0.021
262	21.83	0.07	0.015	( 0.058)	0.002	0.014
263	21.92	0.07	0.015	( 0.058)	0.002	0.014
264	22.00	0.07	0.015	( 0.058)	0.002	0.014
265	22.08	0.10	0.023	( 0.057)	0.002	0.021
266	22.17	0.10	0.023	( 0.057)	0.002	0.021
267	22.25	0.10	0.023	( 0.057)	0.002	0.021
268	22.33	0.07	0.015	( 0.057)	0.002	0.014
269	22.42	0.07	0.015	( 0.057)	0.002	0.014
270	22.50	0.07	0.015	( 0.057)	0.002	0.014
271	22.58	0.07	0.015	( 0.056)	0.002	0.014
272	22.67	0.07	0.015	( 0.056)	0.002	0.014
273	22.75	0.07	0.015	( 0.056)	0.002	0.014
274	22.83	0.07	0.015	( 0.056)	0.002	0.014
275	22.92	0.07	0.015	( 0.056)	0.002	0.014
276	23.00	0.07	0.015	( 0.056)	0.002	0.014
277	23.08	0.07	0.015	( 0.055)	0.002	0.014
278	23.17	0.07	0.015	( 0.055)	0.002	0.014
279	23.25	0.07	0.015	( 0.055)	0.002	0.014
280	23.33	0.07	0.015	( 0.055)	0.002	0.014
281	23.42	0.07	0.015	( 0.055)	0.002	0.014
282	23.50	0.07	0.015	( 0.055)	0.002	0.014
283	23.58	0.07	0.015	( 0.055)	0.002	0.014
284	23.67	0.07	0.015	( 0.055)	0.002	0.014
285	23.75	0.07	0.015	( 0.055)	0.002	0.014
286	23.83	0.07	0.015	( 0.055)	0.002	0.014
287	23.92	0.07	0.015	( 0.055)	0.002	0.014
288	24.00	0.07	0.015	( 0.055)	0.002	0.014

(Loss Rate Not Used)

Sum = 100.0

Sum = 20.5

Flood volume = Effective rainfall 1.71(In)  
 times area 9.6(Ac.)/[ (In)/(Ft.) ] = 1.4(Ac.Ft)  
 Total soil loss = 0.19(In)  
 Total soil loss = 0.152(Ac.Ft)  
 Total rainfall = 1.90(In)  
 Flood volume = 59402.8 Cubic Feet  
 Total soil loss = 6600.3 Cubic Feet

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 Peak flow rate of this hydrograph = 2.244(CFS)  
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24 - H O U R S T O R M  
 R u n o f f H y d r o g r a p h

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 Hydrograph in 5 Minute intervals ((CFS))  
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Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0005	0.07	Q				
0+10	0.0013	0.12	Q				
0+15	0.0022	0.13	Q				
0+20	0.0033	0.17	Q				
0+25	0.0047	0.19	Q				
0+30	0.0060	0.20	Q				
0+35	0.0074	0.20	Q				
0+40	0.0087	0.20	Q				
0+45	0.0101	0.20	Q				
0+50	0.0117	0.23	Q				
0+55	0.0135	0.26	VQ				
1+ 0	0.0153	0.26	VQ				
1+ 5	0.0169	0.23	Q				
1+10	0.0183	0.20	Q				
1+15	0.0196	0.20	Q				
1+20	0.0210	0.20	Q				
1+25	0.0224	0.20	Q				
1+30	0.0237	0.20	Q				
1+35	0.0251	0.20	Q				
1+40	0.0265	0.20	Q				
1+45	0.0278	0.20	Q				
1+50	0.0294	0.23	Q				
1+55	0.0312	0.26	VQ				
2+ 0	0.0330	0.26	VQ				
2+ 5	0.0348	0.26	Q				
2+10	0.0366	0.26	Q				
2+15	0.0385	0.26	Q				
2+20	0.0403	0.26	Q				
2+25	0.0421	0.26	Q				
2+30	0.0439	0.26	Q				
2+35	0.0460	0.30	Q				

2+40	0.0482	0.32	Q				
2+45	0.0505	0.33	Q				
2+50	0.0527	0.33	Q				
2+55	0.0550	0.33	Q				
3+ 0	0.0573	0.33	Q				
3+ 5	0.0596	0.33	Q				
3+10	0.0618	0.33	Q				
3+15	0.0641	0.33	Q				
3+20	0.0664	0.33	Q				
3+25	0.0686	0.33	QV				
3+30	0.0709	0.33	QV				
3+35	0.0732	0.33	QV				
3+40	0.0755	0.33	QV				
3+45	0.0777	0.33	QV				
3+50	0.0802	0.36	QV				
3+55	0.0829	0.39	QV				
4+ 0	0.0856	0.39	QV				
4+ 5	0.0884	0.40	QV				
4+10	0.0911	0.40	QV				
4+15	0.0938	0.40	QV				
4+20	0.0968	0.43	QV				
4+25	0.0999	0.46	QV				
4+30	0.1031	0.46	Q V				
4+35	0.1063	0.46	Q V				
4+40	0.1095	0.46	Q V				
4+45	0.1127	0.46	Q V				
4+50	0.1161	0.50	Q V				
4+55	0.1197	0.52	QV				
5+ 0	0.1233	0.53	QV				
5+ 5	0.1265	0.46	Q V				
5+10	0.1293	0.41	Q V				
5+15	0.1320	0.40	Q V				
5+20	0.1350	0.43	Q V				
5+25	0.1381	0.46	Q V				
5+30	0.1413	0.46	Q V				
5+35	0.1447	0.50	Q V				
5+40	0.1483	0.52	Q V				
5+45	0.1519	0.53	Q V				
5+50	0.1556	0.53	Q V				
5+55	0.1592	0.53	Q V				
6+ 0	0.1628	0.53	Q V				
6+ 5	0.1667	0.56	Q V				
6+10	0.1708	0.59	Q V				
6+15	0.1748	0.59	Q V				
6+20	0.1789	0.59	Q V				
6+25	0.1830	0.59	Q V				
6+30	0.1871	0.59	Q V				
6+35	0.1914	0.63	Q V				
6+40	0.1959	0.65	Q V				
6+45	0.2005	0.66	Q V				

6+50	0.2050	0.66	Q	V				
6+55	0.2096	0.66	Q	V				
7+ 0	0.2141	0.66	Q	V				
7+ 5	0.2187	0.66	Q	V				
7+10	0.2232	0.66	Q	V				
7+15	0.2278	0.66	Q	V				
7+20	0.2325	0.69	Q	V				
7+25	0.2375	0.72	Q	V				
7+30	0.2425	0.72	Q	V				
7+35	0.2477	0.76	Q	V				
7+40	0.2531	0.79	Q	V				
7+45	0.2586	0.79	Q	V				
7+50	0.2643	0.83	Q	V				
7+55	0.2701	0.85	Q	V				
8+ 0	0.2760	0.86	Q	V				
8+ 5	0.2824	0.93	Q	V				
8+10	0.2891	0.98	Q	V				
8+15	0.2959	0.99	Q	V				
8+20	0.3028	0.99	Q	V				
8+25	0.3096	0.99	Q	V				
8+30	0.3164	0.99	Q	V				
8+35	0.3235	1.02	Q	V				
8+40	0.3307	1.05	Q	V				
8+45	0.3379	1.05	Q	V				
8+50	0.3455	1.09	Q	V				
8+55	0.3531	1.12	Q	V				
9+ 0	0.3609	1.12	Q	V				
9+ 5	0.3691	1.19	Q	V				
9+10	0.3776	1.24	Q	V				
9+15	0.3862	1.25	Q	V				
9+20	0.3951	1.29	Q	V				
9+25	0.4041	1.31	Q	V				
9+30	0.4132	1.32	Q	V				
9+35	0.4226	1.35	Q	V				
9+40	0.4321	1.38	Q	V				
9+45	0.4416	1.38	Q	V				
9+50	0.4514	1.42	Q	V				
9+55	0.4613	1.45	Q	V				
10+ 0	0.4713	1.45	Q	V				
10+ 5	0.4797	1.22	Q	V				
10+10	0.4868	1.03	Q	V				
10+15	0.4937	1.00	Q	V				
10+20	0.5005	0.99	Q	V				
10+25	0.5073	0.99	Q	V				
10+30	0.5141	0.99	Q	V				
10+35	0.5221	1.16	Q	V				
10+40	0.5310	1.29	Q	V				
10+45	0.5401	1.31	Q	V				
10+50	0.5491	1.32	Q	V				
10+55	0.5582	1.32	Q	V				



11+ 0	0.5673	1.32	Q	V		
11+ 5	0.5762	1.29	Q	V		
11+10	0.5849	1.26	Q	V		
11+15	0.5935	1.26	Q	V		
11+20	0.6021	1.25	Q	V		
11+25	0.6108	1.25	Q	V		
11+30	0.6194	1.25	Q	V		
11+35	0.6276	1.19	Q	V		
11+40	0.6354	1.13	Q	V		
11+45	0.6431	1.12	Q	V		
11+50	0.6511	1.16	Q	V		
11+55	0.6592	1.18	Q	V		
12+ 0	0.6674	1.19	Q	V		
12+ 5	0.6772	1.42	Q	V		
12+10	0.6883	1.61	Q	V		
12+15	0.6996	1.64	Q	V		
12+20	0.7112	1.68	Q	V		
12+25	0.7230	1.71	Q	V		
12+30	0.7348	1.71	Q	V		
12+35	0.7471	1.78	Q	V		
12+40	0.7597	1.84	Q	V		
12+45	0.7724	1.85	Q	V		
12+50	0.7854	1.88	Q	V		
12+55	0.7985	1.91	Q	V		
13+ 0	0.8117	1.91	Q	V		
13+ 5	0.8261	2.08	Q	V		
13+10	0.8413	2.21	Q	V		
13+15	0.8567	2.24	Q	V		
13+20	0.8722	2.24	Q	V		
13+25	0.8876	2.24	Q	V		
13+30	0.9031	2.24	Q	V		
13+35	0.9160	1.87	Q	V		
13+40	0.9269	1.58	Q	V		
13+45	0.9374	1.53	Q	V		
13+50	0.9479	1.52	Q	V		
13+55	0.9584	1.52	Q	V		
14+ 0	0.9688	1.52	Q	V		
14+ 5	0.9802	1.65	Q	V		
14+10	0.9923	1.76	Q	V		
14+15	1.0045	1.78	Q	V		
14+20	1.0166	1.75	Q	V		
14+25	1.0284	1.72	Q	V		
14+30	1.0403	1.72	Q	V		
14+35	1.0521	1.72	Q	V		
14+40	1.0639	1.72	Q	V		
14+45	1.0757	1.72	Q	V		
14+50	1.0873	1.68	Q	V		
14+55	1.0987	1.66	Q	V		
15+ 0	1.1101	1.65	Q	V		
15+ 5	1.1212	1.62	Q	V		

15+10	1.1322	1.59	Q	V
15+15	1.1431	1.59	Q	V
15+20	1.1538	1.55	Q	V
15+25	1.1643	1.52	Q	V
15+30	1.1747	1.52	Q	V
15+35	1.1843	1.38	Q	V
15+40	1.1930	1.28	Q	V
15+45	1.2017	1.26	Q	V
15+50	1.2104	1.25	Q	V
15+55	1.2190	1.25	Q	V
16+ 0	1.2276	1.25	Q	V
16+ 5	1.2328	0.75	Q	V
16+10	1.2352	0.35	Q	V
16+15	1.2372	0.28	Q	V
16+20	1.2390	0.26	Q	V
16+25	1.2408	0.26	Q	V
16+30	1.2426	0.26	Q	V
16+35	1.2442	0.23	Q	V
16+40	1.2456	0.20	Q	V
16+45	1.2470	0.20	Q	V
16+50	1.2483	0.20	Q	V
16+55	1.2497	0.20	Q	V
17+ 0	1.2511	0.20	Q	V
17+ 5	1.2529	0.27	Q	V
17+10	1.2551	0.32	Q	V
17+15	1.2573	0.33	Q	V
17+20	1.2596	0.33	Q	V
17+25	1.2619	0.33	Q	V
17+30	1.2642	0.33	Q	V
17+35	1.2664	0.33	Q	V
17+40	1.2687	0.33	Q	V
17+45	1.2710	0.33	Q	V
17+50	1.2730	0.30	Q	V
17+55	1.2749	0.27	Q	V
18+ 0	1.2767	0.27	Q	V
18+ 5	1.2785	0.26	Q	V
18+10	1.2803	0.26	Q	V
18+15	1.2822	0.26	Q	V
18+20	1.2840	0.26	Q	V
18+25	1.2858	0.26	Q	V
18+30	1.2876	0.26	Q	V
18+35	1.2892	0.23	Q	V
18+40	1.2906	0.20	Q	V
18+45	1.2920	0.20	Q	V
18+50	1.2931	0.16	Q	V
18+55	1.2941	0.14	Q	V
19+ 0	1.2950	0.13	Q	V
19+ 5	1.2961	0.17	Q	V
19+10	1.2974	0.19	Q	V
19+15	1.2988	0.20	Q	V

19+20	1.3004	0.23	Q	V
19+25	1.3022	0.26	Q	V
19+30	1.3040	0.26	Q	V
19+35	1.3056	0.23	Q	V
19+40	1.3070	0.20	Q	V
19+45	1.3083	0.20	Q	V
19+50	1.3095	0.16	Q	V
19+55	1.3104	0.14	Q	V
20+ 0	1.3113	0.13	Q	V
20+ 5	1.3125	0.17	Q	V
20+10	1.3138	0.19	Q	V
20+15	1.3152	0.20	Q	V
20+20	1.3165	0.20	Q	V
20+25	1.3179	0.20	Q	V
20+30	1.3192	0.20	Q	V
20+35	1.3206	0.20	Q	V
20+40	1.3220	0.20	Q	V
20+45	1.3233	0.20	Q	V
20+50	1.3245	0.16	Q	V
20+55	1.3254	0.14	Q	V
21+ 0	1.3263	0.13	Q	V
21+ 5	1.3275	0.17	Q	V
21+10	1.3288	0.19	Q	V
21+15	1.3302	0.20	Q	V
21+20	1.3313	0.16	Q	V
21+25	1.3322	0.14	Q	V
21+30	1.3332	0.13	Q	V
21+35	1.3343	0.17	Q	V
21+40	1.3356	0.19	Q	V
21+45	1.3370	0.20	Q	V
21+50	1.3381	0.16	Q	V
21+55	1.3391	0.14	Q	V
22+ 0	1.3400	0.13	Q	V
22+ 5	1.3411	0.17	Q	V
22+10	1.3424	0.19	Q	V
22+15	1.3438	0.20	Q	V
22+20	1.3449	0.16	Q	V
22+25	1.3459	0.14	Q	V
22+30	1.3468	0.13	Q	V
22+35	1.3477	0.13	Q	V
22+40	1.3486	0.13	Q	V
22+45	1.3495	0.13	Q	V
22+50	1.3504	0.13	Q	V
22+55	1.3513	0.13	Q	V
23+ 0	1.3522	0.13	Q	V
23+ 5	1.3532	0.13	Q	V
23+10	1.3541	0.13	Q	V
23+15	1.3550	0.13	Q	V
23+20	1.3559	0.13	Q	V
23+25	1.3568	0.13	Q	V

23+30	1.3577	0.13	Q				V
23+35	1.3586	0.13	Q				V
23+40	1.3595	0.13	Q				V
23+45	1.3604	0.13	Q				V
23+50	1.3613	0.13	Q				V
23+55	1.3622	0.13	Q				V
24+ 0	1.3632	0.13	Q				V
24+ 5	1.3636	0.06	Q				V
24+10	1.3637	0.01	Q				V
24+15	1.3637	0.00	Q				V

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# 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.1 on 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
<input checked="" type="checkbox"/> A. On-site storm drain inlets	<input checked="" type="checkbox"/> Locations of inlets.	<input checked="" type="checkbox"/> 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.	<input checked="" type="checkbox"/> Maintain and periodically repaint or replace inlet markings. <input checked="" type="checkbox"/> Provide stormwater pollution prevention information to new site owners, lessees, or operators. <input checked="" type="checkbox"/> See applicable operational BMPs in Fact Sheet SC-44, “Drainage System Maintenance,” in the CASQA Stormwater Quality Handbooks at <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a> <input checked="" type="checkbox"/> 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.”
<input checked="" type="checkbox"/> B. Interior floor drains and elevator shaft sump pumps		<input checked="" type="checkbox"/> State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	<input checked="" type="checkbox"/> Inspect and maintain drains to prevent blockages and overflow.
<input type="checkbox"/> C. Interior parking garages		<input type="checkbox"/> State that parking garage floor drains will be plumbed to the sanitary sewer.	<input type="checkbox"/> Inspect and maintain drains to prevent blockages and overflow.

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
<input type="checkbox"/> D1. Need for future indoor & structural pest control		<input type="checkbox"/> Note building design features that discourage entry of pests.	<input type="checkbox"/> Provide Integrated Pest Management information to owners, lessees, and operators.
<input checked="" type="checkbox"/> D2. Landscape/ Outdoor Pesticide Use	<input type="checkbox"/> Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. <input checked="" type="checkbox"/> Show self-retaining landscape areas, if any. <input type="checkbox"/> Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)	<p>State that final landscape plans will accomplish all of the following.</p> <input type="checkbox"/> Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. <input checked="" type="checkbox"/> 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. <input type="checkbox"/> Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. <input checked="" type="checkbox"/> Consider using pest-resistant plants, especially adjacent to hardscape. <p>To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.</p>	<input checked="" type="checkbox"/> Maintain landscaping using minimum or no pesticides. <input checked="" type="checkbox"/> See applicable operational BMPs in “What you should know for.....Landscape and Gardening” at <a href="http://rcflood.org/stormwater/Error!">http://rcflood.org/stormwater/Error!</a> <small>Hyperlink reference not valid.</small> <input checked="" type="checkbox"/> Provide IPM information to new owners, lessees and operators.

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
<input type="checkbox"/> E. Pools, spas, ponds, decorative fountains, and other water features.	<input type="checkbox"/> 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.	<input type="checkbox"/> See applicable operational BMPs in “Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain” at <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a>
<input type="checkbox"/> F. Food service	<input type="checkbox"/> 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.  <input type="checkbox"/> On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	<input type="checkbox"/> Describe the location and features of the designated cleaning area.  <input type="checkbox"/> Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	<input type="checkbox"/> See the brochure, “The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries” at <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a>  <b>Provide this brochure to new site owners, lessees, and operators.</b>
<input checked="" type="checkbox"/> G. Refuse areas	<input checked="" type="checkbox"/> 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.  <input checked="" type="checkbox"/> 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.  <input type="checkbox"/> Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	<input checked="" type="checkbox"/> State how site refuse will be handled and provide supporting detail to what is shown on plans.  <input checked="" type="checkbox"/> State that signs will be posted on or near dumpsters with the words “Do not dump hazardous materials here” or similar.	<input checked="" type="checkbox"/> State how the following will be implemented:  <b>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 <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a></b>



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
<input checked="" type="checkbox"/> H. Industrial processes.	<input type="checkbox"/> Show process area.	<input checked="" type="checkbox"/> 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.”	<input checked="" type="checkbox"/> See Fact Sheet SC-10, “Non-Stormwater Discharges” in the CASQA Stormwater Quality Handbooks at <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a>  See the brochure “Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities” at <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a>

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
<input type="checkbox"/> I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	<input type="checkbox"/> 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. <input type="checkbox"/> 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. <input type="checkbox"/> 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.	<p>Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.</p> <p>Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:</p> <ul style="list-style-type: none"> <li>▪ Hazardous Waste Generation</li> <li>▪ Hazardous Materials Release Response and Inventory</li> <li>▪ California Accidental Release (CalARP)</li> <li>▪ Aboveground Storage Tank</li> <li>▪ Uniform Fire Code Article 80 Section 103(b) &amp; (c) 1991</li> <li>▪ Underground Storage Tank</li> </ul> <p><a href="http://www.cchealth.org/groups/hazmat/">www.cchealth.org/groups/hazmat/</a></p>	<input type="checkbox"/> 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 <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a>

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><input type="checkbox"/> <b>J. Vehicle and Equipment Cleaning</b></p>	<p><input type="checkbox"/> <b>Show on drawings as appropriate:</b></p> <p>(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.</p> <p>(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).</p> <p>(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.</p> <p>(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.</p>	<p><input type="checkbox"/> <b>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.</b></p>	<p><b>Describe operational measures to implement the following (if applicable):</b></p> <p><input type="checkbox"/> <b>Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.</b> 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 <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a></p> <p><input type="checkbox"/> <b>Car dealerships and similar may rinse cars with water only.</b></p>

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><input type="checkbox"/> <b>K. Vehicle/Equipment Repair and Maintenance</b></p>	<p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p>	<p><input type="checkbox"/> State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.</p> <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p>	<p>In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:</p> <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p> <p>Refer to "Automotive Maintenance &amp; 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 <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a></p> <p>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 <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a></p>

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
<input type="checkbox"/> L. Fuel Dispensing Areas	<input type="checkbox"/> Fueling areas <sup>6</sup> 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.  <input type="checkbox"/> 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 <sup>1</sup> .] The canopy [or cover] shall not drain onto the fueling area.		<input type="checkbox"/> The property owner shall dry sweep the fueling area routinely. <input type="checkbox"/> See the Fact Sheet SD-30 , “Fueling Areas” in the CASQA Stormwater Quality Handbooks at <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a>

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<sup>6</sup> 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.

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
<input checked="" type="checkbox"/> M. Loading Docks	<input checked="" type="checkbox"/> 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.  <input type="checkbox"/> 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.  <input type="checkbox"/> Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		<input checked="" type="checkbox"/> Move loaded and unloaded items indoors as soon as possible.  <input checked="" type="checkbox"/> See Fact Sheet SC-30, “Outdoor Loading and Unloading,” in the CASQA Stormwater Quality Handbooks at <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a>

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
<input type="checkbox"/> N. Fire Sprinkler Test Water		<input type="checkbox"/> Provide a means to drain fire sprinkler test water to the sanitary sewer.	<input type="checkbox"/> See the note in Fact Sheet SC-41, “Building and Grounds Maintenance,” in the CASQA Stormwater Quality Handbooks at <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a>
<p>O. Miscellaneous Drain or Wash Water or Other Sources</p> <input type="checkbox"/> Boiler drain lines <input type="checkbox"/> Condensate drain lines <input checked="" type="checkbox"/> Rooftop equipment <input checked="" type="checkbox"/> Drainage sumps <input checked="" type="checkbox"/> Roofing, gutters, and trim. <input type="checkbox"/> Other sources		<input type="checkbox"/> Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. <input type="checkbox"/> 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. <input checked="" type="checkbox"/> Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. <input checked="" type="checkbox"/> 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
<input checked="" type="checkbox"/> P. Plazas, sidewalks, and parking lots.			<input checked="" type="checkbox"/> 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:** Bay and Day Industrial Building

**Original Date Prepared:** October 11, 2023

**Revision Date(s):** \_\_\_\_\_

**Revision Date(s):** \_\_\_\_\_

**Revision Date(s):** \_\_\_\_\_

**Revision Date(s):** \_\_\_\_\_

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- Appendix 9-7: Manufacturer Information
- Appendix 9-8: Service Agreement Information





### III. Introduction

The project site encompasses approximately 10.85 acres of improvements, which includes 9.57 acres of onsite work and 1.28 acres of offsite work along Bay Avenue and Day Street. Proposed improvements to the project will consist of the construction of one warehouse-type building with an area of 190,745 square feet. Loading docks along with trailer parking will be located west of the building. Vehicle parking will be located east of the building. The remainder of the site will be reserved for landscaping.

Per the infiltration report, infiltration rates resulted in less than 0.3 inches per hour; therefore, the project proposes to use underground detention systems and proprietary biotreatment systems (MWS) to treat runoff produced by the 85th percentile storm rainfall depth. Certified full trash capture catch basin filters will also be provided in order to pre-treat runoff prior to entering the water quality features.

In addition, the disturbed area along Bay Avenue and Day Street will drain to six bioretention facilities located along the public right-of-ways. The bioretention's treated flows will be conveyed via proposed storm drains back to the proposed onsite storm drain.

#### **Existing Conditions**

The majority of the site is undeveloped and drains southwesterly towards Linda Court. Flows appear to continue southerly and will eventually drain to Alessandro Boulevard.

The project site receives offsite run-on that is conveyed by an existing 24-inch pipe, Lateral GG-2 Interim Storm Drain, and discharges at the surface via an existing headwall. Flows from Day Street and from the existing residential east of the project site discharge onto the site via this existing storm drain. This offsite flow will be intercepted in a proposed storm drain in Day Street with improvements to the project site.

The site is part of the Line G-G of the Master Plan Project No. 02-8928002, dated December 30, 2004, prepared by AEI-CASC Engineering. There are four alternatives for Line G-G. However, Line G-G has not been constructed and does not seem likely in the future. Line G-G drains to an existing system in Old 215 Frontage Road. Instead the City requested the site to flow to the proposed storm drain system in Day Street.

Previous hydrology report and storm drain plans prepared by Thienes Engineering (PEN21-0079 / LST21-0039) tabled a portion of the project site to the storm drain in Day Street.

#### **Proposed Conditions**

Off-site run-on that enters the easterly portion of the site from the northeast will be intercepted by a proposed catch basin at Day Street. The existing headwall and existing public catch basin on the west side of Day Street will be removed. A proposed public storm drain, along with a public catch basin, will be constructed along the west side of Day Street in the proposed low spot. This storm drain will connect to the existing lateral from the catch basin along the east side of Day Street. The public storm drain will continue southerly in Day Street and will join the future storm drain in Day Street (PEN21-0079/LST21-0039).

Runoff from the easterly vehicle parking, and a portion of the building roof, will drain to catch basins in the parking lot via overland flow. The proposed onsite storm drain will convey flows to the north, turn

west around the building, and continue south toward the building's truck yard. The same onsite storm drain will collect runoff from the building roof, truck yard, and southerly drive aisle along the west side of the building. Stormwater from these areas will surface drain to the several catch basins located in the truck yard. The same onsite storm drain then continues south and turns east along the south of the building to connect with a future storm drain in Day Street. Runoff from the northerly driveway and landscaping will surface drain towards Bay Avenue.

A proposed diversion manhole structure, located at the southwest corner of the site, will direct the Vbmp to the underground detention system and MWS. Sump pumps will be utilized to pump the Vbmp into the MWS and to pump treated flows back into the public storm drain system. A separate sump pump will be utilized to limit the 2-year, 24-hour flowrate for HCOG purposes.

## **IV. Responsibility for Maintenance**

### **IV.A General**

Funding will be provided by the owner:

LDC Molto Edgemont, LLC  
One Lincoln Centre  
18W140 Butterfield Road, #750  
Oakbrook Terrance, CA 60181  
(949) 226-4601  
Contact: Nathan Mead

A copy of the Covenant Agreement will be attached in Appendix 9-3 of this O&M Plan.

### **IV.B Staff Training Program**

Staff training records and descriptions will be inserted in Appendix 9-4 of this O&M Plan.

### **IV.C Records**

Maintenance records are to be inserted chronologically in Appendix 9-1 of this O&M Plan.

### **IV.D Safety**

All maintenance procedures shall comply with the latest OSHA standards.



## V. Summary of Drainage Management Areas and Stormwater BMPs

### V.A Drainage Areas

See Appendix 9-5 of this O&M Plan for WQMP site map.

DMA Name or ID	Surface Type(s) <sup>1</sup>	Area (Sq. Ft.)	Area (Acres)	DMA Type
1A	Roofs/Conc/Asphalt	382,457	8.78	Type D
1B	Ornamental Landscaping	20,038	0.46	Type D
2A-ONSITE	Roofs/Conc/Asphalt	771	0.0177	Type D
2B-ONSITE	Ornamental Landscaping	5,327	0.1223	Type D
2A-OFFSITE	Roofs/Conc/Asphalt	11,204	0.2572	Type D
2B-OFFSITE	Ornamental Landscaping	993	0.0228	Type D
3A-ONSITE	Roofs/Conc/Asphalt	166	0.0038	Type D
3B-ONSITE	Ornamental Landscaping	5,062	0.1162	Type D
3A-OFFSITE	Roofs/Conc/Asphalt	8,507	0.1953	Type D
3B-OFFSITE	Ornamental Landscaping	1,076	0.0247	Type D
4A-ONSITE	Roofs/Conc/Asphalt	287	0.0066	Type D
4B-ONSITE	Ornamental Landscaping	2,762	0.0634	Type D
4A-OFFSITE	Roofs/Conc/Asphalt	8,651	0.1986	Type D
4B-OFFSITE	Ornamental Landscaping	932	0.0214	Type D
5A-OFFSITE	Concrete or Asphalt	7,802	0.1791	Type D
5B-OFFSITE	Ornamental Landscaping	910	0.0209	Type D
6A-OFFSITE	Concrete or Asphalt	5,619	0.1290	Type D
6B-OFFSITE	Ornamental Landscaping	479	0.0110	Type D
7A-OFFSITE	Concrete or Asphalt	8,416	0.1932	Type D
7B-OFFSITE	Ornamental Landscaping	1,167	0.0268	Type D
	<b>TOTAL</b>	<b>472,626</b>	<b>10.85</b>	

DMA Name or ID	BMP Name or ID	Type of Stormwater BMP	Location of DMA	Pervious Areas (ac.)	Impervious Areas (ac.)	Geo-Location of BMPs	
						Latitude	Longitude
1A	MWS & STC #1	Modular Wetlands System and Underground detention chambers	DMA 1A consists of roof area, concrete and asphalt parking/drive aisles (which is the majority of the project site).	0.00	8.78	MWS 33.918855	MWS -117.280154
1B			DMA 1B consists of landscaping located at the parking lot areas, along the building	0.46	0.00	STC 33.919474	STC -117.280701

			edges and along the project boundaries.				
2A-ONSITE	STREET BIO #2	Bioretention	DMA 2A-ONSITE consists of hardscaped areas (such as sidewalks, stairs, ADA ramps, etc.) and concrete/asphalt drive aisles.	0.00	0.0177	33.920421	-117.281330
2B-ONSITE			DMA 2B-ONSITE consists of landscaping fronting Bay Avenue.	0.1223	0.00		
2A-OFFSITE			DMA 2A-OFFSITE consists of asphalt pavement in the street, curb and gutter, and sidewalk. These areas are located within the southerly half of Bay Avenue.	0.00	0.2572		
2B-OFFSITE			DMA 2B-OFFSITE consists of landscaping along the parkway area within the southerly half of Bay Avenue	0.0228	0.00		
3A-ONSITE	STREET BIO #3	Bioretention	DMA 3A-ONSITE consists of hardscaped areas (such as sidewalks, stairs, ADA ramps, etc.) and concrete/asphalt drive aisles.	0.00	0.0038	33.920424	-117.280394
3B-ONSITE			DMA 3B-ONSITE consists of landscaping fronting Bay Avenue.	0.1162	0.00		
3A-OFFSITE			DMA 3A-OFFSITE consists of asphalt pavement in the street, curb and gutter, and sidewalk. These areas are located	0.00	0.1953		

			within the southerly half of Bay Avenue.				
3B-OFFSITE			DMA 3B-OFFSITE consists of landscaping along the parkway area within the southerly half of Bay Avenue	0.0247	0.00		
4A-ONSITE	STREET BIO #4	Bioretention	DMA 4A-ONSITE consists of hardscaped areas (such as sidewalks, stairs, ADA ramps, etc.) and concrete/asphalt drive aisles.	0.00	0.0066	33.920429	-117.279600
4B-ONSITE			DMA 4B-ONSITE consists of landscaping fronting Bay Avenue.	0.0634	0.00		
4A-OFFSITE			DMA 4A-OFFSITE consists of asphalt pavement in the street, curb and gutter, and sidewalk. These areas are located within the southerly half of Bay Avenue.	0.00	0.1986		
4B-OFFSITE			DMA 4B-OFFSITE consists of landscaping along the parkway area within the southerly half of Bay Avenue	0.0214	0.00		
5A-OFFSITE			STREET BIO #5	Bioretention	DMA 5A-OFFSITE consists of asphalt pavement in the street, curb and gutter, and sidewalk. These areas are located within the westerly half of Day Street.		

5B-OFFSITE			DMA 5B-OFFSITE consists of landscaping along the parkway area within the westerly half of Day Street.	0.0209	0.00		
6A-OFFSITE	STREET BIO #6	Bioretention	DMA 6A-OFFSITE consists of asphalt pavement in the street, curb and gutter, and sidewalk. These areas are located within the westerly half of Day Street.	0.00	0.1290	33.919670	-117.278953
6B-OFFSITE			DMA 6B-OFFSITE consists of landscaping along the parkway area within the westerly half of Day Street.	0.0110	0.00		
7A-OFFSITE	STREET BIO #7	Bioretention	DMA 7A-OFFSITE consists of asphalt pavement in the street, curb and gutter, and sidewalk. These areas are located within the westerly half of Day Street.	0.00	0.1932	33.919458	-117.278953
7B-OFFSITE			DMA 7B-OFFSITE consists of landscaping along the parkway area within the westerly half of Day Street.	0.0268	0.00		

*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.*

### V.B Structural Post-Construction BMPs

See Appendix 9-5 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**

Not applicable.

## **VI. Stormwater BMP Design Documentation**

### **VI.A “As-Built” Drawings of each Stormwater BMP**

See Appendix 9-6 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 Detention Chambers)	Inspection and Maintenance Activity (Underground Detention Chambers)
The isolator row shall be inspected semi-annually (by October 1st and February 1st) and cleaned by water-flush and vacuum when solids accumulate to 3" depth. Maintenance to be conducted through service contract with the vendor or equally qualified contractor.	<ul style="list-style-type: none"> <li>The isolator row shall be inspected for debris and sediment accumulations and maintained by a qualified technician and he/she will properly dispose of all wastes and inspect for standing water. A manhole is installed in order to inspect and maintain the inlet row. All entry into the chamber system must be done per OSHA codes to ensure operator and inspector safety. Inspection ports should be checked 48 hours after storm events to see that the water is draining down, at least once each rainy season, following a major storm event. Records shall be maintained by owner to document inspections.</li> </ul>
Schedule (Proprietary Biotreatment)	Inspection and Maintenance Activity (Proprietary Biotreatment)
Average maintenance interval of 6 to 12 months for removing trash from Screening Device. Average interval of 12 to 24 months for removing sediment, replacing Cartridge Filter Media, replacing Drain Down Filter Media and trimming vegetation.	<ul style="list-style-type: none"> <li>Remove trash from Screening Device, sediment from Separation Chamber and replace cartridge Filter Media, and Drain Down Filter Media. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.</li> </ul>
Schedule (Bioretention)	Inspection and Maintenance Activity (Bioretention)
<b>Ongoing</b>	<ul style="list-style-type: none"> <li>Keep adjacent landscape areas maintained. Remove clippings from landscape maintenance activities.</li> <li>Remove trash and debris</li> <li>Replace damaged grass and/or plants</li> <li>Replace surface mulch layer as needed to maintain a 2-3 inch soil cover.</li> </ul>
<b>After storm events</b>	<ul style="list-style-type: none"> <li>Inspect areas for ponding</li> </ul>
<b>Annually</b>	<ul style="list-style-type: none"> <li>Inspect/clean inlets and outlets</li> </ul>

Source Control BMPs

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
A. On-site storm drain inlets	<ul style="list-style-type: none"> <li>Mark all inlets with the words "Only Rain Down the Storm Drain" or similar.</li> </ul>	<ul style="list-style-type: none"> <li>Maintain and periodically repaint or replace inlet markings annually.</li> <li>Provide stormwater pollution prevention information to new site owners, lessees, or operators upon occupancy and annually thereafter.</li> <li>See CASQA fact sheet SC-44 for "Drainage System Maintenance," included in Appendix 10 of this document.</li> <li>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."</li> </ul>
B. Interior floor drains and elevator shaft sump pumps	<ul style="list-style-type: none"> <li>Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.</li> </ul>	<ul style="list-style-type: none"> <li>Inspect and maintain drains semi-annually to prevent blockages and overflow.</li> </ul>
D2. Landscape / Outdoor Pesticide Use	<ul style="list-style-type: none"> <li>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.</li> <li>Pest-resistant plans will be used adjacent to hardscape.</li> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>Maintain landscaping only using minimum pesticides, when needed.</li> <li>See Appendix 10 for "Landscape and Gardening" brochure by RCFlood.</li> <li>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.</li> </ul>
G. Refuse Areas	<ul style="list-style-type: none"> <li>Site refuse will be handled by contractor on a weekly basis.</li> <li>Signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.</li> </ul>	<ul style="list-style-type: none"> <li>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 with 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."</li> </ul>
H. Industrial processes	<ul style="list-style-type: none"> <li>All process activities to be performed indoors. No processes to drain to exterior or to storm drain system.</li> </ul>	<ul style="list-style-type: none"> <li>See Appendix 10 for CASQA fact sheet SC-10 for "Non-Stormwater Discharges"</li> </ul>
M. Loading Docks	<ul style="list-style-type: none"> <li>Spills will be cleaned up immediately and disposed of properly.</li> </ul>	<ul style="list-style-type: none"> <li>Move loaded and unloaded items indoors as soon as possible.</li> <li>See Appendix 10 for CASQA fact sheet SC-30 for "Outdoor Loading and Unloading"</li> </ul>



Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
<p><b>O.</b> Miscellaneous Drain or Wash Water or Other Sources</p>	<ul style="list-style-type: none"> <li>A drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.</li> </ul>	
<p><b>P.</b> Plazas, sidewalks, and parking lots</p>		<ul style="list-style-type: none"> <li>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.</li> </ul>

## VII.B Service Agreement Information

See Appendix 9-8 of this O&M Plan for service agreement information with any contractors regarding the O&M of BMPs at the site, if any.

# Appendix 9-1: Inspection and Maintenance Logs

*Insert Additional Inspection or Maintenance Logs Here*



## Appendix 9-2: Updates, Revisions, and Errata

*Insert Additional Updates, Revisions, and Errata Logs Here*



## Appendix 9-3: Maintenance Mechanism

*Copy of Covenant Agreement*

*Establishing Notification Process And Responsibility*

*For Water Quality Management Plan Implementation And Maintenance*

**MAINTENANCE AGREEMENTS AND O&M  
DOCUMENTS WILL BE PROVIDED WITH  
FWQMP SUBMITTAL**

RECORDING REQUESTED BY  
AND WHEN RECORDED MAIL TO:

LAND DEVELOPMENT DIV.  
CITY OF MORENO VALLEY  
PO BOX 88005  
14177 FREDERICK STREET  
MORENO VALLEY, CA 92552-0805

EXEMPT FROM FEE PER G.C. Section 6103

SPACE ABOVE THIS LINE FOR RECORDER'S USE

APN: **263-230-001, 263-230-003, 263-230-004 and 263-230-025**  
**PEN21-0123 / LGL24-XXXX**

---

STORMWATER TREATMENT DEVICE AND CONTROL MEASURE ACCESS AND  
MAINTENANCE COVENANT

THIS INSTRUMENT is made and entered into this \_\_\_\_\_ day of \_\_\_\_\_ **2025**,  
by and between **LDC Molto Edgemont, LLC**, hereinafter referred to as "Owner," and the City  
of Moreno Valley, a municipal corporation, hereinafter referred to as "City."

RECITALS

WHEREAS, the Owner owns real property ("Property") in the City specifically described  
in Exhibit "A," which is attached hereto and incorporated herein by this reference; and

WHEREAS, at the time of approval of the development project known as  
**PEN21-0123: Bay and Day Industrial Building (XXXXXX Day Street)** (the "Project") for the  
Property, the City required the Project to employ on-site stormwater and non-stormwater control  
measures to mitigate the Project impacts to water quality and minimize pollutants in urban  
stormwater runoff; and

WHEREAS, the City and Owner, its successors, and assigns, agree that the health, safety and welfare of the residents of the City, require that on-site stormwater and non-stormwater management control measures be constructed and implemented and adequately maintained on the Property; and

WHEREAS, the Owner has chosen to install **one (1) proprietary biotreatment system with underground detention and five (5) offsite bioretention facilities**, hereinafter referred to as the "Device" and other control measures all as described in the Final Water Quality Management Plan (WQMP) to minimize pollutants in urban stormwater and non-stormwater runoff; and

WHEREAS, the Device and other control measures have been installed and/or implemented in accordance with the WQMP, project plans and specifications approved by the City; and

WHEREAS, the Device and other control measures, being installed on private property and draining only private property are private facilities with all maintenance or replacement therefore being the sole responsibility of the Owner; and

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 discharges from the Device, other control measures and the Project are in compliance with the



City's Municipal Code for stormwater and non-stormwater discharges and that such maintenance activity will require compliance with all Federal, State and local laws and regulations, including those pertaining to confined space and waste disposal methods in effect at the time such maintenance occurs;

NOW, THEREFORE, in consideration of City's approval of the Project and the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the City and Owner agree as follows:

1. The Owner hereby provides the City and its designees with full right of access to the Device and other control measures and the immediate vicinity of the property at any time, upon reasonable notice; or in the event of emergency, as determined by City's Public Works Director/City Engineer or designees, no advance notice; for the purpose of inspection, sampling and testing of the Device and other control measures, and in cases of emergency, where the public health, safety, or welfare is compromised, such emergency shall be declared a "nuisance" as defined in the Municipal Code. Such conditions that created the emergency shall be abated as provided for in the Municipal Code and at the Owner's expense as provided for in Section 3, below.
2. The Owner shall diligently maintain the Device and other control measures in a manner assuring all discharges from the Device, other control measures and the Project are in compliance with the Municipal Code for stormwater and non-stormwater discharges at all times. All reasonable precautions shall be exercised

by the Owner and the Owner's representatives in the removal and extraction of materials from the Device and other control measures, and the ultimate disposal of the materials in a manner consistent with all applicable laws. As may be requested from time to time by the City, the Owner shall provide the City with documentation identifying the materials removed, the quantity and the recycle of disposal destinations, as appropriate.

3. In the event the Owner fails to perform the necessary maintenance contemplated by this Instrument, within five (5) days of being given written notice by the City, the lack of maintenance shall be considered a public health and safety concern and declared a "nuisance", the City shall take all necessary actions as provided in the Municipal Code, to abate the nuisance and charge the entire cost and expense to the Owner, including administrative costs, attorneys' fees and interest thereon at the maximum rate authorized by law from the date of the notice of expense until paid in full. Additionally, any discharge as a result from the lack of maintenance prescribed herein from the Device to the City's maintained Municipal Separate Storm Sewer System shall be considered an illegal discharge and considered a violation of the Municipal Code and shall cease immediately. Such cessation may include a yellow or red tag issued to the Project.
4. This Instrument shall be recorded in the Official Records of the County of Riverside at the expense of the Owner and shall constitute notice to all successors and assigns to the title to the Property of the obligations herein set forth. This Instrument shall also constitute a lien against the Property 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.

5. It is the intent of the Owner that the burdens and benefits herein undertaken shall constitute covenants that run with the Property and shall constitute a lien against the Property.
6. This covenant imposes no liability of any kind whatsoever on the City and the Owner agrees to hold the City harmless from any liability in the event the Device and other control measures fail to operate in accordance with the plans and specification submitted to the City.
7. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the Owner hereto. The term "Owner" shall include not only the Owner, but also its heirs, successors, executors, administrators, lessees and assigns. The Owner shall notify any successor to title of all or part of the Property about the existence of this Instrument. The Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. The Owner shall provide a copy of such notice to the City at the same time such notice is provided to the successor.
8. Time is of the essence in the performance of this Instrument.
9. Any notice to a party required or called for in this Instrument shall be served in

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

CITY:

Public Works Director/City Engineer  
City of Moreno Valley  
PO Box 88005  
14177 Frederick Street  
Moreno Valley, CA 92552-0805

OWNER:

Name: Nathan Mead  
Company: LDC Molto Edgemont, LLC  
Address: One Lincoln Centre  
18W140 Butterfield Road, #750  
City/State/ZIP: Oakbrook Terrace, IL 60181

- 10. This Instrument represents the entire Covenant of the parties hereto as to the matters contained herein and supersedes any and all prior written or verbal agreements between the parties as to the subject matter hereof.
- 11. This Instrument shall be governed by and construed in accordance with the laws of the State of California.
- 12. No amendment to this Instrument shall be made without prior written approval by the City.

OWNER:

LDC MOLTO EDGEMONT, LLC,  
A DELAWARE LIMITED LIABILITY COMPANY

\_\_\_\_\_  
NATHAN MEAD, DIRECTOR OF OPERATIONS  
LDC MOLTO EDGEMONT, LLC

CITY:

CITY OF MORENO VALLEY

APPROVED AS TO FORM:

\_\_\_\_\_  
City Attorney

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Mike Lee, City Manager

Attest:

By: \_\_\_\_\_ Date: \_\_\_\_\_  
City Clerk

**EXHIBIT “A”**

**Legal Description**

**EXHIBIT “A-1”**

*(Include 8.5x11 project site map and show location(s) of treatment control BMPs)*

## Notification Process and Responsibility

1. **Name:** \_\_\_\_\_  
**Title:** \_\_\_\_\_  
**Phone:** \_\_\_\_\_

WQMP Responsibilities:

- (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:** \_\_\_\_\_

WQMP Responsibilities:

- (1) Cleaning, repairing, servicing, and maintenance of BMP.

3. **Name:** \_\_\_\_\_  
**Title:** \_\_\_\_\_  
**Phone:** \_\_\_\_\_

WQMP Responsibilities:

- (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.



# Appendix 9-4: Training Records

*Insert Training Records with Brief Discussion Here*

# Appendix 9-5: Site Plan and Details

*WQMP Site Map and BMP Details*



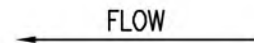


**TEI** Thienes Engineering, Inc.  
CIVIL ENGINEERING • LAND SURVEYING  
14349 FIRESTONE BOULEVARD  
LA MIRADA, CALIFORNIA 90638  
PH.(714)521-4811 FAX(714)521-4173

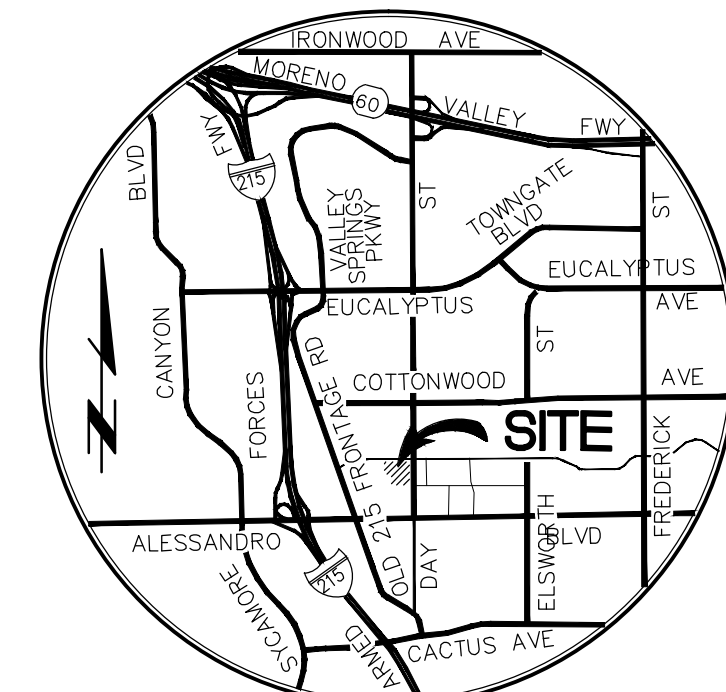
**"RECEIVING WATERS MAP"**

FOR

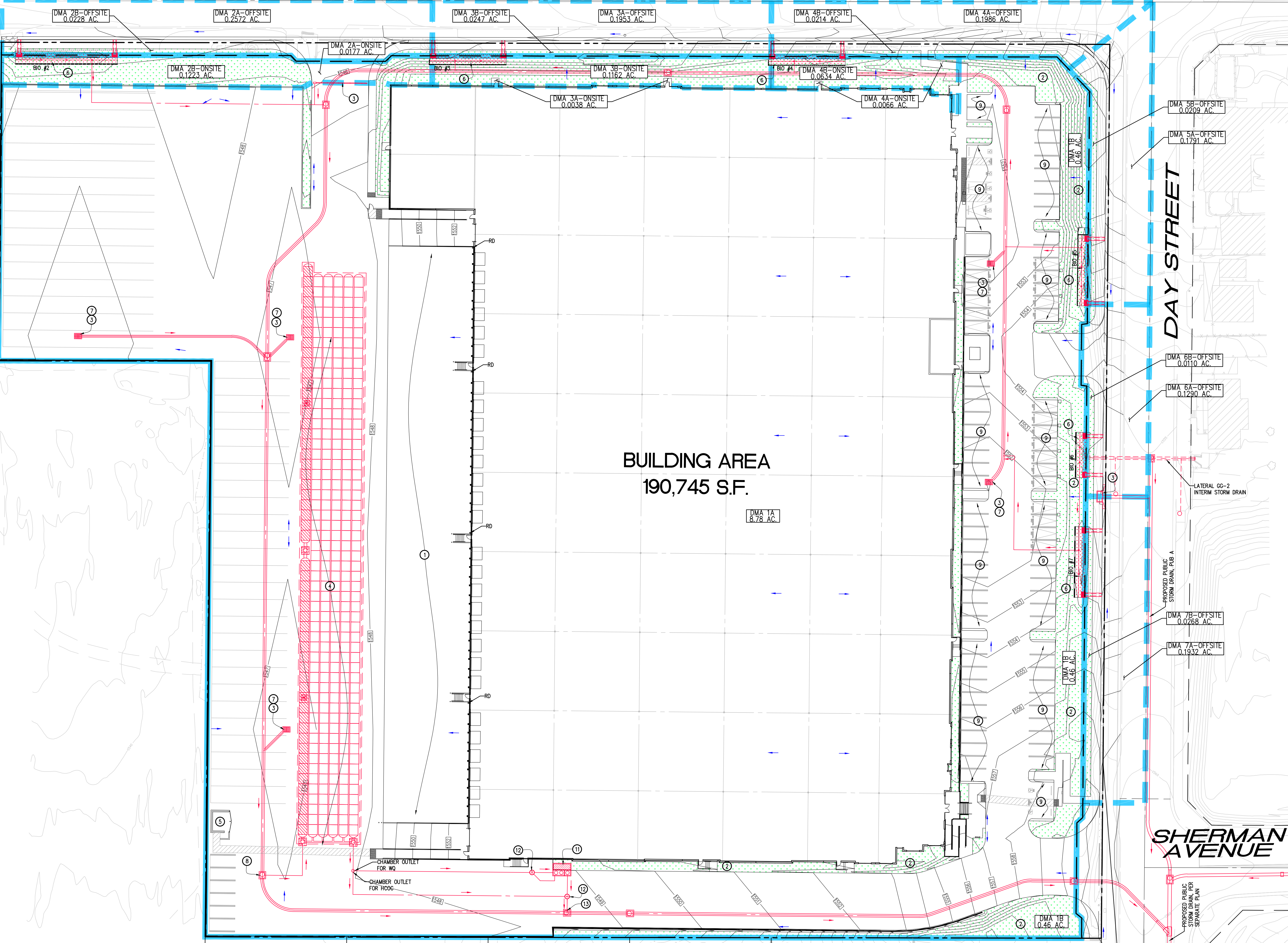
**SOUTHWEST CORNER OF  
BAY AVENUE AND DAY STREET**



BAY AVENUE



VICINITY MAP  
N.T.S.



BUILDING AREA  
190,745 S.F.

DMA 1A  
8.78 AC.

**LEGEND**

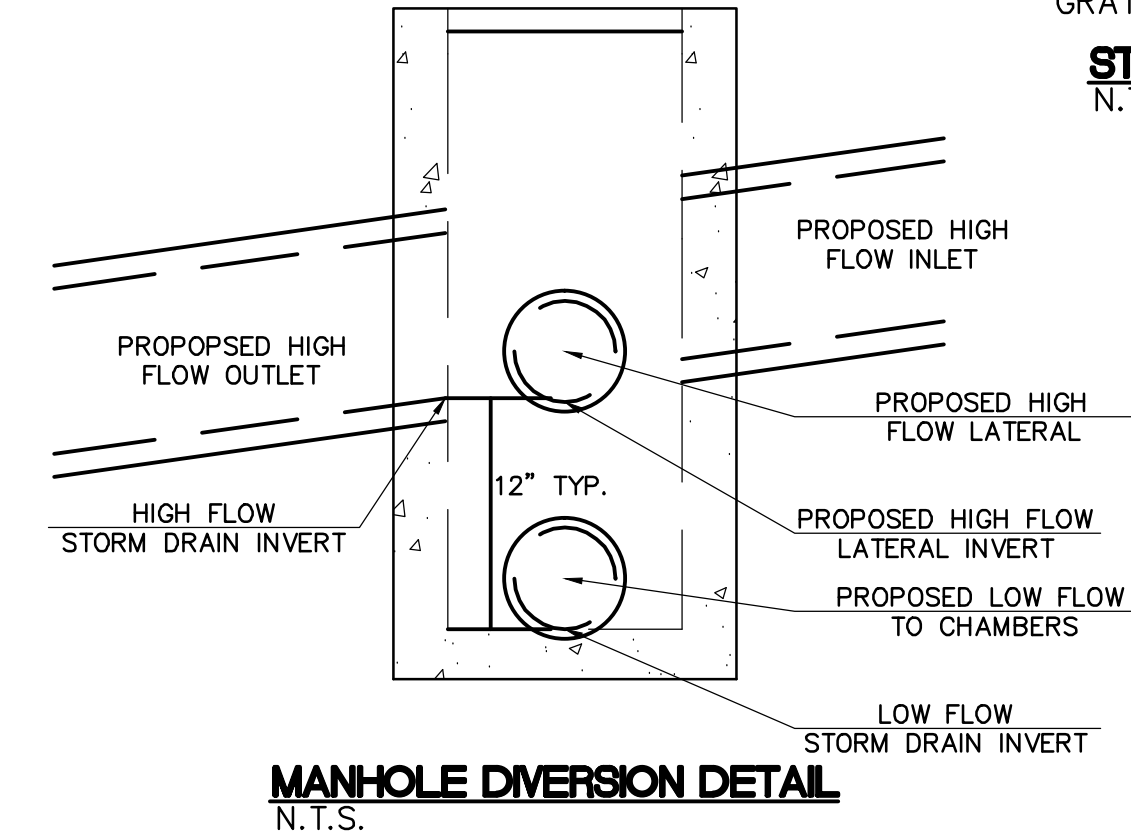
- 1 SC-M: LOADING DOCKS
- 2 SC-O2: LANDSCAPE/OUTDOOR PESTICIDE USE
- 3 SC-A: ON-SITE STORM DRAIN INLETS MARKED WITH "ONLY RAIN DOWN THE STORM DRAIN"
- 4 MC-3500 STORMTECH CHAMBERS - DETENTION
- 5 SC-F: REFUSE AREAS
- 6 STREET BMP - BIORETENTION
- 7 DRAIN INSERT(S)
- 8 MANHOLE WITH DIVERSION
- 9 SC-P: PLAZAS, SIDEWALKS AND PARKING LOTS
- 10 NOT USED
- 11 PROPRIETARY BIOPOLTRATION SYSTEM
- 12 MODULAR WETLANDS SYSTEM
- 13 SUMP PUMP
- 14 DISCHARGE POINT

**NOTE:**

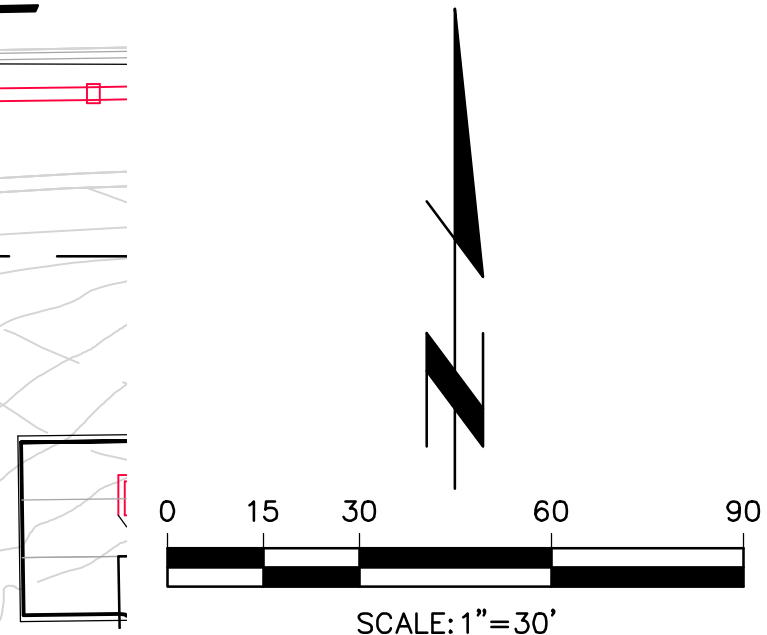
- STC: STORMTECH CHAMBERS
- MWS: MODULAR WETLANDS SYSTEM
- DMA: DRAINAGE MANAGEMENT AREA
- RD: ROOF DRAIN
- BOUNDARY: BOUNDARY
- SUBAREAS: SUBAREAS
- SURFACE FLOW DIRECTION: SURFACE FLOW DIRECTION
- SD FLOW DIRECTION: SD FLOW DIRECTION
- LANDSCAPING: LANDSCAPING



SAMPLE STENCIL TO BE USED NEAR GRATE AND CURB OPENING INLETS  
**STORM DRAIN STENCILING**  
N.T.S.



**MANHOLE DIVERSION DETAIL**  
N.T.S.



DMA ID	PERVIOUS AREA (AC.)	IMPERVIOUS AREA (AC.)	TOTAL AREA (AC.)	BMP ID	BMP VOLUME REQUIRED (CU-FT)	BMP VOLUME PROVIDED (CU-FT)
DMA 1	0.46	8.78	9.24	MWS & STC #1	17,741	19,015
DMA 2	0.0405	0.3795	0.42	STREET BIO #2	588	597
DMA 3	0.1409	0.1991	0.34	STREET BIO #3	435	448
DMA 4	0.0848	0.2052	0.29	STREET BIO #4	433	448
DMA 5	0.0209	0.1791	0.20	STREET BIO #5	365	415
DMA 6	0.0110	0.1290	0.14	STREET BIO #6	262	265
DMA 7	0.0268	0.1932	0.22	STREET BIO #7	395	415
<b>TOTAL</b>	<b>0.78</b>	<b>10.07</b>	<b>10.85</b>		<b>20,219</b>	<b>21,603</b>

Level Update: 10/11/23  
C:\S900-3999\_3620\3620BMPSTEM.dwg

**OWNER:**  
LDC MOLTO EDMONT, LLC  
ONE LINCOLN CENTRE  
18W140 BUTTERFIELD ROAD, #750  
OAKBROOK TERRACE, CA 90181  
TEL: 949-226-4601

**ENGINEER:**  
**Thienes Engineering, Inc.**  
CIVIL ENGINEERING & LAND SURVEYING  
14349 FIRESTONE BOULEVARD  
LA MIRADA, CALIFORNIA 90638  
PH: (714) 921-6011 FAX: (714) 921-6172  
EMAIL: GESAR@THIENES.COM

**CITY OF MORENO VALLEY**  
PUBLIC WORKS DEPARTMENT  
**PRELIMINARY WQMP SITE MAP**  
PEN21-0123 / LWQ23-0013  
**BAY AND DAY INDUSTRIAL BUILDING**  
SOUTHWEST CORNER  
OF  
**BAY AVENUE AND DAY STREET**  
MORENO VALLEY, CALIFORNIA

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
FLOW BASED (CFS)	0.346		
PEAK BYPASS REQUIRED (CFS) - IF APPLICABLE	OFFLINE		
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
PRETREATMENT	BIOFILTRATION	DISCHARGE	
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		

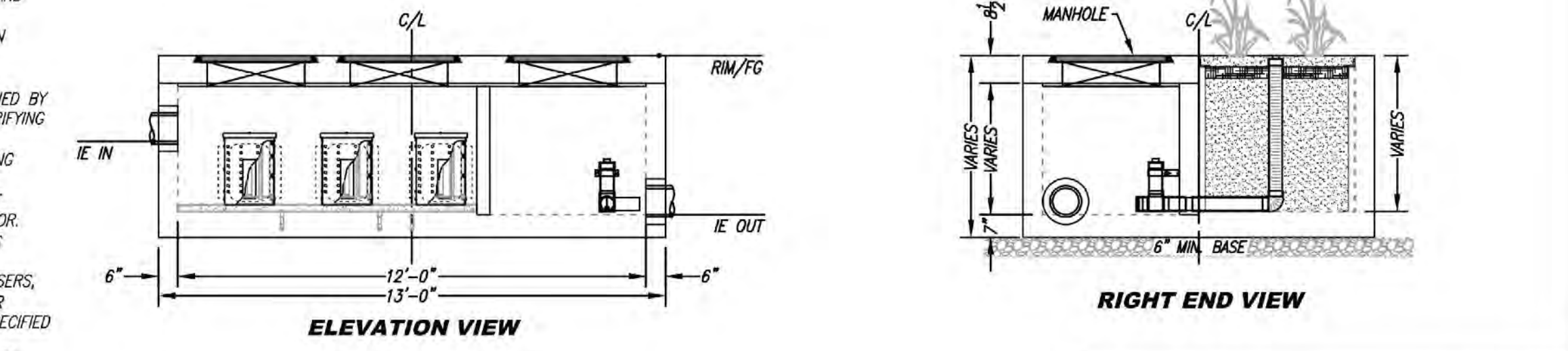
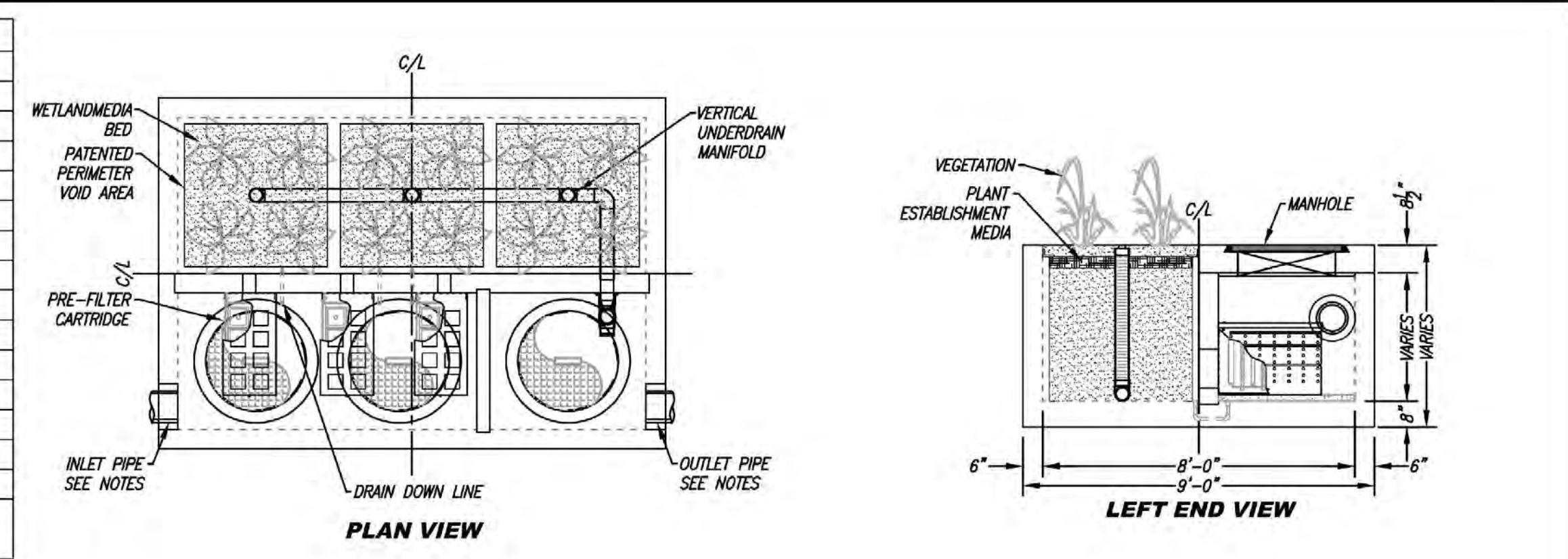
NOTES:  
\* PRELIMINARY NOT FOR CONSTRUCTION

#### INSTALLATION NOTES

- CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
- UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
- CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. PIPES CANNOT INTRUDE BEYOND FLUSH. INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
- CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND WATCHES. CONTRACTOR TO USE GROUT AND/OR BRICKS TO MATCH COVERS WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
- VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
- CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.

#### GENERAL NOTES

- MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
- ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND QUANTITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT CONTECH.



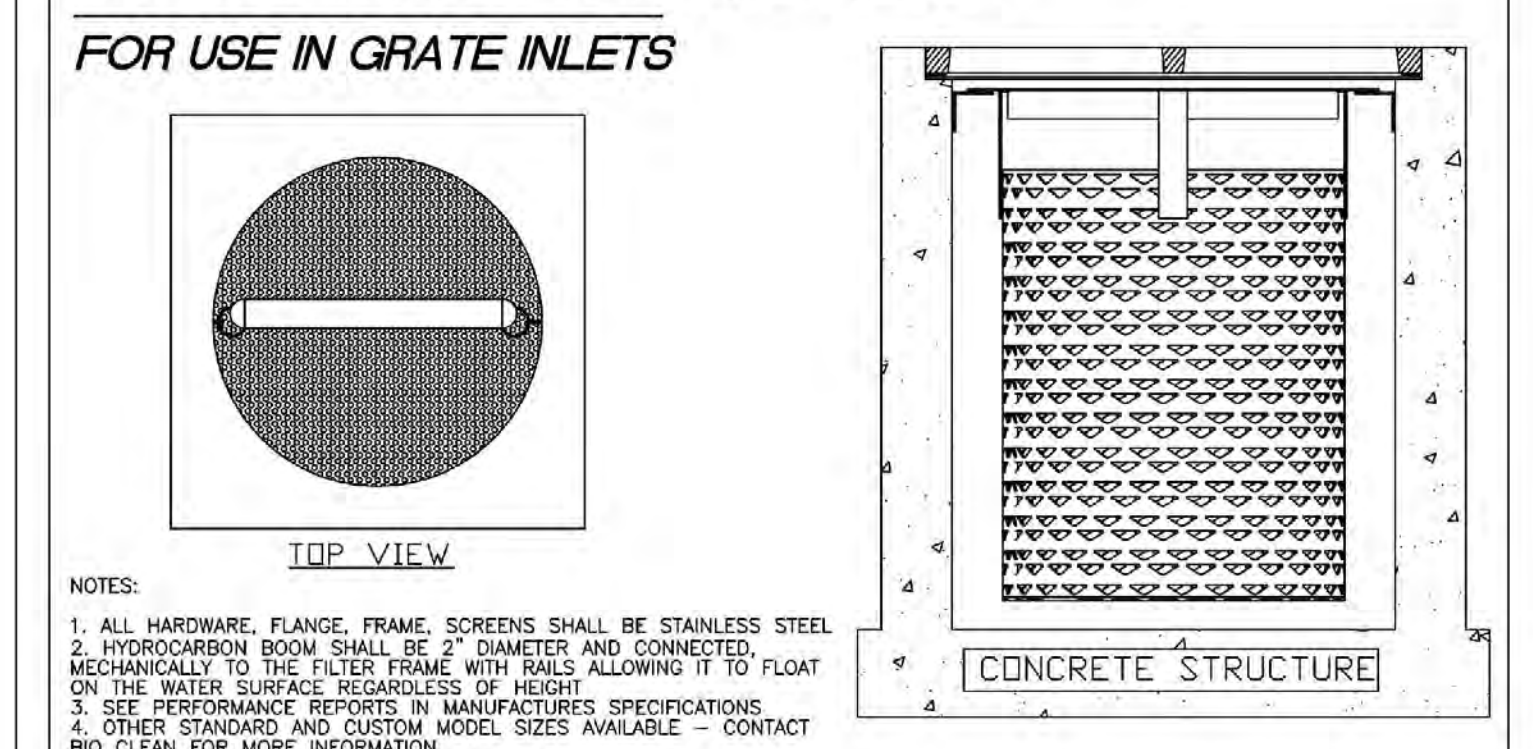
TREATMENT FLOW (CFS)	0.346
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

**MWS-L-8-12-V**  
STORMWATER BIOFILTRATION SYSTEM  
STANDARD DETAIL



### BIO CLEAN FULL CAPTURE FILTER

FOR USE IN GRATE INLETS



- NOTES:
- ALL HARDWARE, FLANGE, FRAME, SCREENS SHALL BE STAINLESS STEEL.
  - HYDROCARBON BOOM SHALL BE 2" DIAMETER AND CONNECTED MECHANICALLY TO THE FILTER FRAME WITH HOLES ALLOWING IT TO FLOAT ON THE WATER SURFACE REGARDLESS OF HEIGHT.
  - SEE PERFORMANCE REPORTS IN MANUFACTURER'S SPECIFICATIONS.
  - OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE - CONTACT BIO CLEAN FOR MORE INFORMATION.
  - BASED ON 5% OPEN AREA.
  - CONSIDERS A SAFETY FACTOR OF 2.0.
  - CONSIDERS A LOCAL DEPRESSION PONDING DEPTH OF 6 INCHES.
  - STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
  - CONCRETE STRUCTURES SOLD SEPARATELY.

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	23.59	10.13	7.92

BIO CLEAN FULL CAPTURE FILTER DETAILS

MEETS FULL CAPTURE REQUIREMENTS

WARRANTY: 5 YEAR MANUFACTURERS

BIO CLEAN ENVIRONMENTAL SERVICES, INC.  
398 VIA EL CENTRAL, OESANITE, CA 90288  
PHONE: 760-433-7640 FAX: 760-433-3176

PROJECT: \_\_\_\_\_ DATE: \_\_\_\_\_  
REVISIONS: \_\_\_\_\_ DATE: \_\_\_\_\_  
DATE: 10/11/23 SIZE: 12" x 12" REVISIONS: \_\_\_\_\_ DATE: \_\_\_\_\_  
DRAWING NO: \_\_\_\_\_ UNITS: INCHES

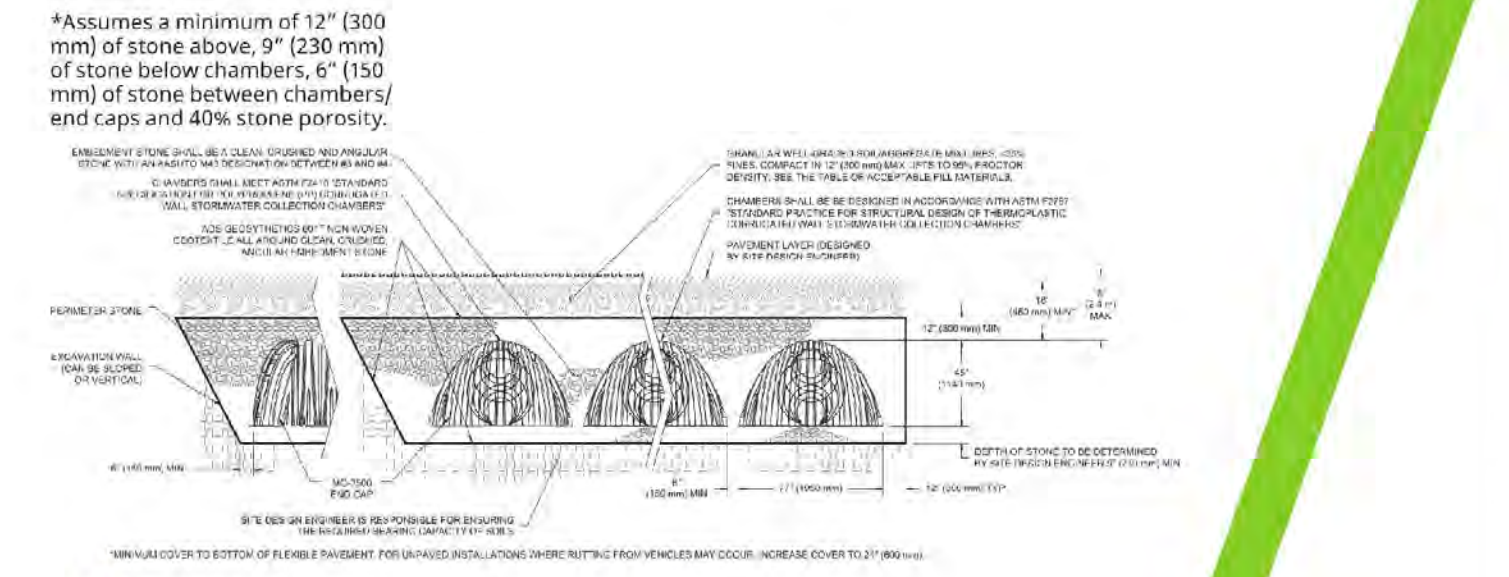
**Bio Clean**  
A Forterra Company

PAGE 1

## StormTech® MC-3500 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

Nominal Chamber Specifications (not to scale)	Nominal End Cap Specifications (not to scale)
<b>Size (L x W x H)</b> 90" x 77" x 45" 2286 mm x 1956 mm x 1143 mm	<b>Size (L x W x H)</b> 26.5" x 71" x 45.1" 673 mm x 1803 mm x 1145 mm
<b>Chamber Storage</b> 103.9 ft <sup>3</sup> (3.11 m <sup>3</sup> )	<b>End Cap Storage</b> 14.9 ft <sup>3</sup> (0.42 m <sup>3</sup> )
<b>Min. Installed Storage*</b> 175.0 ft <sup>3</sup> (4.96 m <sup>3</sup> )	<b>Min. Installed Storage*</b> 45.1 ft <sup>3</sup> (1.28 m <sup>3</sup> )
<b>Weight</b> 134 lbs (60.8 kg)	<b>Weight</b> 49 lbs (22.2 kg)
<b>Shipping</b> 15 chambers/pallet 7 end caps/pallet 7 pallets/truck	<b>Shipping</b> 15 chambers/pallet 7 end caps/pallet 7 pallets/truck



### StormTech MC-3500 Specifications

#### Storage Volume Per Chamber

Bare Chamber Storage ft <sup>3</sup> (m <sup>3</sup> )	Chamber and Stone Foundation Depth in. (mm)			
	9 in (230 mm)	12 in (300 mm)	15 in (375 mm)	18 in (450 mm)
Chamber	109.9 (3.11)	175.0 (4.96)	179.9 (5.09)	184.9 (5.24)
End Cap	14.9 (0.42)	45.1 (1.28)	46.6 (1.32)	48.3 (1.37)

Note: Assumes 6" (150 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume.

#### Amount of Stone Per Chamber

English Tons (yds <sup>3</sup> )	Stone Foundation Depth			
	9 in	12 in	15 in	18 in
Chamber	8.5 (6.0)	9.1 (6.5)	9.7 (6.9)	10.4 (7.4)
End Cap	3.9 (2.8)	4.1 (2.9)	4.3 (3.1)	4.5 (3.2)

Metric kilograms (m <sup>3</sup> )	Stone Foundation Depth			
	230 mm	300 mm	375 mm	450 mm
Chamber	7711 (4.6)	8255 (5.0)	8800 (5.3)	9435 (5.7)
End Cap	3538 (2.1)	3719 (2.2)	3901 (2.4)	4082 (2.5)

Note: Assumes 12" (300 mm) of stone above and 6" (150 mm) row spacing and 6" (150 mm) of perimeter stone in front of end caps.

#### Volume Excavation Per Chamber yd<sup>3</sup> (m<sup>3</sup>)

	Stone Foundation Depth			
	9 in (230 mm)	12 in (300 mm)	15 in (375 mm)	18 in (450 mm)
Chamber	11.9 (9.1)	12.4 (9.5)	12.8 (9.8)	13.3 (10.2)
End Cap	4.0 (3.1)	4.1 (3.3)	4.3 (3.3)	4.4 (3.4)

Note: Assumes 6" (150 mm) of separation between chamber rows and 24" (600 mm) of cover. The volume of excavation will vary as depth of cover increases.

ADS StormTech products, manufactured in accordance with ASTM F2418 or ASTM F2922, comply with all requirements in the Build America, Buy America (BABA) Act.

Working on a project?  
Visit us at [adspipes.com/stormtech](http://adspipes.com/stormtech) and utilize the Design Tool



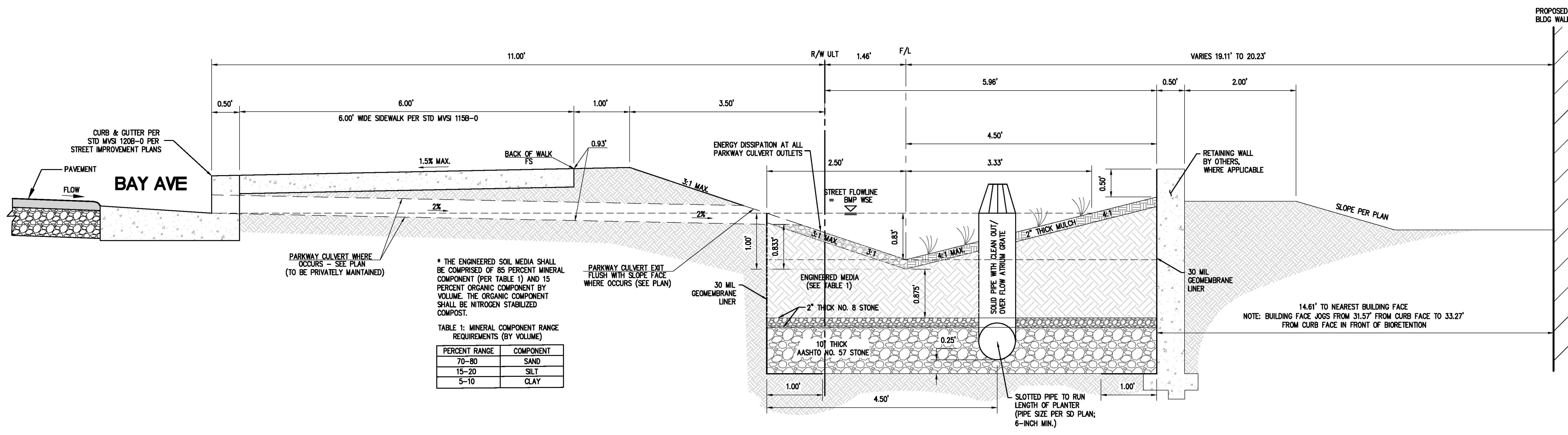
adspipe.com  
800-821-6710

OWNER:  
LDC MOLTO EDGEMONT, LLC  
ONE LINCOLN CENTRE  
180140 BUTTERFIELD ROAD, #750  
OAKBROOK TERRACE, CA 90181  
TEL: 949-226-4601

ENGINEER:  
Thienes Engineering, Inc.  
CIVIL ENGINEERING - LAND SURVEYING  
14319 FRESTONE BOULEVARD  
LA BREA, CALIFORNIA 90639  
PH: 949-481-1422 FAX: 949-481-1422  
EMAIL: GCS@THIENESINC.COM

CITY OF MORENO VALLEY  
PUBLIC WORKS DEPARTMENT  
PRELIMINARY WQMP SITE MAP  
PEN21-0123 / LWQ23-0013  
BAY AND DAY INDUSTRIAL BUILDING  
SOUTHWEST CORNER  
OF  
BAY AVENUE AND DAY STREET  
MORENO VALLEY, CALIFORNIA

2 of 3 Sheets

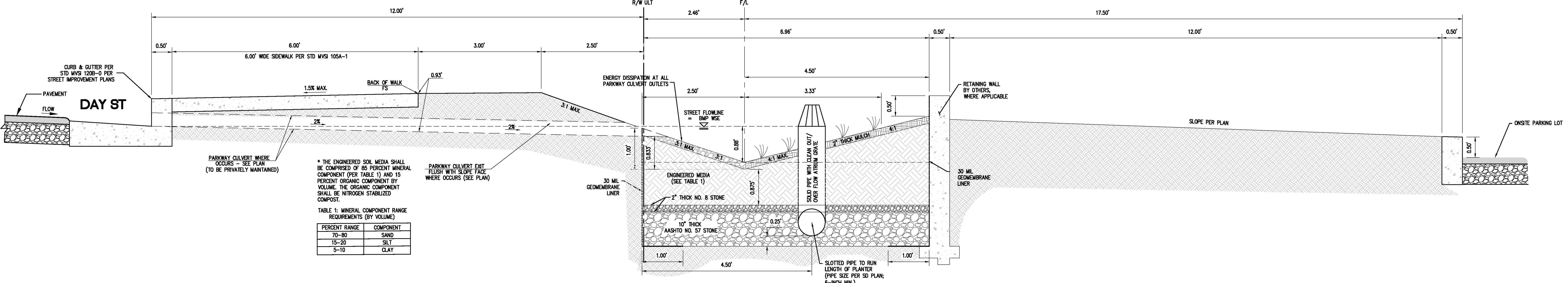


\* THE ENGINEERED SOIL MEDIA SHALL BE COMPRISED OF 85 PERCENT MINERAL COMPONENT (PER TABLE 1) AND 15 PERCENT ORGANIC COMPONENT BY VOLUME. THE ORGANIC COMPONENT SHALL BE NITROGEN STABILIZED COMPOST.

TABLE 1: MINERAL COMPONENT RANGE REQUIREMENTS (BY VOLUME)

PERCENT RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

**STREET BMP - BAY AVE BIORETENTION #2, #3 AND #4**  
**LENGTH = 72 LF FOR #2**  
**LENGTH = 54 LF FOR #3 AND #4**



\* THE ENGINEERED SOIL MEDIA SHALL BE COMPRISED OF 85 PERCENT MINERAL COMPONENT (PER TABLE 1) AND 15 PERCENT ORGANIC COMPONENT BY VOLUME. THE ORGANIC COMPONENT SHALL BE NITROGEN STABILIZED COMPOST.

TABLE 1: MINERAL COMPONENT RANGE REQUIREMENTS (BY VOLUME)

PERCENT RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

**STREET BMP - DAY ST BIORETENTION #5, #6 AND #7**  
**LENGTH = 50 LF FOR #5 AND #7**  
**LENGTH = 32 LF FOR #6**

OWNER:  
 LDC MOLTO EDMONT, LLC  
 ONE LINCOLN CENTRE  
 18W140 BUTTERFIELD ROAD, #750  
 OAKBROOK TERRACE, CA 90181  
 TEL: 949-226-4601

ENGINEER:  
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 EMAIL: GESAR@THIENES.COM

CITY OF MORENO VALLEY  
 PUBLIC WORKS DEPARTMENT  
**PRELIMINARY WOMP SITE MAP**  
 PEN21-0123 / LWQ23-0013  
**BAY AND DAY INDUSTRIAL BUILDING**  
 SOUTHWEST CORNER  
 OF  
 BAY AVENUE AND DAY STREET  
 MORENO VALLEY, CALIFORNIA

JUN 30 2023

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# Appendix 9-6: “As-Built” Drawings

*Insert “As-Builts” Here When Available*



# Appendix 9-7: Manufacturer Information

*Brochures, Manuals, and Maintenance Requirements*

# Modular Wetlands<sup>®</sup> Linear Operation & Maintenance Manual



# MODULAR WETLANDS® LINEAR OPERATION & MAINTENANCE MANUAL

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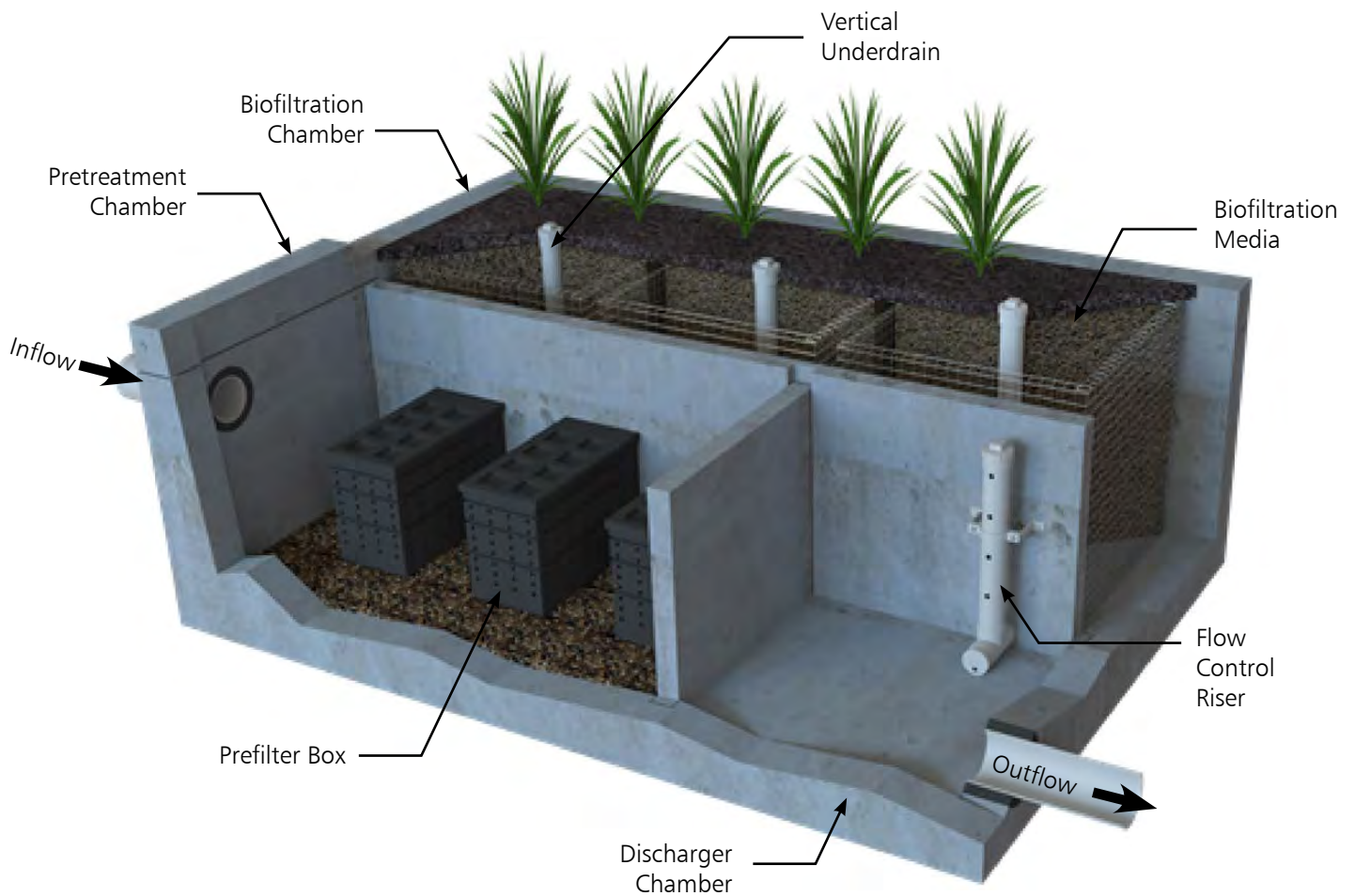
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## OVERVIEW

The Modular Wetlands® Linear Biofilter is designed to remove high levels of trash, debris, sediments, nutrients, metals, and hydrocarbons. Its simple design allows for quick and easy installation. The system is housed in a standard precast structure and can be installed at various depths to meet site-specific conditions.

## INTRODUCTION

This is the Modular Wetlands Linear Biofilter operation and maintenance manual. Before starting, read the instructions and equipment lists closely. It is important to follow all necessary safety procedures associated with state and local regulations. Some steps required confined space entry. Please contact Contech for more information on pre-authorized third party contractors who can provide installation services in your area. For a list of service providers in your area please visit: [www.conteches.com/maintenance](http://www.conteches.com/maintenance).



# INSTRUCTIONS

## ***INSPECTION SUMMARY***

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 the site specific loading conditions. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided.

- Inspect pre-treatment, biofiltration, and discharge chambers an average of once every six to twelve months. Varies based on site specific and local conditions.
- Average inspection time is approximately 15 minutes. Always ensure appropriate safety protocol and procedures are followed.

The following is a list of equipment required to allow for simple and effective inspection of the Modular Wetlands Linear:

- Modular Wetlands Linear Inspection Form
- Flashlight
- Manhole hook or appropriate tools to remove access hatches and covers
- Appropriate traffic control signage and procedures
- Measuring pole and/or tape measure
- Protective clothing and eye protection
- 7/16" open or closed ended wrench
- Large permanent black marker (initial inspections only - first year)

Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system

## **INSPECTION AND MAINTENANCE NOTES**

1. Following maintenance and/or inspection, it is recommended that the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.
2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.
3. Transport all debris, trash, organics, and sediments to approved facility for disposal in accordance with local and state requirements.
4. Entry into chambers may require confined space training based on state and local regulations.
5. No fertilizer shall be used in the biofiltration chamber.
6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may not require irrigation after initial establishment.

# INSPECTION PROCESS

1. Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other information (see inspection form).
2. Observe the inside of the system through the access covers. If minimal light is available and vision into the unit is impaired, utilize a flashlight to see inside the system and all of its chambers.
3. Look for any out of the ordinary obstructions in the inflow pipe, pre-treatment chamber, biofiltration chamber, discharge chamber or outflow pipe. Write down any observations on the inspection form.
4. Through observation and/or digital photographs, estimate the amount of trash, debris accumulated in the pre-treatment chamber. Utilizing a tape measure or measuring stick, estimate the amount of sediment in this chamber. Record this depth on the inspection form.
5. Through visual observation, inspect the condition of the pre-filter cartridges. Look for excessive build-up of sediment on the cartridges, any build-up on the tops of the cartridges, or clogging of the holes. Record this information on the inspection form. The prefilter cartridges can be further inspected by removing the cartridge tops and assessing the color of the BioMediaGREEN filter cubes (requires entry into pre-treatment chamber - see notes previous notes regarding confined space entry). Record the color of the material. New material is a light green color. As the media becomes clogged, it will turn darker in color, eventually becoming dark brown or black. The closer to black the media is the higher percentage that the media is exhausted and is in need of replacement.



6. The biofiltration chamber is generally maintenance-free due to the system's advanced pre-treatment chamber. For units which have open planters with vegetation, it is recommended that the vegetation be inspected. Look for any plants that are dead or showing signs of disease or other negative stressors. Record the general health of the plants on the inspection form and indicate through visual observation or digital photographs if trimming of the vegetation is required.
7. The discharge chamber houses the orifice control structure, drain down filter (only in California - older models), and is connected to the outflow pipe. It is important to check to ensure the orifice is in proper operating conditions and free of any obstructions. It is also important to assess the condition of the drain down filter media which utilizes a block form of the BioMediaGREEN. Assess in the same manner as the cubes in the pre-filter cartridge as mentioned above. Generally, the discharge chamber will be clean and free of debris. Inspect the water marks on the side walls. If possible, inspect the discharge chamber during a rain event to assess the amount of flow leaving the system while it is at 100% capacity (pre-treatment chamber water level at peak HGL - top of bypass weir). The water level of the flowing water should be compared to the watermark level on the side walls, which is an indicator of the highest discharge rate the system achieved when initially installed. Record on the form if there is any difference in level from the watermark in inches.

*NOTE: During the first few storms, the water level in the outflow chamber should be observed and a 6" long horizontal watermark line drawn (using a large permanent marker) at the water level in the discharge chamber while the system is operating at 100% capacity. The diagram below illustrates where the line should be drawn. This line is a reference point for future inspections of the system.*

*Water level in the discharge chamber is a function of flow rate and pipe size. Observation of the water level during the first few months of operation can be used as a benchmark level for future inspections. The initial mark and all future observations shall be made when the system is at 100% capacity (water level at maximum level in the pre-treatment chamber). If future water levels are below this mark when the system is at 100% capacity, this is an indicator that maintenance to the pre-filter cartridges may be needed.*



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

## MAINTENANCE INDICATORS

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

- Missing or damaged internal components or cartridges
- Obstructions in the system or its inlet and/or outlet pipes
- Excessive accumulation of floatables in the pretreatment chamber in which the length and width of the chamber is fully impacted more than 18". See photo below.
- Excessive accumulation of sediment in the pretreatment chamber of more than 6" in depth.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pretreatment cartridges. The following chart shows photos of the condition of the BioMediaGREEN contained within the pre-filter cartridges. When media is more than 85% clogged, replacement is required.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pretreatment cartridges. When media is more than 85% clogged, replacement is required. The darker the BioMediaGREEN, the more clogged it is and in need of replacement.



# INSPECTION PROCESS

- Excessive accumulation of sediment on the BioMediaGREEN media housed within the drain down filter (California only - older models). The following photos show the condition of the BioMediaGREEN contained within the drain down filter. When media is more than 85% clogged, replacement is required.



- Overgrown vegetation.



- Water level in the discharge chamber during 100% operating capacity (pretreatment chamber water level at max height) is lower than the water mark by 20%.



## MAINTENANCE SUMMARY

The time has come to maintain your Modular Wetlands® Linear. All necessary pre-maintenance steps must be carried out before maintenance occurs. Once traffic control has been set up per local and state regulations and access covers have been safely opened, the maintenance process can begin. It should be noted that some maintenance activities require confined space entry. All confined space requirements must be strictly followed before entry into the system. In addition, the following is recommended:

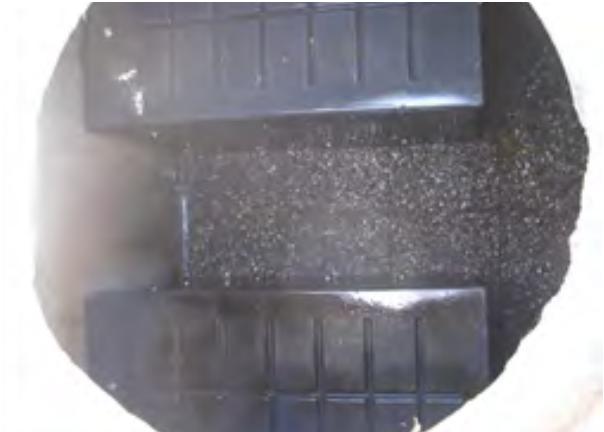
- Prepare the maintenance form by writing in the necessary information including project name, location, date & time, unit number and other info (see maintenance form).
- Set up all appropriate safety and cleaning equipment.
- Ensure traffic control is set up and properly positioned.
- Prepared pre-checks (OSHA, safety, confined space entry) are performed.

The following is a list of equipment to required for maintenance of the Modular Wetlands® Linear:

- Modular Wetlands Linear Maintenance Form
- Manhole hook or appropriate tools to access hatches and covers
- Protective clothing, flashlight, and eye protection
- 7/16" open or closed ended wrench
- Vacuum assisted truck with pressure washer
- Replacement BioMediaGREEN for pre-filter cartridges if required (order from one of Contech's Maintenance Team members at <https://www.conteches.com/maintenance>).

# MAINTENANCE | PRETREATMENT CHAMBER

- 1. Remove access cover over pre-treatment chamber and position vacuum truck accordingly.
- 2. With a pressure washer, spray down pollutants accumulated on walls and pre-filter cartridges.
- 3. Vacuum out pre-treatment chamber and remove all accumulated pollutants including trash, debris, and sediments. Be sure to vacuum the floor until the pervious pavers are visible and clean.
- 4. If pre-filter cartridges require media replacement, continue to step 5. If not, replace access cover and move to step 11.



## MAINTENANCE | PREFILTER CARTRIDGES

5. After successfully cleaning out the pre-treatment chamber (previous page) enter the pre-treatment chamber.
6. Unscrew the two bolts (circles shown below) holding the lid on each cartridge filter and remove lid.



7. Place the vacuum hose over each individual media filter to suck out filter media.



8. Once filter media has been sucked out, use a pressure washer to spray down the inside of the cartridge and it's media cages. Remove cleaned media cages and place to the side. Once removed, the vacuum hose can be inserted into the cartridge to vacuum out any remaining material near the bottom of the cartridge.
9. Reinstall media cages and fill with new media from the manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase. Utilize the manufacture-provided refilling tray and place on top of the cartridge. Fill the tray with new bulk media and shake down into place. Using your hands, lightly compact the media into each filter cage. Once the cages are full, remove the refilling tray and replace the cartridge top, ensuring bolts are properly tightened.



10. Exit the pre-treatment chamber. Replace access hatch or manhole cover.

## MAINTENANCE | BIOFILTRATION CHAMBER

11. In general, the biofiltration chamber is maintenance-free with the exception of maintaining the vegetation. The Modular Wetlands Linear utilizes vegetation similar to surrounding landscape areas, therefore trim vegetation to match surrounding vegetation. If any plants have died, replace them with new ones.



12. Each vertical under drain on the biofiltration chamber has a removable (threaded cap) that can be taken off to check any blockages or root growth. Once removed, a jetting attachment can be used to clean out the under drain and orifice riser.
13. As with all biofilter systems, at some point the biofiltration media (WetlandMedia) will need to be replaced. Either because of physical clogging or sorptive exhaustion of the media ion exchange capacity (to remove dissolved metals and phosphorous). The general life of this media is 10 to 20 years based on site specific conditions and pollutant loading. Utilize the vacuum truck to vacuum out the media by placing the hose into the chamber. Once all the media is removed use the power washer to spray down all the netting on the outer metal cage. Inspect the netting for any damage or holes. If the netting is damaged it can be repaired or replaced with guidance by the manufacturer.
14. Contact one of Contech's Maintenance Team members at <https://www.conteches.com/maintenance> to order new WetlandMedia. The quantity of media needed can be determined by providing the model number and unit depth. Media will be provided in super sacks for easy installation. Each sack will weigh between 1000 and 2000 lbs. A lifting apparatus (backhoe, boom truck, or other) is recommended to position the super sack over the biofiltration chamber. Fill the media cages up to the same level as the old media. Replant with vegetation.



## MAINTENANCE | DISCHARGE CHAMBER

15. Remove access hatch or manhole cover over discharge chamber.
16. Enter chamber to gain access to the drain down filter. Unlock the locking mechanism and lift up drain down filter housing to remove used BioMediaGREEN filter block as shown below. *NOTE: Drain down filter is only found on units installed in California prior to 2023. If no drain down filter is present, skip steps 16 and 17.*



17. Insert a new BioMediaGREEN filter block and lock drain down filter housing back in place.
18. Replace access hatch or manhole cover over discharge chamber.





## Inspection Report Modular Wetlands Linear

Project Name \_\_\_\_\_

For Office Use Only
(Reviewed By) _____
(Date) _____ Office personnel to complete section to the left.

Project Address \_\_\_\_\_ (city) (Zip Code)

Owner / Management Company \_\_\_\_\_

Contact \_\_\_\_\_

Phone ( ) - \_\_\_\_\_

Inspector Name \_\_\_\_\_

Date \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Time \_\_\_\_\_ AM / PM

Type of Inspection    Routine    Follow Up    Complaint    Storm   Storm Event in Last 72-hours?    No    Yes

Weather Condition \_\_\_\_\_

Additional Notes \_\_\_\_\_

### Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): \_\_\_\_\_ Size (22', 14' or etc.): \_\_\_\_\_

Structural Integrity:	Yes	No	Comments
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
<b>Working Condition:</b>			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth: _____
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber: _____
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
<b>Other Inspection Items:</b>			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	Yes	No
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



## Cleaning and Maintenance Report Modular Wetlands Linear

Project Name \_\_\_\_\_

For Office Use Only

---

(Reviewed By) \_\_\_\_\_

---

(Date) \_\_\_\_\_  
Office personnel to complete section to the left.

Project Address \_\_\_\_\_ (city) (Zip Code)

Owner / Management Company \_\_\_\_\_

Contact \_\_\_\_\_

Phone (       ) - \_\_\_\_\_

Inspector Name \_\_\_\_\_

Date \_\_\_\_ / \_\_\_\_ / \_\_\_\_ Time \_\_\_\_\_ AM / PM

Type of Inspection     Routine     Follow Up     Complaint     Storm                  Storm Event in Last 72-hours?     No     Yes

Weather Condition \_\_\_\_\_

Additional Notes \_\_\_\_\_

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: _____ Long: _____	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_





# **CONTECH**<sup>®</sup> ENGINEERED SOLUTIONS

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Modular Wetlands Maintenance Guide 1/2023

# Isolator<sup>®</sup> Row Plus

## O&M Manual

---



# The Isolator<sup>®</sup> Row Plus

## Introduction

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row Plus is a technique to inexpensively enhance Total Suspended Solids (TSS) and Total Phosphorus (TP) removal with easy access for inspection and maintenance.

## The Isolator Row Plus

The Isolator Row Plus is a row of StormTech chambers, either SC-160, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-7200 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for sediment settling and filtration as stormwater rises in the Isolator Row Plus and passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC-310-3 and SC-740 models) allow stormwater to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row Plus protecting the adjacent stone and chambers storage areas from sediment accumulation.

ADS geotextile fabric is placed between the stone and the Isolator Row Plus chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the chamber's sidewall. The non-woven fabric is not required over the SC-160, DC-780, MC-3500 or MC-7200 models as these chambers do not have perforated side walls.

The Isolator Row Plus is designed to capture the "first flush" runoff and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole provides access to the Isolator Row Plus and includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row Plus bypass through a manifold to the other chambers. This is achieved with an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row Plus row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row Plus. After Stormwater flows through the Isolator Row Plus and into the rest of the chamber system it is either exfiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

The Isolator Row FLAMP<sup>™</sup> (patent pending) is a flared end ramp apparatus attached to the inlet pipe on the inside of the chamber end cap. The FLAMP provides a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance by enhancing outflow of solid debris that would otherwise collect at the chamber's end. It also serves to improve the fluid and solid flow into the access pipe during maintenance and cleaning and to guide cleaning and inspection equipment back into the inlet pipe when complete.

The Isolator Row Plus may be part of a treatment train system. The treatment train design and pretreatment device selection by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, StormTech recommend using the Isolator Row Plus to minimize maintenance requirements and maintenance costs.

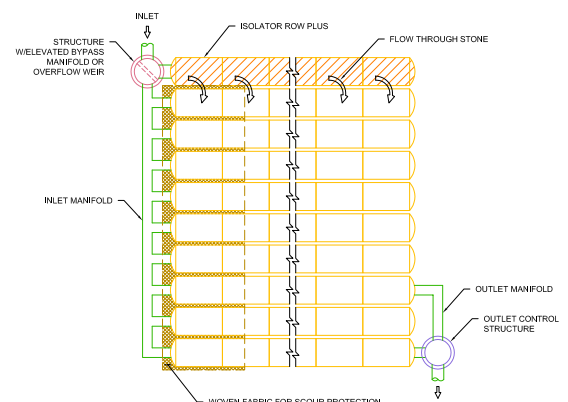
**Note:** See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row Plus.



Looking down the Isolator Row PLUS from the manhole opening, ADS PLUS Fabric is shown between the chamber and stone base.



StormTech Isolator Row PLUS with Overflow Spillway (not to scale)



# Isolator Row Plus Inspection/Maintenance

## Inspection

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row Plus should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row Plus incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

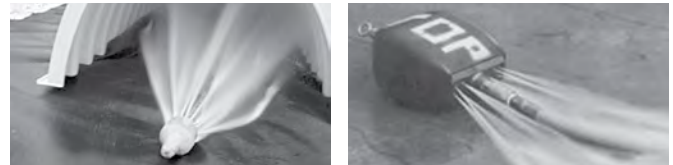
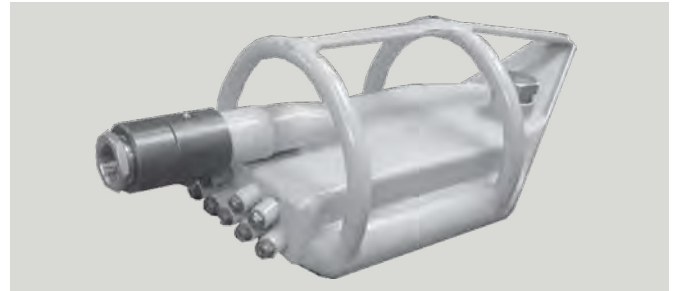
If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row Plus, clean-out should be performed.

## Maintenance

The Isolator Row Plus was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided

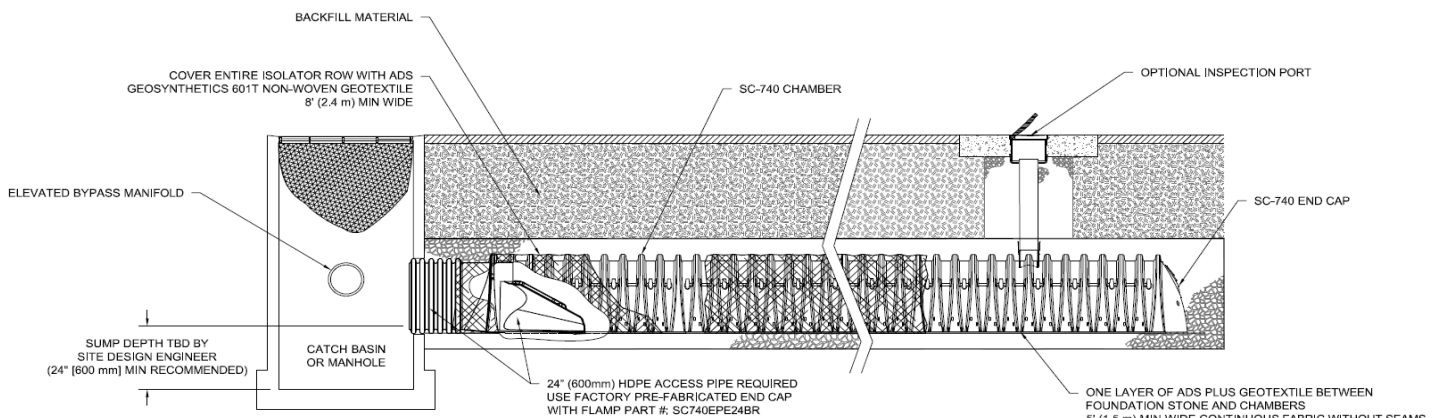
via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row Plus while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. StormTech recommends a maximum nozzle pressure of 2000 psi be utilized during cleaning. JetVac reels can vary in length. For ease of maintenance, ADS recommends Isolator Row Plus lengths up to 200' (61 m). **The JetVac process shall only be performed on StormTech Isolator Row Plus that have ADS Plus Fabric (as specified by StormTech) over their angular base stone.**



## StormTech Isolator Row PLUS (not to scale)

**Note:** Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-7200 chamber models and is not required over the entire Isolator Row PLUS.



# Isolator Row Plus Step By Step Maintenance Procedures

## Step 1

Inspect Isolator Row Plus for sediment.

- A) Inspection ports (if present)
  - i. Remove lid from floor box frame
  - ii. Remove cap from inspection riser
  - iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.
  - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
- B) All Isolator Row Plus
  - i. Remove cover from manhole at upstream end of Isolator Row Plus
  - ii. Using a flashlight, inspect down Isolator Row Plus through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering manhole
  - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

## Step 2

Clean out Isolator Row Plus using the JetVac process.

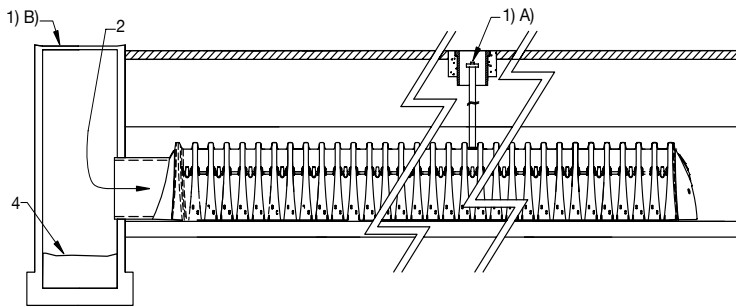
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

## Step 3

Replace all caps, lids and covers, record observations and actions.

## Step 4

Inspect & clean catch basins and manholes upstream of the StormTech system.



## Sample Maintenance Log

Date	Stadia Rod Readings		Sedi-ment Depth (1)-(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row PLUS, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

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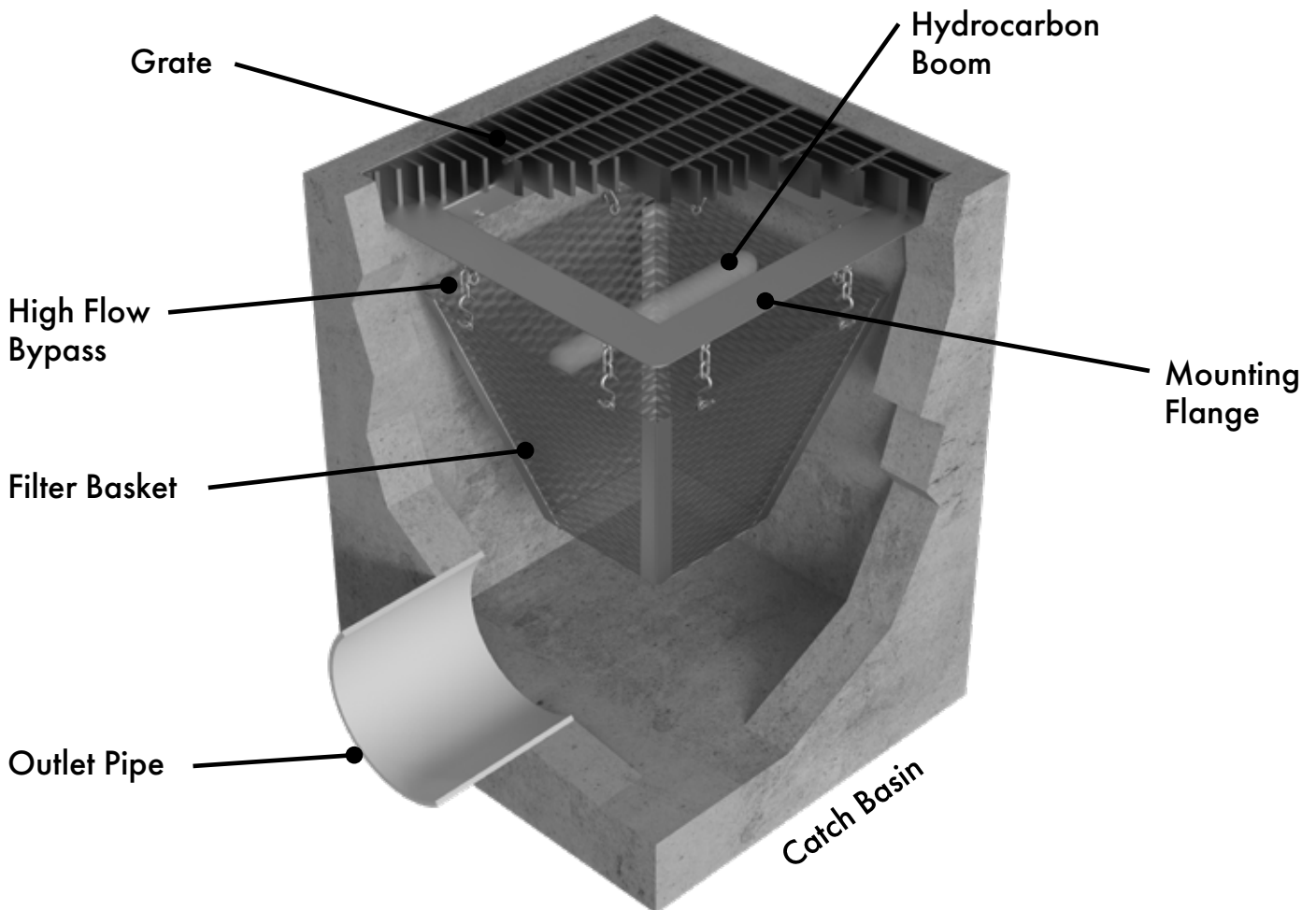
Bio Clean<sup>®</sup> Grate Inlet Filter  
Operation & Maintenance Manual



## Operation & Maintenance

Contech's 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, Kraken® membrane filter, and fabric filter variations. This manual covers maintenance procedures of the trash full capture and fabric filter configurations. A supplemental manual is available for the Kraken variation. The trash full capture filter is made of 100% stainless steel, while the fabric filter is made of a woven monofilament geotextile fabric. Both filters are available at various sizes and depths allowing them to fit in any grated catch basin inlet. The filter's heavy duty construction allows for cleaning with any vacuum truck. The filter 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:

- Contech 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 through 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:

Basket Model	Height <sup>1</sup> (inches)	Top Width (inches)	Top Length (inches)	Bottom Width (inches)	Bottom Length (inches)	50% Storage Capacity (CF)	100% Storage Capacity (CF)
BIO-GRATE-FULL/ FABRIC-12-12-12	6.00	10.00	10.00	8.31	8.31	0.15	0.30
BIO-GRATE-FULL/ FABRIC-18-18-12	6.00	15.00	15.00	12.50	12.50	0.33	0.66
BIO-GRATE-FULL/ FABRIC-24-24-12	6.00	20.00	20.00	16.69	16.69	0.59	1.18
BIO-GRATE-FULL/ FABRIC-24-24-24	18.00	20.00	20.00	10.00	10.00	1.22	2.44
BIO-GRATE-FULL/ FABRIC-24-40-12	6.00	20.00	30.00	16.69	25.00	0.88	1.76
BIO-GRATE-FULL/ FABRIC-24-40-24	18.00	20.00	30.00	10.00	15.00	1.82	3.64
BIO-GRATE-FULL/ FABRIC-36-36-24	18.00	30.00	30.00	15.00	15.00	2.73	5.46
BIO-GRATE-FULL/ FABRIC-24-40-24	18.00	20.00	30.00	10.00	15.00	1.82	3.64
BIO-GRATE-FULL/ FABRIC-36-36-24	18.00	30.00	30.00	15.00	15.00	2.73	5.46

<sup>1</sup> Refers to basket height, total system height is equal to basket height plus 6 inches for bypass.

## Maintenance Equipment

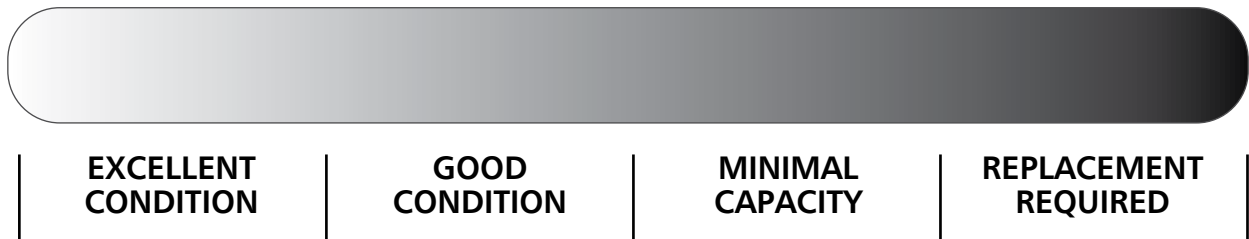
It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter, though it can easily be cleaned by hand:

- Contech 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 off 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.
- The following is a replacement indication color chart for the hydrocarbon booms:

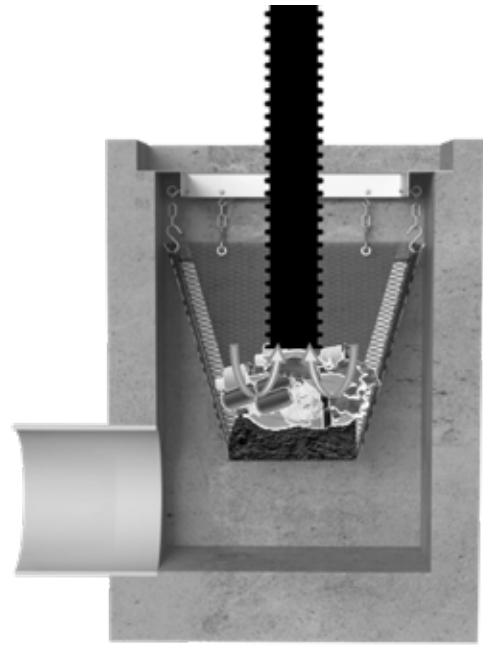


- The last step is to replace the grate and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, 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.

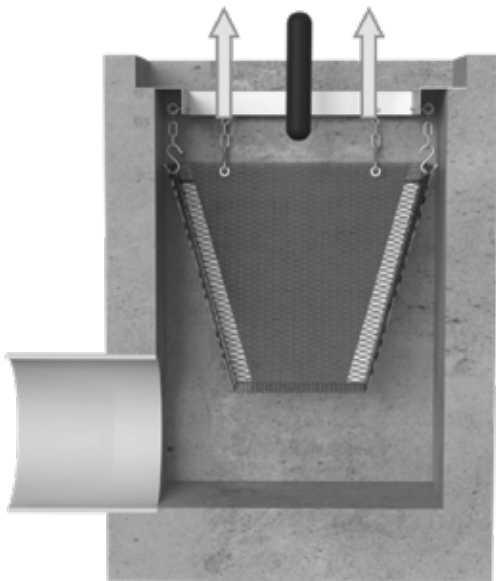
## Maintenance Sequence



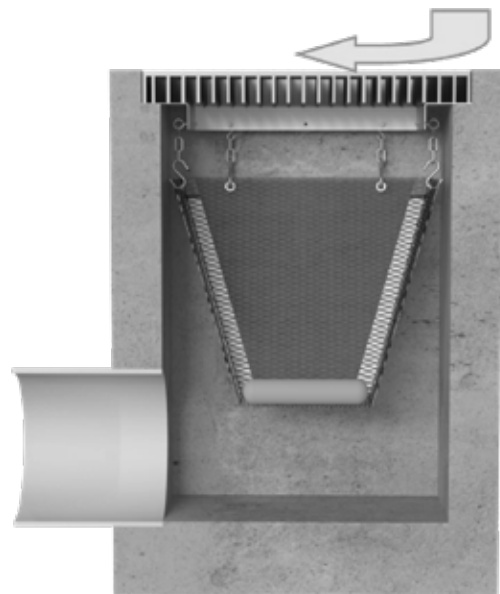
1. Remove grate and set up vacuum truck to clean the filter basket.



2. 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.



3. 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 information in the chart above. If replacement is required, install and fasten on a new hydrocarbon boom.



4. 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.



## Inspection and Maintenance Report Catch Basin Only

Project Name \_\_\_\_\_

For Office Use Only

---

(Reviewed By) \_\_\_\_\_

---

(Date) \_\_\_\_\_  
Office personnel to complete section to the left.

Project Address \_\_\_\_\_ (city) (Zip Code)

Owner / Management Company \_\_\_\_\_

Contact \_\_\_\_\_

Phone (     )     -     \_\_\_\_\_

Inspector Name \_\_\_\_\_

Date \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Time \_\_\_\_\_ AM / PM

Type of Inspection     Routine     Follow Up     Complaint     Storm    Storm Event in Last 72-hours?     No     Yes

Weather Condition \_\_\_\_\_

Additional Notes \_\_\_\_\_

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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Grate Inlet Filter Operation & Maintenance Manual 08/22

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# Appendix 9-8: Service Agreement Information

*Insert Contractor Information (if any)*

# Appendix 10: Educational Materials

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

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# Modular Wetlands<sup>®</sup> Linear Operation & Maintenance Manual



**MODULAR WETLANDS® LINEAR  
OPERATION & MAINTENANCE MANUAL**

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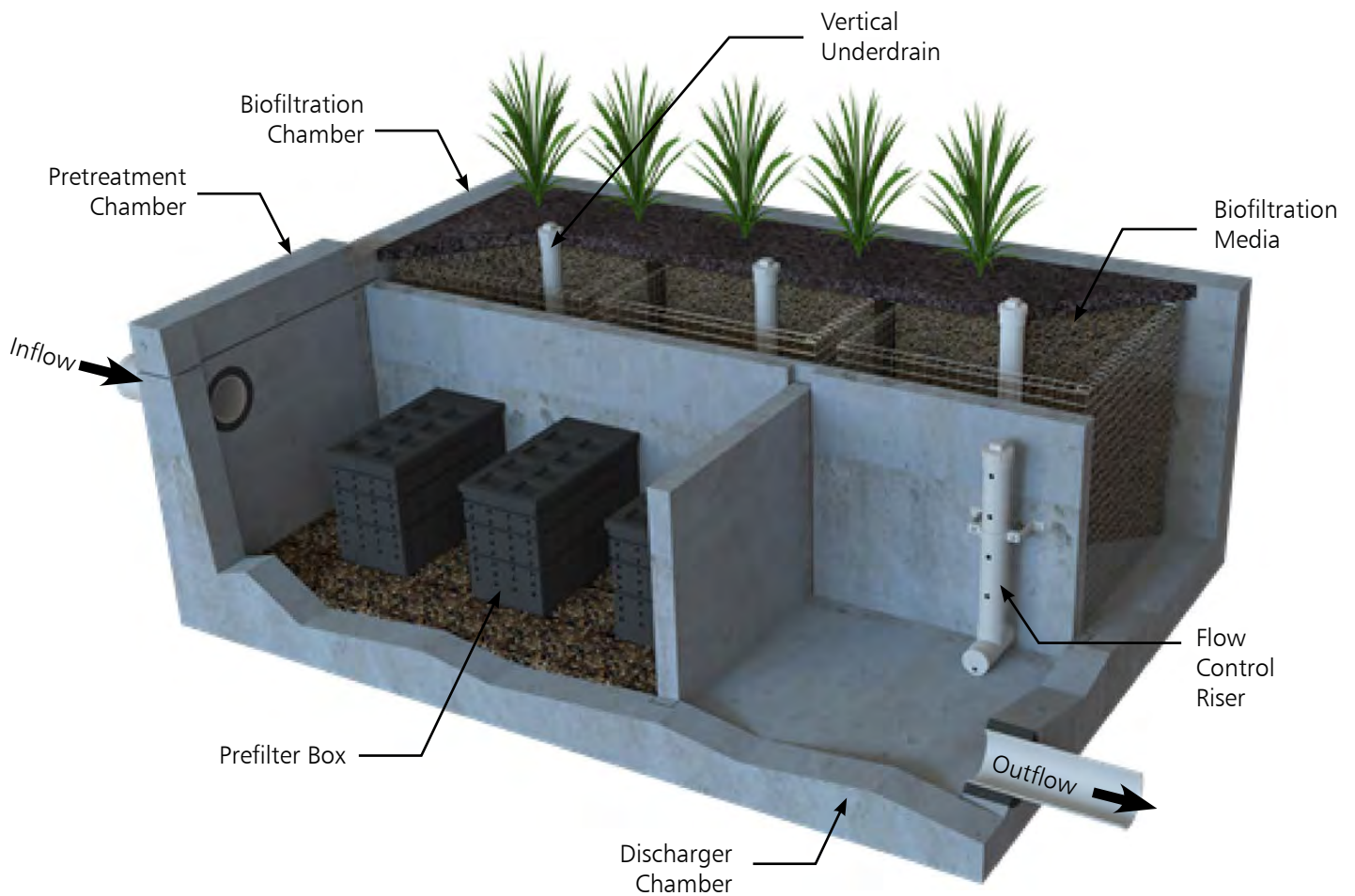
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## OVERVIEW

The Modular Wetlands® Linear Biofilter is designed to remove high levels of trash, debris, sediments, nutrients, metals, and hydrocarbons. Its simple design allows for quick and easy installation. The system is housed in a standard precast structure and can be installed at various depths to meet site-specific conditions.

## INTRODUCTION

This is the Modular Wetlands Linear Biofilter operation and maintenance manual. Before starting, read the instructions and equipment lists closely. It is important to follow all necessary safety procedures associated with state and local regulations. Some steps required confined space entry. Please contact Contech for more information on pre-authorized third party contractors who can provide installation services in your area. For a list of service providers in your area please visit: [www.conteches.com/maintenance](http://www.conteches.com/maintenance).



# INSTRUCTIONS

## ***INSPECTION SUMMARY***

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 the site specific loading conditions. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided.

- Inspect pre-treatment, biofiltration, and discharge chambers an average of once every six to twelve months. Varies based on site specific and local conditions.
- Average inspection time is approximately 15 minutes. Always ensure appropriate safety protocol and procedures are followed.

The following is a list of equipment required to allow for simple and effective inspection of the Modular Wetlands Linear:

- Modular Wetlands Linear Inspection Form
- Flashlight
- Manhole hook or appropriate tools to remove access hatches and covers
- Appropriate traffic control signage and procedures
- Measuring pole and/or tape measure
- Protective clothing and eye protection
- 7/16" open or closed ended wrench
- Large permanent black marker (initial inspections only - first year)

Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system

## **INSPECTION AND MAINTENANCE NOTES**

1. Following maintenance and/or inspection, it is recommended that the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.
2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.
3. Transport all debris, trash, organics, and sediments to approved facility for disposal in accordance with local and state requirements.
4. Entry into chambers may require confined space training based on state and local regulations.
5. No fertilizer shall be used in the biofiltration chamber.
6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may not require irrigation after initial establishment.

# INSPECTION PROCESS

1. Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other information (see inspection form).
2. Observe the inside of the system through the access covers. If minimal light is available and vision into the unit is impaired, utilize a flashlight to see inside the system and all of its chambers.
3. Look for any out of the ordinary obstructions in the inflow pipe, pre-treatment chamber, biofiltration chamber, discharge chamber or outflow pipe. Write down any observations on the inspection form.
4. Through observation and/or digital photographs, estimate the amount of trash, debris accumulated in the pre-treatment chamber. Utilizing a tape measure or measuring stick, estimate the amount of sediment in this chamber. Record this depth on the inspection form.
5. Through visual observation, inspect the condition of the pre-filter cartridges. Look for excessive build-up of sediment on the cartridges, any build-up on the tops of the cartridges, or clogging of the holes. Record this information on the inspection form. The prefilter cartridges can be further inspected by removing the cartridge tops and assessing the color of the BioMediaGREEN filter cubes (requires entry into pre-treatment chamber - see notes previous notes regarding confined space entry). Record the color of the material. New material is a light green color. As the media becomes clogged, it will turn darker in color, eventually becoming dark brown or black. The closer to black the media is the higher percentage that the media is exhausted and is in need of replacement.



6. The biofiltration chamber is generally maintenance-free due to the system's advanced pre-treatment chamber. For units which have open planters with vegetation, it is recommended that the vegetation be inspected. Look for any plants that are dead or showing signs of disease or other negative stressors. Record the general health of the plants on the inspection form and indicate through visual observation or digital photographs if trimming of the vegetation is required.
7. The discharge chamber houses the orifice control structure, drain down filter (only in California - older models), and is connected to the outflow pipe. It is important to check to ensure the orifice is in proper operating conditions and free of any obstructions. It is also important to assess the condition of the drain down filter media which utilizes a block form of the BioMediaGREEN. Assess in the same manner as the cubes in the pre-filter cartridge as mentioned above. Generally, the discharge chamber will be clean and free of debris. Inspect the water marks on the side walls. If possible, inspect the discharge chamber during a rain event to assess the amount of flow leaving the system while it is at 100% capacity (pre-treatment chamber water level at peak HGL - top of bypass weir). The water level of the flowing water should be compared to the watermark level on the side walls, which is an indicator of the highest discharge rate the system achieved when initially installed. Record on the form if there is any difference in level from the watermark in inches.

*NOTE: During the first few storms, the water level in the outflow chamber should be observed and a 6" long horizontal watermark line drawn (using a large permanent marker) at the water level in the discharge chamber while the system is operating at 100% capacity. The diagram below illustrates where the line should be drawn. This line is a reference point for future inspections of the system.*

*Water level in the discharge chamber is a function of flow rate and pipe size. Observation of the water level during the first few months of operation can be used as a benchmark level for future inspections. The initial mark and all future observations shall be made when the system is at 100% capacity (water level at maximum level in the pre-treatment chamber). If future water levels are below this mark when the system is at 100% capacity, this is an indicator that maintenance to the pre-filter cartridges may be needed.*



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

## MAINTENANCE INDICATORS

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

- Missing or damaged internal components or cartridges
- Obstructions in the system or its inlet and/or outlet pipes
- Excessive accumulation of floatables in the pretreatment chamber in which the length and width of the chamber is fully impacted more than 18". See photo below.
- Excessive accumulation of sediment in the pretreatment chamber of more than 6" in depth.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pretreatment cartridges. The following chart shows photos of the condition of the BioMediaGREEN contained within the pre-filter cartridges. When media is more than 85% clogged, replacement is required.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pretreatment cartridges. When media is more than 85% clogged, replacement is required. The darker the BioMediaGREEN, the more clogged it is and in need of replacement.



## INSPECTION PROCESS

- Excessive accumulation of sediment on the BioMediaGREEN media housed within the drain down filter (California only - older models). The following photos show the condition of the BioMediaGREEN contained within the drain down filter. When media is more than 85% clogged, replacement is required.



- Overgrown vegetation.



- Water level in the discharge chamber during 100% operating capacity (pretreatment chamber water level at max height) is lower than the water mark by 20%.

## MAINTENANCE SUMMARY

The time has come to maintain your Modular Wetlands® Linear. All necessary pre-maintenance steps must be carried out before maintenance occurs. Once traffic control has been set up per local and state regulations and access covers have been safely opened, the maintenance process can begin. It should be noted that some maintenance activities require confined space entry. All confined space requirements must be strictly followed before entry into the system. In addition, the following is recommended:

- Prepare the maintenance form by writing in the necessary information including project name, location, date & time, unit number and other info (see maintenance form).
- Set up all appropriate safety and cleaning equipment.
- Ensure traffic control is set up and properly positioned.
- Prepared pre-checks (OSHA, safety, confined space entry) are performed.

The following is a list of equipment to required for maintenance of the Modular Wetlands® Linear:

- Modular Wetlands Linear Maintenance Form
- Manhole hook or appropriate tools to access hatches and covers
- Protective clothing, flashlight, and eye protection
- 7/16" open or closed ended wrench
- Vacuum assisted truck with pressure washer
- Replacement BioMediaGREEN for pre-filter cartridges if required (order from one of Contech's Maintenance Team members at <https://www.conteches.com/maintenance>).



## MAINTENANCE | PRETREATMENT CHAMBER

1. Remove access cover over pre-treatment chamber and position vacuum truck accordingly.
2. With a pressure washer, spray down pollutants accumulated on walls and pre-filter cartridges.
3. Vacuum out pre-treatment chamber and remove all accumulated pollutants including trash, debris, and sediments. Be sure to vacuum the floor until the pervious pavers are visible and clean.
4. If pre-filter cartridges require media replacement, continue to step 5. If not, replace access cover and move to step 11.



## MAINTENANCE | PREFILTER CARTRIDGES

5. After successfully cleaning out the pre-treatment chamber (previous page) enter the pre-treatment chamber.
6. Unscrew the two bolts (circles shown below) holding the lid on each cartridge filter and remove lid.



7. Place the vacuum hose over each individual media filter to suck out filter media.



8. Once filter media has been sucked out, use a pressure washer to spray down the inside of the cartridge and it's media cages. Remove cleaned media cages and place to the side. Once removed, the vacuum hose can be inserted into the cartridge to vacuum out any remaining material near the bottom of the cartridge.
9. Reinstall media cages and fill with new media from the manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase. Utilize the manufacture-provided refilling tray and place on top of the cartridge. Fill the tray with new bulk media and shake down into place. Using your hands, lightly compact the media into each filter cage. Once the cages are full, remove the refilling tray and replace the cartridge top, ensuring bolts are properly tightened.



10. Exit the pre-treatment chamber. Replace access hatch or manhole cover.

## MAINTENANCE | BIOFILTRATION CHAMBER

11. In general, the biofiltration chamber is maintenance-free with the exception of maintaining the vegetation. The Modular Wetlands Linear utilizes vegetation similar to surrounding landscape areas, therefore trim vegetation to match surrounding vegetation. If any plants have died, replace them with new ones.



12. Each vertical under drain on the biofiltration chamber has a removable (threaded cap) that can be taken off to check any blockages or root growth. Once removed, a jetting attachment can be used to clean out the under drain and orifice riser.
13. As with all biofilter systems, at some point the biofiltration media (WetlandMedia) will need to be replaced. Either because of physical clogging or sorptive exhaustion of the media ion exchange capacity (to remove dissolved metals and phosphorous). The general life of this media is 10 to 20 years based on site specific conditions and pollutant loading. Utilize the vacuum truck to vacuum out the media by placing the hose into the chamber. Once all the media is removed use the power washer to spray down all the netting on the outer metal cage. Inspect the netting for any damage or holes. If the netting is damaged it can be repaired or replaced with guidance by the manufacturer.
14. Contact one of Contech's Maintenance Team members at <https://www.conteches.com/maintenance> to order new WetlandMedia. The quantity of media needed can be determined by providing the model number and unit depth. Media will be provided in super sacks for easy installation. Each sack will weigh between 1000 and 2000 lbs. A lifting apparatus (backhoe, boom truck, or other) is recommended to position the super sack over the biofiltration chamber. Fill the media cages up to the same level as the old media. Replant with vegetation.



## MAINTENANCE | DISCHARGE CHAMBER

15. Remove access hatch or manhole cover over discharge chamber.
16. Enter chamber to gain access to the drain down filter. Unlock the locking mechanism and lift up drain down filter housing to remove used BioMediaGREEN filter block as shown below. *NOTE: Drain down filter is only found on units installed in California prior to 2023. If no drain down filter is present, skip steps 16 and 17.*



17. Insert a new BioMediaGREEN filter block and lock drain down filter housing back in place.
18. Replace access hatch or manhole cover over discharge chamber.



Project Name \_\_\_\_\_

Project Address \_\_\_\_\_ (city) (Zip Code)

Owner / Management Company \_\_\_\_\_

Contact \_\_\_\_\_

Phone ( ) -

Inspector Name \_\_\_\_\_

Date \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Time \_\_\_\_\_ AM / PM

Type of Inspection  Routine  Follow Up  Complaint

Storm Storm Event in Last 72-hours?  No  Yes

Weather Condition \_\_\_\_\_

Additional Notes \_\_\_\_\_

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

**Inspection Checklist**

Modular Wetland System Type (Curb, Grate or UG Vault): \_\_\_\_\_ Size (22', 14' or etc.): \_\_\_\_\_

Structural Integrity:	Yes	No	Comments
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
<b>Working Condition:</b>			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
<b>Other Inspection Items:</b>			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	Yes	No
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



## Cleaning and Maintenance Report Modular Wetlands Linear

Project Name \_\_\_\_\_

For Office Use Only

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(Reviewed By) \_\_\_\_\_

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(Date) \_\_\_\_\_  
Office personnel to complete section to the left.

Project Address \_\_\_\_\_ (city) (Zip Code)

Owner / Management Company \_\_\_\_\_

Contact \_\_\_\_\_

Phone (      ) - \_\_\_\_\_

Inspector Name \_\_\_\_\_

Date \_\_\_\_ / \_\_\_\_ / \_\_\_\_ Time \_\_\_\_ AM / PM

Type of Inspection     Routine     Follow Up     Complaint     Storm                  Storm Event in Last 72-hours?     No     Yes

Weather Condition \_\_\_\_\_

Additional Notes \_\_\_\_\_

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: _____ Long: _____	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



## **CONTECH**<sup>®</sup> ENGINEERED SOLUTIONS

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DRAWINGS AND SPECIFICATIONS ARE AVAILABLE AT [WWW.CONTECHES.COM](http://WWW.CONTECHES.COM)

Modular Wetlands Maintenance Guide 1/2023





**November 2022**

**GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS)  
ENHANCED AND PHOSPHORUS TREATMENT**

**For**

**Contech Engineered Solutions, LLC (Contech) Modular Wetlands  
Linear**

**Ecology's Decision**

Based on Modular Wetland Systems, Inc, application submissions, including the Technical Evaluation Report, dated April 1, 2014, Ecology hereby issues the following use level designation:

1. General Use Level Designation (GULD) for the Modular Wetlands Linear Stormwater Treatment System for Basic, Phosphorus, and Enhanced treatment
  - Sized at a hydraulic loading rate of:
    - 1 gallon per minute (gpm) per square foot (sq ft) of Wetland Cell Surface Area
    - Prefilter box (approved at either 22 inches or 33 inches tall)
      - 3.0 gpm/sq ft of prefilter box surface area for moderate pollutant loading rates (low to medium density residential basins).
      - 2.1 gpm/sq ft of prefilter box surface area for high pollutant loading rates (commercial and industrial basins).
2. Ecology approves the Modular Wetlands Linear Stormwater Treatment System units for Basic, Phosphorus, and Enhanced treatment at the hydraulic loading rate listed above. Designers shall calculate the water quality design flow rates using the following procedures:
  - Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute water quality treatment design flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology- approved continuous runoff model.

- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute water quality treatment design flow rate as calculated using one of the three methods described in Chapter 2.7.6 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
  - Entire State: For treatment installed downstream of detention, the water quality treatment design flow rate is the full 2-year release rate of the detention facility.
3. These use level designations have no expiration date but may be amended or revoked by Ecology, and are subject to the conditions specified below.

### **Ecology's Conditions of Use**

Applicants shall comply with the following conditions:

- 1) Design, assemble, install, operate, and maintain the Modular Wetlands Linear Stormwater Treatment System units, in accordance with Contech's applicable manuals and documents and the Ecology Decision.
- 2) Each site plan must undergo Contech review and approval before site installation. This ensures that site grading and slope are appropriate for use of a Modular Wetlands Linear Stormwater Treatment System unit.
- 3) Modular Wetlands Linear Stormwater Treatment System media shall conform to the specifications submitted to and approved by Ecology.
- 4) The applicant tested the Modular Wetlands Linear Stormwater Treatment System with an external bypass weir. This weir limited the depth of water flowing through the media, and therefore the active treatment area, to below the root zone of the plants. This GULD applies to Modular Wetlands Linear Stormwater Treatment Systems whether plants are included in the final product or not.
- 5) Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of stormwater treatment technology.
  - Typically, Contech designs Modular Wetland systems for a target prefilter media life of 6 to 12 months.
  - Indications of the need for maintenance include effluent flow decreasing to below the design flow rate or decrease in treatment below required levels.
  - Owners/operators must inspect Modular Wetland systems for a minimum of twelve months from the start of post-construction operation to determine site-specific maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to the SWMMEW, the wet

season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.

- Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.
- When inspections are performed, the following findings typically serve as maintenance triggers:
  - Standing water remains in the vault between rain events, or
  - Bypass occurs during storms smaller than the design storm.
  - If excessive floatables (trash and debris) are present (but no standing water or excessive sedimentation), perform a minor maintenance consisting of gross solids removal, not prefilter media replacement.
  - Additional data collection will be used to create a correlation between pretreatment chamber sediment depth and pre-filter clogging (see *Issues to be Addressed by the Company* section below)

6) Discharges from the Modular Wetlands Linear Stormwater Treatment System units shall not cause or contribute to water quality standards violations in receiving waters.

**Applicant:** Contech Engineered Solutions, LLC

**Applicant's Address:** 11815 NE Glenn Widing Dr.  
Portland, OR 97220

**Application Documents:**

*Original Application for Conditional Use Level Designation, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., January 2011*

*Quality Assurance Project Plan: Modular Wetland System – Linear Treatment System Performance Monitoring Project, draft, January 2011*

*Revised Application for Conditional Use Level Designation, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., May 2011*

*Memorandum: Modular Wetland System-Linear GULD Application Supplementary Data, April 2014*

**Applicant's Use Level Request:**

- General Use Level Designation as a Basic, Enhanced, and Phosphorus treatment device in accordance with Ecology's Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE) January 2011 Revision.

**Applicant's Performance Claims:**

- The Modular Wetlands Linear is capable of removing a minimum of 80-percent of TSS from stormwater with influent concentrations between 100 and 200 mg/L.
- The Modular Wetlands Linear is capable of removing a minimum of 50-percent of total phosphorus from stormwater with influent concentrations between 0.1 and 0.5 mg/L.
- The Modular Wetlands Linear is capable of removing a minimum 30-percent of dissolved copper from stormwater with influent concentrations between 0.005 and 0.020 mg/L.
- The Modular Wetlands Linear is capable of removing a minimum 60-percent of dissolved zinc from stormwater with influent concentrations between 0.02 and 0.30 mg/L.

**Ecology's Recommendations:**

- Contech has shown Ecology, through laboratory and field-testing, that the Modular Wetlands Linear Stormwater Treatment System filter system is capable of attaining Ecology's Basic, Phosphorus, and Enhanced treatment goals.

**Findings of Fact:**

Laboratory Testing

The Modular Wetlands Linear Stormwater Treatment System has the:

- Capability to remove 99 percent of total suspended solids (using Sil-Co-Sil 106) in a quarter-scale model with influent concentrations of 270 mg/L.
- Capability to remove 91 percent of total suspended solids (using Sil-Co-Sil 106) in laboratory conditions with influent concentrations of 84.6 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 93 percent of dissolved Copper in a quarter-scale model with influent concentrations of 0.757 mg/L.
- Capability to remove 79 percent of dissolved Copper in laboratory conditions with influent concentrations of 0.567 mg/L at a flow rate of 3.0 gpm per square foot of media.

- Capability to remove 80.5-percent of dissolved Zinc in a quarter-scale model with influent concentrations of 0.95 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 78-percent of dissolved Zinc in laboratory conditions with influent concentrations of 0.75 mg/L at a flow rate of 3.0 gpm per square foot of media.

### Field Testing

- Modular Wetland Systems, Inc. conducted monitoring of an MWS-Linear (Model # MWS-L-4-13) from April 2012 through May 2013, at a transportation maintenance facility in Portland, Oregon. The manufacturer collected flow-weighted composite samples of the system's influent and effluent during 28 separate storm events. The system treated approximately 75 percent of the runoff from 53.5 inches of rainfall during the monitoring period. The applicant sized the system at 1 gpm/sq ft. (wetland media) and 3gpm/sq ft. (prefilter).
- Influent TSS concentrations for qualifying sampled storm events ranged from 20 to 339 mg/L. Average TSS removal for influent concentrations greater than 100 mg/L (n=7) averaged 85 percent. For influent concentrations in the range of 20-100 mg/L (n=18), the upper 95 percent confidence interval about the mean effluent concentration was 12.8 mg/L.
- Total phosphorus removal for 17 events with influent TP concentrations in the range of 0.1 to 0.5 mg/L averaged 65 percent. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 58 percent.
- The lower 95 percent confidence limit of the mean percent removal was 60.5 percent for dissolved zinc for influent concentrations in the range of 0.02 to 0.3 mg/L (n=11). The lower 95 percent confidence limit of the mean percent removal was 32.5 percent for dissolved copper for influent concentrations in the range of 0.005 to 0.02 mg/L (n=14) at flow rates up to 28 gpm (design flow rate 41 gpm). Laboratory test data augmented the data set, showing dissolved copper removal at the design flow rate of 41 gpm (93 percent reduction in influent dissolved copper of 0.757 mg/L).

### **Issues to be addressed by the Company:**

1. Contech should collect maintenance and inspection data for the first year on all installations in the Northwest in order to assess standard maintenance requirements for various land uses in the region. Contech should use these data to establish required maintenance cycles.
2. Contech should collect pre-treatment chamber sediment depth data for the first year of operation for all installations in the Northwest. Contech will use these data to create a correlation between sediment depth and pre-filter clogging.

**Technology Description:**

Download at <https://www.conteches.com/modular-wetlands>

**Contact Information:**

Applicant: Jeremiah Lehman  
Contech Engineered Solutions, LLC  
11815 NE Glenn Widing Dr.  
Portland, OR 97220  
[Jeremiah.Lehman@ContechES.com](mailto:Jeremiah.Lehman@ContechES.com)

Applicant website: <http://www.conteches.com>

Ecology web link: <http://www.ecy.wa.gov/programs/wg/stormwater/newtech/index.html>

Ecology: Douglas C. Howie, P.E.  
Department of Ecology  
Water Quality Program  
(360) 870-0983  
[douglas.howie@ecy.wa.gov](mailto:douglas.howie@ecy.wa.gov)

**Revision History**

<b>Date</b>	<b>Revision</b>
June 2011	Original use-level-designation document
September 2012	Revised dates for TER and expiration
January 2013	Modified Design Storm Description, added Revision Table, added maintenance discussion, modified format in accordance with Ecology standard
December 2013	Updated name of Applicant
April 2014	Approved GULD designation for Basic, Phosphorus, and Enhanced treatment
December 2015	Updated GULD to document the acceptance of MWS – Linear Modular Wetland installations with or without the inclusion of plants
July 2017	Revised Manufacturer Contact Information (name, address, and email)
December 2019	Revised Manufacturer Contact Address
July 2021	Added additional prefilter sized at 33 inches
August 2021	Changed “Prefilter” to “Prefilter box”
November 2022	Changed Contacts to Contech ES

# Isolator<sup>®</sup> Row Plus

## O&M Manual

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# The Isolator<sup>®</sup> Row Plus

## Introduction

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row Plus is a technique to inexpensively enhance Total Suspended Solids (TSS) and Total Phosphorus (TP) removal with easy access for inspection and maintenance.

## The Isolator Row Plus

The Isolator Row Plus is a row of StormTech chambers, either SC-160, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-7200 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for sediment settling and filtration as stormwater rises in the Isolator Row Plus and passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC-310-3 and SC-740 models) allow stormwater to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row Plus protecting the adjacent stone and chambers storage areas from sediment accumulation.

ADS geotextile fabric is placed between the stone and the Isolator Row Plus chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the chamber's sidewall. The non-woven fabric is not required over the SC-160, DC-780, MC-3500 or MC-7200 models as these chambers do not have perforated side walls.

The Isolator Row Plus is designed to capture the "first flush" runoff and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole provides access to the Isolator Row Plus and includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row Plus bypass through a manifold to the other chambers. This is achieved with an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row Plus row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row Plus. After Stormwater flows through the Isolator Row Plus and into the rest of the chamber system it is either exfiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

The Isolator Row FLAMP<sup>™</sup> (patent pending) is a flared end ramp apparatus attached to the inlet pipe on the inside of the chamber end cap. The FLAMP provides a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance by enhancing outflow of solid debris that would otherwise collect at the chamber's end. It also serves to improve the fluid and solid flow into the access pipe during maintenance and cleaning and to guide cleaning and inspection equipment back into the inlet pipe when complete.

The Isolator Row Plus may be part of a treatment train system. The treatment train design and pretreatment device selection by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, StormTech recommend using the Isolator Row Plus to minimize maintenance requirements and maintenance costs.

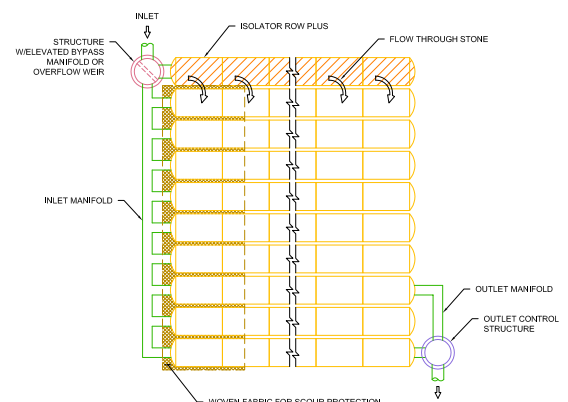
**Note:** See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row Plus.



Looking down the Isolator Row PLUS from the manhole opening, ADS PLUS Fabric is shown between the chamber and stone base.



StormTech Isolator Row PLUS with Overflow Spillway (not to scale)





# Isolator Row Plus Inspection/Maintenance

## Inspection

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row Plus should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row Plus incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

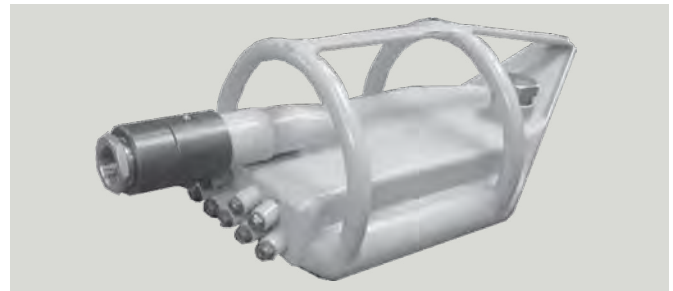
If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row Plus, clean-out should be performed.

## Maintenance

The Isolator Row Plus was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided

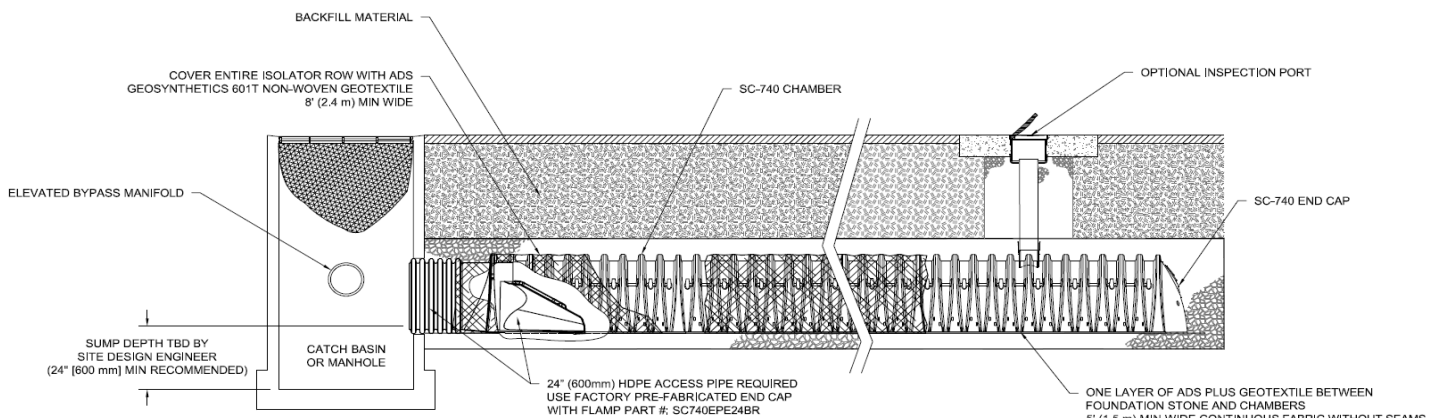
via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row Plus while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. StormTech recommends a maximum nozzle pressure of 2000 psi be utilized during cleaning. JetVac reels can vary in length. For ease of maintenance, ADS recommends Isolator Row Plus lengths up to 200' (61 m). **The JetVac process shall only be performed on StormTech Isolator Row Plus that have ADS Plus Fabric (as specified by StormTech) over their angular base stone.**



## StormTech Isolator Row PLUS (not to scale)

**Note:** Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-7200 chamber models and is not required over the entire Isolator Row PLUS.



# Isolator Row Plus Step By Step Maintenance Procedures

## Step 1

Inspect Isolator Row Plus for sediment.

- A) Inspection ports (if present)
  - i. Remove lid from floor box frame
  - ii. Remove cap from inspection riser
  - iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.
  - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
- B) All Isolator Row Plus
  - i. Remove cover from manhole at upstream end of Isolator Row Plus
  - ii. Using a flashlight, inspect down Isolator Row Plus through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering manhole
  - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

## Step 2

Clean out Isolator Row Plus using the JetVac process.

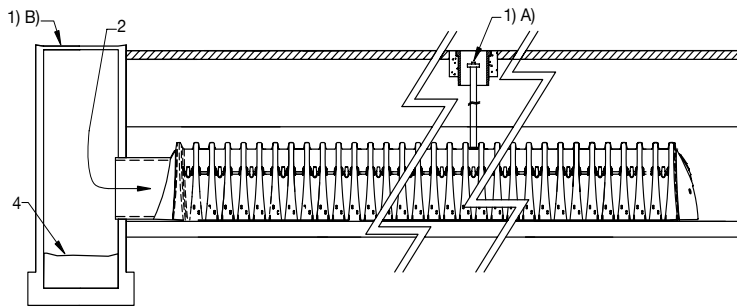
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

## Step 3

Replace all caps, lids and covers, record observations and actions.

## Step 4

Inspect & clean catch basins and manholes upstream of the StormTech system.



## Sample Maintenance Log

Date	Stadia Rod Readings		Sedi-ment Depth (1)-(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row PLUS, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

adspipe.com

800-821-6710

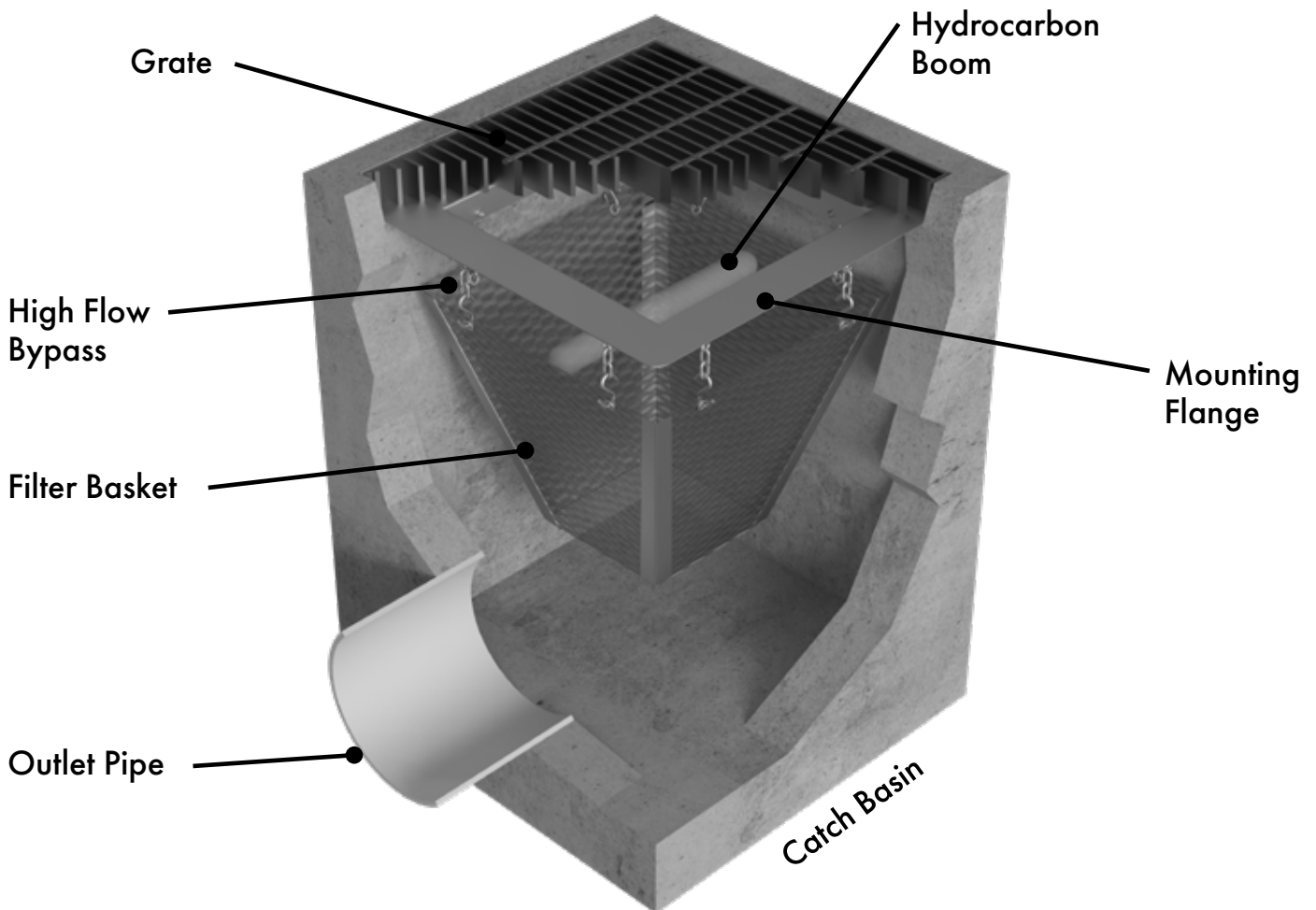
Bio Clean<sup>®</sup> Grate Inlet Filter  
Operation & Maintenance Manual



## Operation & Maintenance

Contech's 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, Kraken® membrane filter, and fabric filter variations. This manual covers maintenance procedures of the trash full capture and fabric filter configurations. A supplemental manual is available for the Kraken variation. The trash full capture filter is made of 100% stainless steel, while the fabric filter is made of a woven monofilament geotextile fabric. Both filters are available at various sizes and depths allowing them to fit in any grated catch basin inlet. The filters heavy duty construction allows for cleaning with any vacuum truck. The filter 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:

- Contech 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 through 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:

Basket Model	Height <sup>1</sup> (inches)	Top Width (inches)	Top Length (inches)	Bottom Width (inches)	Bottom Length (inches)	50% Storage Capacity (CF)	100% Storage Capacity (CF)
BIO-GRATE-FULL/ FABRIC-12-12-12	6.00	10.00	10.00	8.31	8.31	0.15	0.30
BIO-GRATE-FULL/ FABRIC-18-18-12	6.00	15.00	15.00	12.50	12.50	0.33	0.66
BIO-GRATE-FULL/ FABRIC-24-24-12	6.00	20.00	20.00	16.69	16.69	0.59	1.18
BIO-GRATE-FULL/ FABRIC-24-24-24	18.00	20.00	20.00	10.00	10.00	1.22	2.44
BIO-GRATE-FULL/ FABRIC-24-40-12	6.00	20.00	30.00	16.69	25.00	0.88	1.76
BIO-GRATE-FULL/ FABRIC-24-40-24	18.00	20.00	30.00	10.00	15.00	1.82	3.64
BIO-GRATE-FULL/ FABRIC-36-36-24	18.00	30.00	30.00	15.00	15.00	2.73	5.46
BIO-GRATE-FULL/ FABRIC-24-40-24	18.00	20.00	30.00	10.00	15.00	1.82	3.64
BIO-GRATE-FULL/ FABRIC-36-36-24	18.00	30.00	30.00	15.00	15.00	2.73	5.46

<sup>1</sup> Refers to basket height, total system height is equal to basket height plus 6 inches for bypass.

## Maintenance Equipment

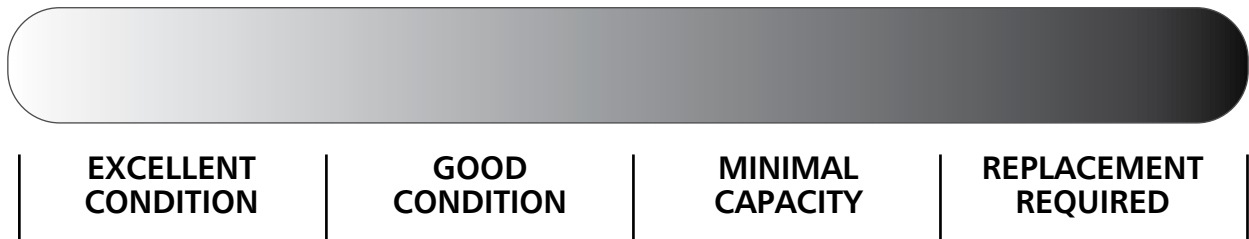
It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter, though it can easily be cleaned by hand:

- Contech 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 off 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.
- The following is a replacement indication color chart for the hydrocarbon booms:

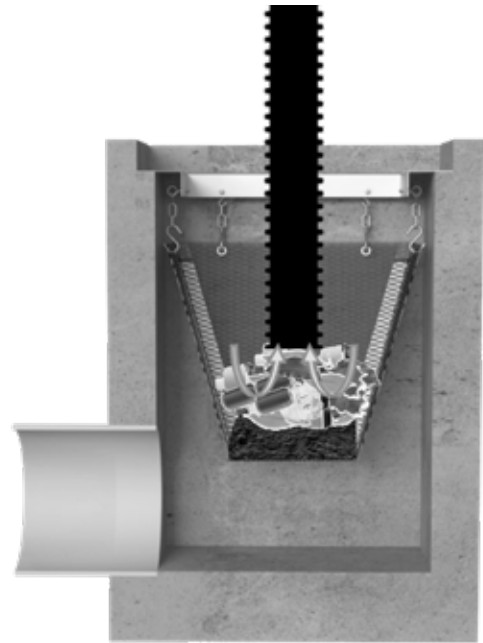


- The last step is to replace the grate and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, 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.

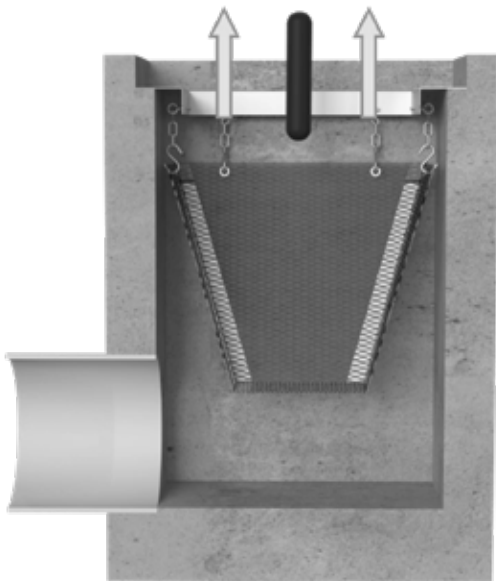
## Maintenance Sequence



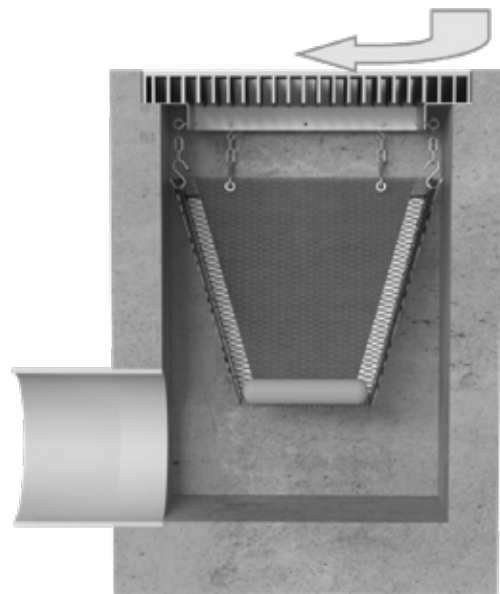
1. Remove grate and set up vacuum truck to clean the filter basket.



2. 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.



3. 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 information in the chart above. If replacement is required, install and fasten on a new hydrocarbon boom.



4. 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.





## Inspection and Maintenance Report Catch Basin Only

Project Name \_\_\_\_\_

For Office Use Only

---

(Reviewed By) \_\_\_\_\_

---

(Date) \_\_\_\_\_  
Office personnel to complete section to the left.

Project Address \_\_\_\_\_ (city) (Zip Code)

Owner / Management Company \_\_\_\_\_

Contact \_\_\_\_\_

Phone (     )     -     \_\_\_\_\_

Inspector Name \_\_\_\_\_

Date \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Time \_\_\_\_\_ AM / PM

Type of Inspection     Routine     Follow Up     Complaint     Storm    Storm Event in Last 72-hours?     No     Yes

Weather Condition \_\_\_\_\_

Additional Notes \_\_\_\_\_

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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### **SUPPORT**

DRAWINGS AND SPECIFICATIONS ARE AVAILABLE AT [WWW.CONTECHES.COM](http://WWW.CONTECHES.COM)

Grate Inlet Filter Operation & Maintenance Manual 08/22

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### 3.5 Bioretention Facility

<b>Type of BMP</b>	LID – Bioretention
<b>Treatment Mechanisms</b>	Infiltration, Evapotranspiration, Evaporation, Biofiltration
<b>Maximum Drainage Area</b>	This BMP is intended to be integrated into a project’s landscaped area in a distributed manner. Typically, contributing drainage areas to Bioretention Facilities range from less than 1 acre to a maximum of around 10 acres.
<b>Other Names</b>	Rain Garden, Bioretention Cell, Bioretention Basin, Biofiltration Basin, Landscaped Filter Basin, Porous Landscape Detention

#### Description

Bioretention Facilities are shallow, vegetated basins underlain by an engineered soil media. Healthy plant and biological activity in the root zone maintain and renew the macro-pore space in the soil and maximize plant uptake of pollutants and runoff. This keeps the Best Management Practice (BMP) from becoming clogged and allows more of the soil column to function as both a sponge (retaining water) and a highly effective and self-maintaining biofilter. In most cases, the bottom of a Bioretention Facility is unlined, which also provides an opportunity for infiltration to the extent the underlying onsite soil can accommodate. When the infiltration rate of the underlying soil is exceeded, fully biotreated flows are discharged via underdrains. Bioretention Facilities therefore will inherently achieve the maximum feasible level of infiltration and evapotranspiration and achieve the minimum feasible (but highly biotreated) discharge to the storm drain system.

#### Siting Considerations

These facilities work best when they are designed in a relatively level area. Unlike other BMPs, Bioretention Facilities can be used in smaller landscaped spaces on the site, such as:

- ✓ Parking islands
- ✓ Medians
- ✓ Site entrances

Landscaped areas on the site (such as may otherwise be required through minimum landscaping ordinances), can often be designed as Bioretention Facilities. This can be accomplished by:

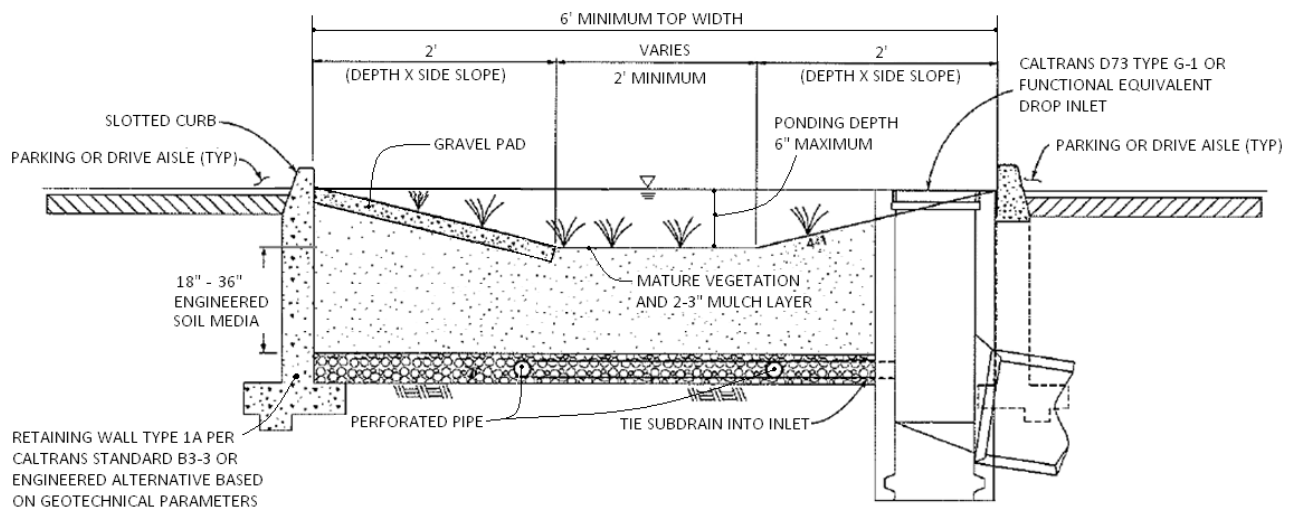
- *Depressing* landscaped areas below adjacent impervious surfaces, rather than elevating those areas
- Grading the site to direct runoff from those impervious surfaces *into* the Bioretention Facility, rather than away from the landscaping
- Sizing and designing the depressed landscaped area as a Bioretention Facility as described in this Fact Sheet

Bioretention Facilities should however not be used downstream of areas where large amounts of sediment can clog the system. Placing a Bioretention Facility at the toe of a steep slope should also be avoided due to the potential for clogging the engineered soil media with erosion from the slope, as well as the potential for damaging the vegetation.

### **Design and Sizing Criteria**

The recommended cross section necessary for a Bioretention Facility includes:

- Vegetated area
- 18' minimum depth of engineered soil media
- 12' minimum gravel layer depth with 6' perforated pipes (added flow control features such as orifice plates may be required to mitigate for HCOC conditions)



While the 18-inch minimum engineered soil media depth can be used in some cases, it is recommended to use 24 inches or a preferred 36 inches to provide an adequate root zone for the chosen plant palate. Such a design also provides for improved removal effectiveness for nutrients. The recommended ponding depth inside of a Bioretention Facility is 6 inches; measured from the flat bottom surface to the top of the water surface as shown in Figure 1.

Because this BMP is filled with an engineered soil media, pore space in the soil and gravel layer is assumed to provide storage volume. However, several considerations must be noted:

- Surcharge storage above the soil surface (6 inches) is important to assure that design flows do not bypass the BMP when runoff exceeds the soil's absorption rate.
- In cases where the Bioretention Facility contains engineered soil media deeper than 36 inches, the pore space within the engineered soil media can only be counted to the 36-inch depth.
- A maximum of 30 percent pore space can be used for the soil media whereas a maximum of 40 percent pore space can be use for the gravel layer.

**Figure 1: Standard Layout for a Bioretention Facility**

## BIORETENTION FACILITY BMP FACT SHEET

### Engineered Soil Media Requirements

The engineered soil media shall be comprised of 85 percent mineral component and 15 percent organic component, by volume, drum mixed prior to placement. The mineral component shall be a Class A sandy loam topsoil that meets the range specified in Table 1 below. The organic component shall be nitrogen stabilized compost<sup>1</sup>, such that nitrogen does not leach from the media.

**Table 1: Mineral Component Range Requirements**

Percent Range	Component
70-80	Sand
15-20	Silt
5-10	Clay

The trip ticket, or certificate of compliance, shall be made available to the inspector to prove the engineered mix meets this specification.

### Vegetation Requirements

Vegetative cover is important to minimize erosion and ensure that treatment occurs in the Bioretention Facility. The area should be designed for at least 70 percent mature coverage throughout the Bioretention Facility. To prevent the BMP from being used as walkways, Bioretention Facilities shall be planted with a combination of small trees, densely planted shrubs, and natural grasses. Grasses shall be native or ornamental; preferably ones that do not need to be mowed. The application of fertilizers and pesticides should be minimal. To maintain oxygen levels for the vegetation and promote biodegradation, it is important that vegetation not be completely submerged for any extended period of time. Therefore, a maximum of 6 inches of ponded water shall be used in the design to ensure that plants within the Bioretention Facility remain healthy.

A 2 to 3-inch layer of standard shredded aged hardwood mulch shall be placed as the top layer inside the Bioretention Facility. The 6-inch ponding depth shown in Figure 1 above shall be measured from the top surface of the 2 to 3-inch mulch layer.

### Curb Cuts

To allow water to flow into the Bioretention Facility, 1-foot-wide (minimum) curb cuts should be placed approximately every 10 feet around the perimeter of the Bioretention Facility. Figure 2 shows a curb cut in a Bioretention Facility. Curb cut flow lines must be at or above the  $V_{BMP}$  water surface level.

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<sup>1</sup> For more information on compost, visit the US Composting Council website at: <http://compostingcouncil.org/>

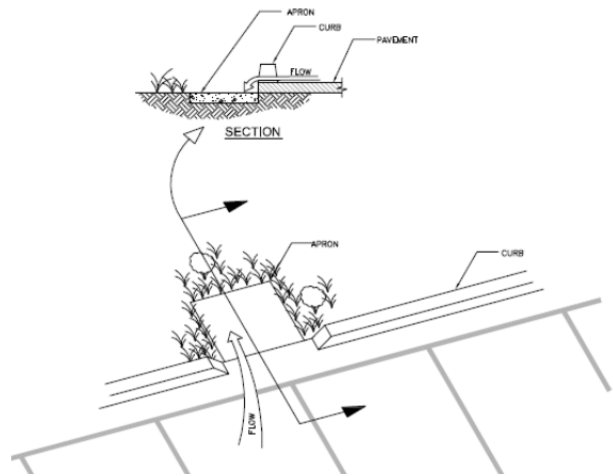
## BIORETENTION FACILITY BMP FACT SHEET



**Figure 2: Curb Cut located in a Bioretention Facility**

To reduce erosion, a gravel pad shall be placed at each inlet point to the Bioretention Facility. The gravel should be 1- to 1.5-inch diameter in size. The gravel should overlap the curb cut opening a minimum of 6 inches. The gravel pad inside the Bioretention Facility should be flush with the finished surface at the curb cut and extend to the bottom of the slope.

In addition, place an apron of stone or concrete, a foot square or larger, inside each inlet to prevent vegetation from growing up and blocking the inlet. See Figure 3.



**Figure 3: Apron located in a Bioretention Facility**

### **Terracing the Landscaped Filter Basin**

It is recommended that Bioretention Facilities be level. In the event the facility site slopes and lacks proper design, water would fill the lowest point of the BMP and then discharge from the basin without being treated. To ensure that the water will be held within the Bioretention Facility on sloped sites, the BMP must be terraced with nonporous check dams to provide the required storage and treatment capacity.

The terraced version of this BMP shall be used on non-flat sites with no more than a 3 percent slope. The surcharge depth cannot exceed 0.5 feet, and side slopes shall not exceed 4:1. Table 2 below shows the spacing of the check dams, and slopes shall be rounded up (i.e., 2.5 percent slope shall use 10' spacing for check dams).

**Table 2: Check Dam Spacing**

6" Check Dam Spacing	
Slope	Spacing
<b>1%</b>	<b>25'</b>
<b>2%</b>	<b>15'</b>
<b>3%</b>	<b>10'</b>

## BIORETENTION FACILITY BMP FACT SHEET

### Roof Runoff

Roof downspouts may be directed towards Bioretention Facilities. However, the downspouts must discharge onto a concrete splash block to protect the Bioretention Facility from erosion.

### Retaining Walls

It is recommended that Retaining Wall Type 1A, per Caltrans Standard B3-3 or equivalent, be constructed around the entire perimeter of the Bioretention Facility. This practice will protect the sides of the Bioretention Facility from collapsing during construction and maintenance or from high service loads adjacent to the BMP. Where such service loads would not exist adjacent to the BMP, an engineered alternative may be used if signed by a licensed civil engineer.

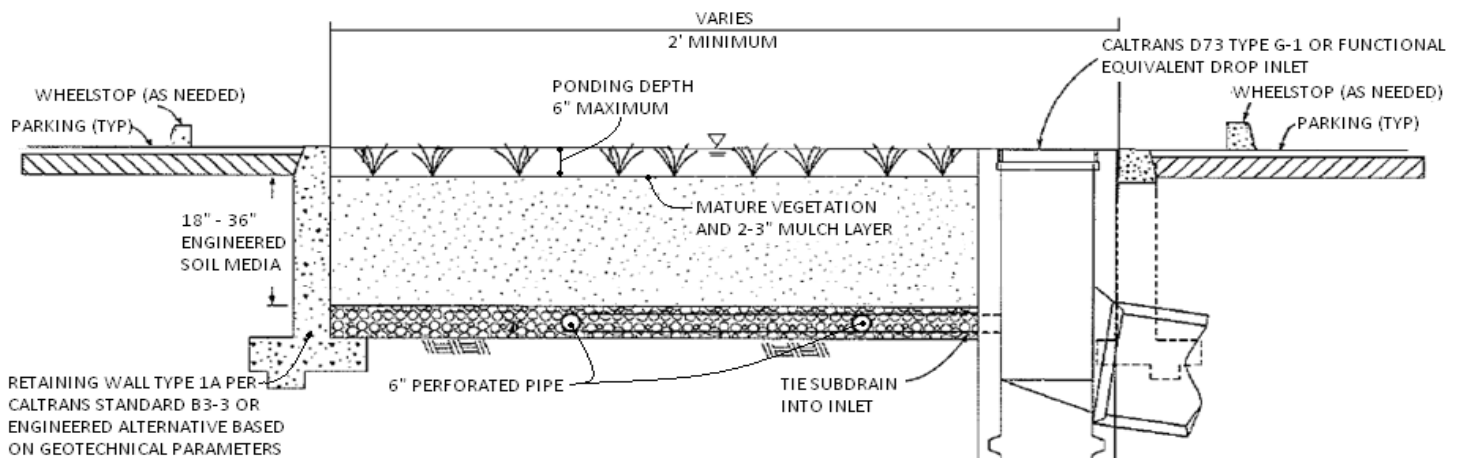
### Side Slope Requirements

#### ***Bioretention Facilities Requiring Side Slopes***

The design should assure that the Bioretention Facility does not present a tripping hazard. Bioretention Facilities proposed near pedestrian areas, such as areas parallel to parking spaces or along a walkway, must have a gentle slope to the bottom of the facility. Side slopes inside of a Bioretention Facility shall be 4:1. A typical cross section for the Bioretention Facility is shown in Figure 1.

#### ***Bioretention Facilities Not Requiring Side Slopes***

Where cars park perpendicular to the Bioretention Facility, side slopes are not required. A 6-inch maximum drop may be used, and the Bioretention Facility must be planted with trees and shrubs to prevent pedestrian access. In this case, a curb is not placed around the Bioretention Facility, but wheel stops shall be used to prevent vehicles from entering the Bioretention Facility, as shown in Figure 4.



## BIORETENTION FACILITY BMP FACT SHEET

### **Planter Boxes**

Bioretention Facilities can also be placed above ground as planter boxes. Planter boxes must have a minimum width of 2 feet, a maximum surcharge depth of 6 inches, and no side slopes are necessary. Planter boxes must be constructed so as to ensure that the top surface of the engineered soil media will remain level. This option may be constructed of concrete, brick, stone or other stable materials that will not warp or bend. Chemically treated wood or galvanized steel, which has the ability to contaminate stormwater, should not be used. Planter boxes must be lined with an impermeable liner on all sides, including the bottom. Due to the impermeable liner, the inside bottom of the planter box shall be designed and constructed with a cross fall, directing treated flows within the subdrain layer toward the point where subdrain exits the planter box, and subdrains shall be oriented with drain holes oriented down. These provisions will help avoid excessive stagnant water within the gravel underdrain layer. Similar to the in-ground Bioretention Facility versions, this BMP benefits from healthy plants and biological activity in the root zone. Planter boxes should be planted with appropriately selected vegetation.



**Figure 5: Planter Box**

Source: LA Team Effort

### **Overflow**

An overflow route is needed in the Bioretention Facility design to bypass stored runoff from storm events larger than  $V_{BMP}$  or in the event of facility or subdrain clogging. Overflow systems must connect to an acceptable discharge point, such as a downstream conveyance system as shown in Figure 1 and Figure 4. The inlet to the overflow structure shall be elevated inside the Bioretention Facility to be flush with the ponding surface for the design capture volume ( $V_{BMP}$ ) as shown in Figure 4. This will allow the design capture volume to be fully treated by the Bioretention Facility, and for larger events to safely be conveyed to downstream systems. The overflow inlet shall **not** be located in the entrance of a Bioretention Facility, as shown in Figure 6.



## BIORETENTION FACILITY BMP FACT SHEET

### **Underdrain Gravel and Pipes**

An underdrain gravel layer and pipes shall be provided in accordance with Appendix B – Underdrains.



**Figure 6: Incorrect Placement of an Overflow Inlet.**

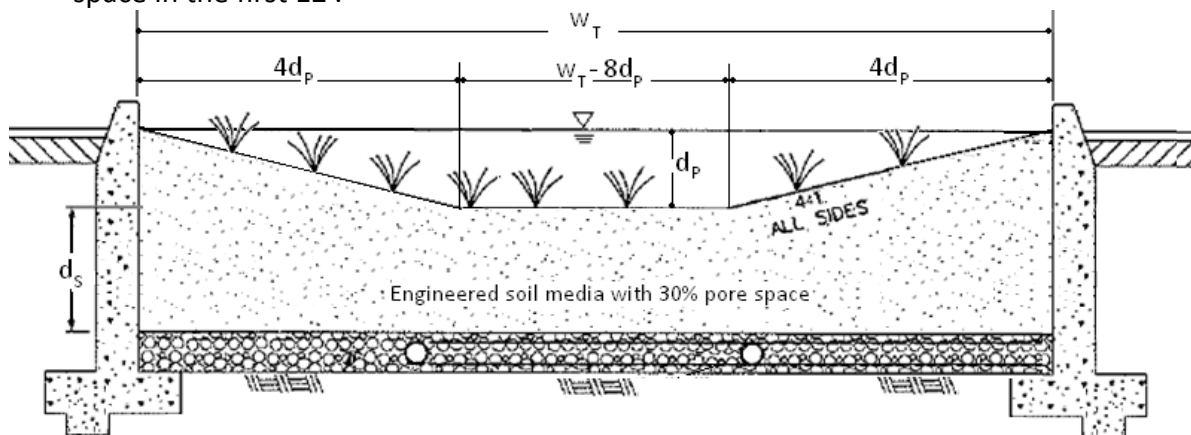
### **Inspection and Maintenance Schedule**

The Bioretention Facility area shall be inspected for erosion, dead vegetation, soggy soils, or standing water. The use of fertilizers and pesticides on the plants inside the Bioretention Facility should be minimized.

Schedule	Activity
Ongoing	<ul style="list-style-type: none"><li>• Keep adjacent landscape areas maintained. Remove clippings from landscape maintenance activities.</li><li>• Remove trash and debris</li><li>• Replace damaged grass and/or plants</li><li>• Replace surface mulch layer as needed to maintain a 2-3 inch soil cover.</li></ul>
After storm events	<ul style="list-style-type: none"><li>• Inspect areas for ponding</li></ul>
Annually	<ul style="list-style-type: none"><li>• Inspect/clean inlets and outlets</li></ul>

## Bioretention Facility Design Procedure

- 1) Enter the area tributary,  $A_T$ , to the Bioretention Facility.
- 2) Enter the Design Volume,  $V_{BMP}$ , determined from Section 2.1 of this Handbook.
- 3) Select the type of design used. There are two types of Bioretention Facility designs: the standard design used for most project sites that include side slopes, and the modified design used when the BMP is located perpendicular to the parking spaces or with planter boxes that do not use side slopes.
- 4) Enter the depth of the engineered soil media,  $d_s$ . The minimum depth for the engineered soil media can be 18' in limited cases, but it is recommended to use 24' or a preferred 36' to provide an adequate root zone for the chosen plant palette. Engineered soil media deeper than 36' will only get credit for the pore space in the first 36'.
- 5) Enter the top width of the Bioretention Facility.
- 6) Calculate the total effective depth,  $d_E$ , within the Bioretention Facility. The maximum allowable pore space of the soil media is 30% while the maximum allowable pore space for the gravel layer is 40%. Gravel layer deeper than 12' will only get credit for the pore space in the first 12'.



- a. For the design with side slopes the following equation shall be used to determine the total effective depth. Where,  $d_p$  is the depth of ponding within the basin.

$$d_E(\text{ft}) = \frac{0.3 \times \left[ (w_T(\text{ft}) \times d_s(\text{ft})) + 4(d_p(\text{ft}))^2 \right] + 0.4 \times 1(\text{ft}) + d_p(\text{ft}) \left[ 4d_p(\text{ft}) + (w_T(\text{ft}) - 8d_p(\text{ft})) \right]}{w_T(\text{ft})}$$

This above equation can be simplified if the maximum ponding depth of 0.5' is used. The equation below is used on the worksheet to find the minimum area required for the Bioretention Facility:

$$d_E(\text{ft}) = (0.3 \times d_s(\text{ft}) + 0.4 \times 1(\text{ft})) - \left( \frac{0.7(\text{ft}^2)}{w_T(\text{ft})} \right) + 0.5(\text{ft})$$

- b. For the design without side slopes the following equation shall be used to determine the total effective depth:

$$d_E(\text{ft}) = d_p(\text{ft}) + [(0.3) \times d_s(\text{ft}) + (0.4) \times 1(\text{ft})]$$

The equation below, using the maximum ponding depth of 0.5', is used on the worksheet to find the minimum area required for the Bioretention Facility:

$$d_E(\text{ft}) = 0.5 (\text{ft}) + [(0.3) \times d_s(\text{ft}) + (0.4) \times 1(\text{ft})]$$

- 7) Calculate the minimum surface area,  $A_M$ , required for the Bioretention Facility. This does not include the curb surrounding the Bioretention Facility or side slopes.

$$A_M(\text{ft}^2) = \frac{V_{\text{BMP}}(\text{ft}^3)}{d_E (\text{ft})}$$

- 8) Enter the proposed surface area. This area shall not be less than the minimum required surface area.
- 9) Verify that side slopes are no steeper than 4:1 in the standard design, and are not required in the modified design.
- 10) Provide the diameter, minimum 6 inches, of the perforated underdrain used in the Bioretention Facility. See Appendix B for specific information regarding perforated pipes.
- 11) Provide the slope of the site around the Bioretention Facility, if used. The maximum slope is 3 percent for a standard design.
- 12) Provide the check dam spacing, if the site around the Bioretention Facility is sloped.
- 13) Describe the vegetation used within the Bioretention Facility.

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**L**andscaping and garden maintenance activities can be major contributors to water pollution. Soils, yard wastes, over-watering and garden chemicals become part of the urban runoff mix that winds its way through streets, gutters and storm drains before entering lakes, rivers, streams, etc. Urban runoff pollution contaminates water and harms aquatic life!

In Riverside County, report illegal discharges into the storm drain, call  
1-800-506-2555  
"Only Rain Down the Storm Drain"

**Important Links:**

Riverside County Household Hazardous Waste Collection Information  
1-800-304-2226 or [www.rivcwm.org](http://www.rivcwm.org)

Riverside County Backyard Composting Program  
1-800-366-SAVE

Integrated Pest Management (IPM) Solutions  
[www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu)

California Master Gardener Programs  
[www.mastergardeners.org](http://www.mastergardeners.org)  
[www.camastergardeners.ucdavis.edu](http://www.camastergardeners.ucdavis.edu)

California Native Plant Society  
[www.cnps.org](http://www.cnps.org)

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## ...Only Rain Down ...the Storm Drain

What you should know for...  
*Landscape and Gardening*

Best Management tips for:

- Professionals
- Novices
- Landscapers
- Gardeners
- Cultivators



# Tips for Landscape & Gardening

This brochure will help you to get the most of your lawn and gardening efforts and keep our waterways clean. Clean waterways provide recreation, establish thriving fish habitats, secure safe sanctuaries for wildlife, and add beauty to our communities. NEVER allow gardening products or waste water to enter the street, gutter or storm drain.

## General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.
- Plant native vegetation to reduce the amount of water, fertilizers and pesticides applied to the landscape.
- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.



## Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro-spray systems. Periodically inspect and fix leaks and misdirected sprinklers.

- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.



- Consider recycling your green waste and adding "nature's own fertilizer" to your lawn or garden.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.
- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains or sewers. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting.

- Try natural long-term common sense solutions first. Integrated Pest Management (IPM) can provide landscaping guidance and solutions, such as:

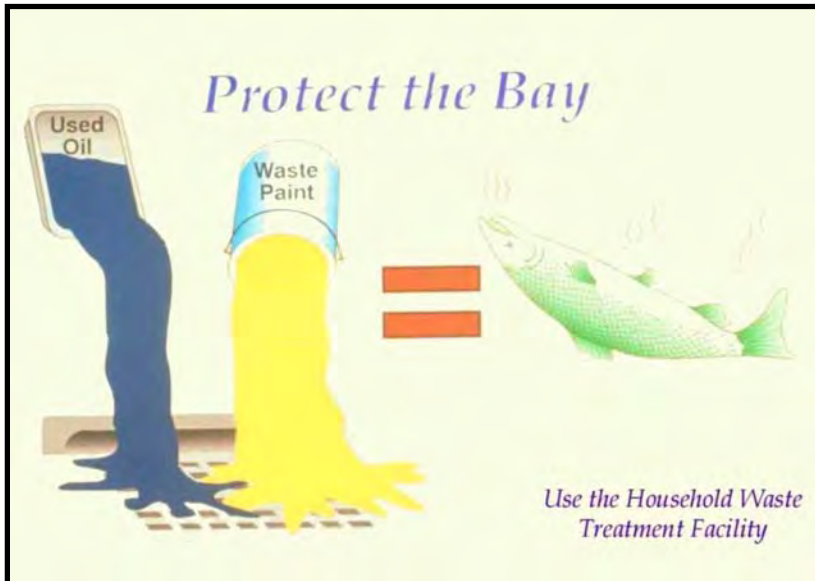
- ◆ **Physical Controls** - Try hand picking, barriers, traps or caulking holes to control weeds and pests.
- ◆ **Biological Controls** - Use predatory insects to control harmful pests.
- ◆ **Chemical Controls** - Check out [www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu) before using chemicals. Remember, all chemicals should be used cautiously and in moderation.

- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Waste Collection Center to be recycled.
- *Dumping toxics into the street, gutter or storm drain is illegal!*

[www.bewaterwise.com](http://www.bewaterwise.com) Great water conservation tips and drought tolerant garden designs.

[www.ourwaterourworld.com](http://www.ourwaterourworld.com) Learn how to safely manage home and garden pests.

Additional information can also be found on the back of this brochure. **Page 46**



Art Credit: Margie Winter

## 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.

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

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



***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.

## 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:

## Targeted Constituents

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



# SC-11 Spill Prevention, Control & Cleanup

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- Description of the facility, owner and address, activities and chemicals present
- Facility map
- Notification and evacuation procedures
- Cleanup instructions
- Identification of responsible departments
- Identify key spill response personnel
- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

## ***Suggested Protocols (including equipment needs)***

### *Spill Prevention*

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.
- If consistent illegal dumping is observed at the facility:
  - Post “No Dumping” signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
  - Landscaping and beautification efforts may also discourage illegal dumping.
  - Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.
- Store and contain liquid materials in such a manner that if the tank is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.
- If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.
- Routine maintenance:
  - Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Any collected liquids or soiled absorbent materials must be reused/recycled or properly disposed.
  - Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site’s spill control plan and/or proper spill cleanup procedures.
  - Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

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- 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)

# SC-11 Spill Prevention, Control & Cleanup

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- 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.



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## 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

# SC-11 Spill Prevention, Control & Cleanup

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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.

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- 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.

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- 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

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- 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/>



Photo Credit: Geoff Brosseau

## 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.

## 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.

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

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



***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/>

## 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.

## Approach

### ***Pollution Prevention***

- Perform the activity during dry periods.
- Use non-toxic chemicals for maintenance and minimize or eliminate the use of solvents.

### ***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.

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

## Targeted Constituents

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



# SC-32 Outdoor Equipment Operations

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- 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 sewerage 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>



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	✓



***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, polypropylene or 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/>

## 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	✓



- 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](http://www.dtsc.ca.gov))

California Integrated Waste Management Board ([www.ciwmb.ca.gov](http://www.ciwmb.ca.gov))

City of Santa Monica ([www.santa-monica.org/environment](http://www.santa-monica.org/environment))

City of Palo Alto ([www.city.palo-alto.ca.us/cleanbay](http://www.city.palo-alto.ca.us/cleanbay))

City and County of San Francisco, Department of the Environment  
([www.ci.sf.ca.us/sfenvironment](http://www.ci.sf.ca.us/sfenvironment))

Earth 911 ([www.earth911.org/master.asp](http://www.earth911.org/master.asp))

Environmental Finance Center Region IX ([www.greenstart.org/efc9](http://www.greenstart.org/efc9))

Flex Your Power ([www.flexyourpower.ca.gov](http://www.flexyourpower.ca.gov))

GreenBiz.com ([www.greenbiz.com](http://www.greenbiz.com))

Green Business Program ([www.abag.org/bayarea/enviro/gbus/gb.html](http://www.abag.org/bayarea/enviro/gbus/gb.html))

Pacific Industrial and Business Association ([www.piba.org](http://www.piba.org))

Sacramento Clean Water Business Partners ([www.sacstormwater.org](http://www.sacstormwater.org))

USEPA BMP fact sheet – Alternative products  
([http://cfpub.epa.gov/npdes/stormwater/menuofbmps/poll\\_2.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/poll_2.cfm))

USEPA Region IX Pollution Prevention Program ([www.epa.gov/region09/p2](http://www.epa.gov/region09/p2))

Western Regional Pollution Prevention Network ([www.westp2net.org](http://www.westp2net.org))

**Metals (mercury, copper)**

National Electrical Manufacturers Association - Environment, Health and Safety  
([www.nema.org](http://www.nema.org))

Sustainable Conservation ([www.suscon.org](http://www.suscon.org))

Auto Recycling Project

Brake Pad Partnership

**Pesticides and Chemical Fertilizers**

Bio-Integral Resource Center ([www.birc.org](http://www.birc.org))

California Department of Pesticide Regulation ([www.cdpr.ca.gov](http://www.cdpr.ca.gov))

University of California Statewide IPM Program ([www.ipm.ucdavis.edu/default.html](http://www.ipm.ucdavis.edu/default.html))

## ***Dioxins***

Bay Area Dioxins Project (<http://dioxin.abag.ca.gov/>)



## 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.

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

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



# SC-41 Building & Grounds Maintenance

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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.

# SC-41 Building & Grounds Maintenance

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- 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/>



## 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.

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Recycle

## Targeted Constituents

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



# SC-42 Building Repair and Construction

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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 vacor 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

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## 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



## 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.

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

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





# SC-43 Parking/Storage Area Maintenance

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## ***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.

# Parking/Storage Area Maintenance SC-43

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- 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

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## 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/>



## 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.

## 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).

## Targeted Constituents

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



- 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 Stream 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.



# SC-44      Drainage System Maintenance

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## 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](http://www.epa.gov/npdes/menuofbmps/poll_16.htm)

## General Description

Drain inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris. There are a multitude of inserts of various shapes and configurations, typically falling into one of three different groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene “bag” is placed in the wire mesh box. The bag takes the form of the box. Most box products are one box; that is, the setting area and filtration through media occur in the same box. Some products consist of one or more trays or mesh grates. The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon.

## Inspection/Maintenance Considerations

Washout problems increase with rain intensity. Susceptibility of accumulated sediments to be re-suspended at low flow rates, can be corrected with an energy dissipater between gate and treatment areas.

Inspection Activities	Suggested Frequency
<ul style="list-style-type: none"> <li>Inspect for sediment buildup and proper functioning.</li> </ul>	At the beginning of the wet season and after significant storms
<ul style="list-style-type: none"> <li>Verify that stormwater enters the unit and does not leak around the perimeter.</li> </ul>	After construction.
Maintenance Activities	Suggested Frequency
<ul style="list-style-type: none"> <li>Remove sediment as needed.</li> </ul>	At the beginning of the wet season and as necessary

## Maintenance Concerns, Objectives, and Goals

- Sediment Removal

## Targeted Constituents

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

### Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.





## 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.



- 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.



## 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



– DRAINS TO OCEAN” and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

### ***Redeveloping Existing Installations***

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of “redevelopment”, then the requirements stated under “designing new installations” above should be included in all project design plans.

### **Additional Information**

#### ***Maintenance Considerations***

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner’s association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

#### ***Placement***

- Signage on top of curbs tends to weather and fade.
- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

### **Supplemental Information**

#### ***Examples***

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

### **Other Resources**

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

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## Design Objectives

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- 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).



- 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 from 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.



## 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.

## 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.

## Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey



- 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.

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