

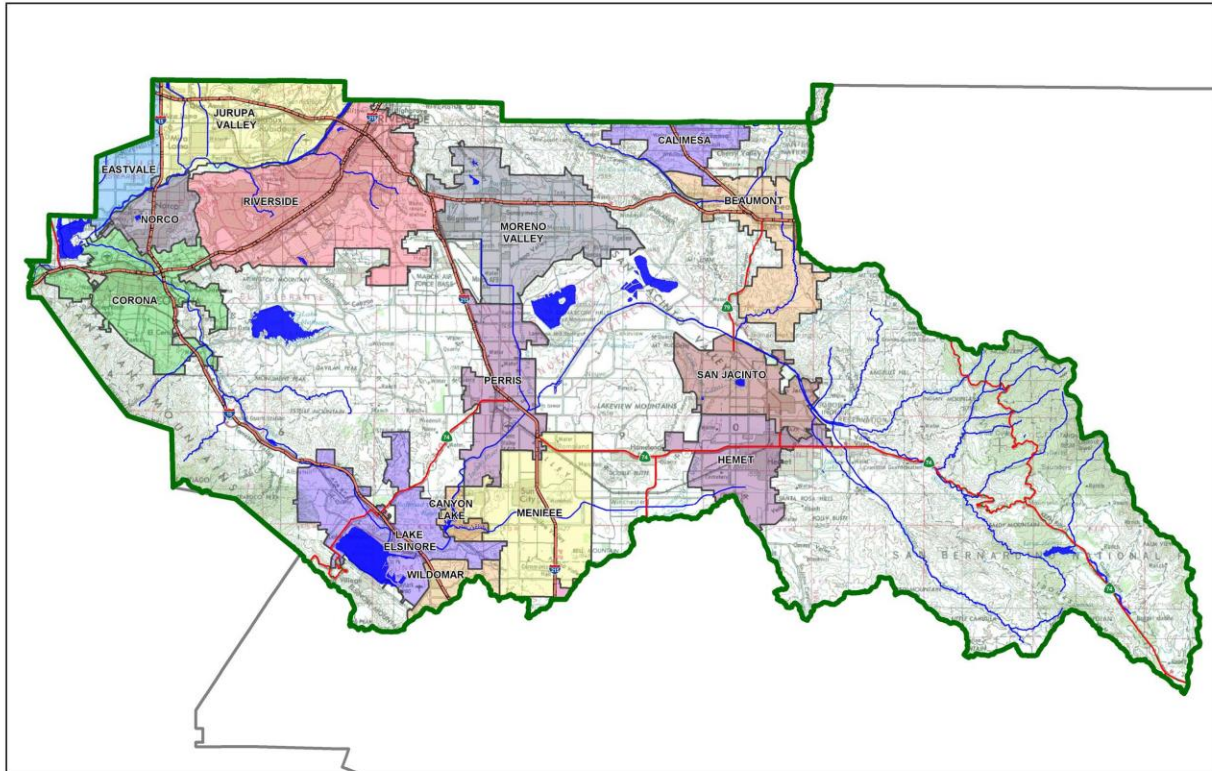
Project Specific Water Quality Management Plan

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

Project Title: Cottonwood Apartments Development

Development No:

Design Review/Case No: LWQ24-0025



- Preliminary
- Final

Original Date Prepared: 4/18/24

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Prepared for Compliance with

Regional Board Order No. R8-2010-0033

Template revised June 30, 2016

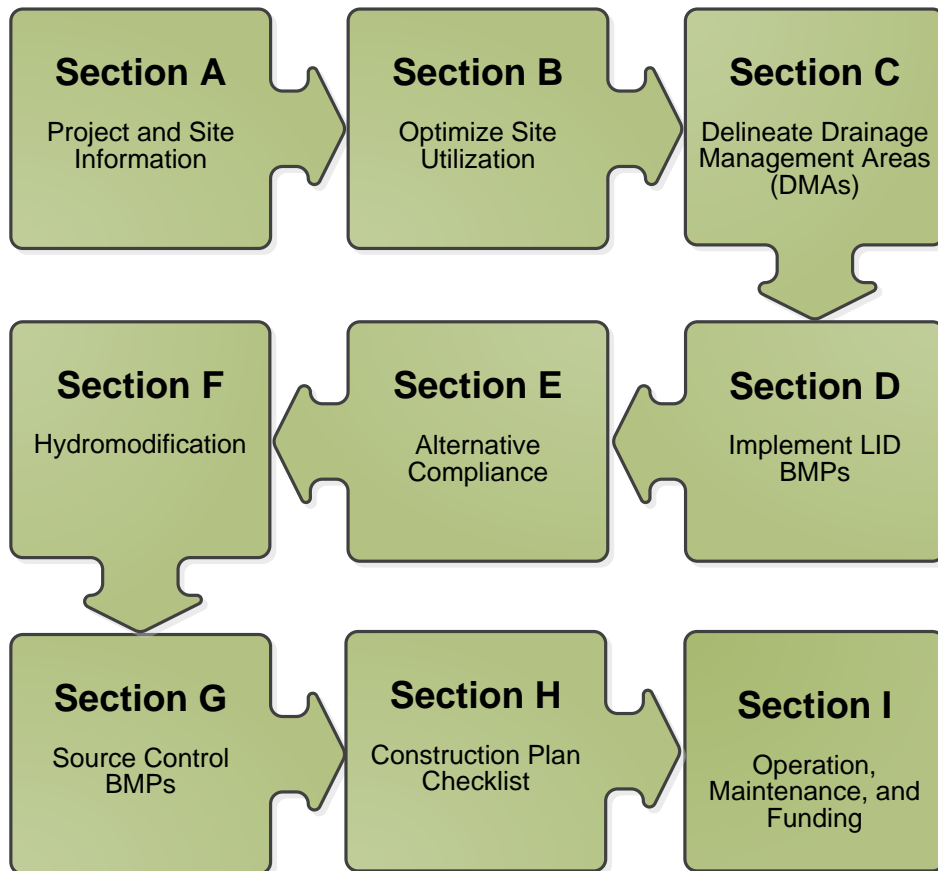
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A Brief Introduction

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.



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for WJK Development Co by Blue Engineering & Consulting, Inc. for the Cottonwood Apartments Development Project project.

This WQMP is intended to comply with the requirements of City of Moreno Valley for Ordinance 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 City of Moreno Valley Water Quality Ordinance (Municipal Code Chapter 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

Grant Keene

Owner's Printed Name

2/4/25

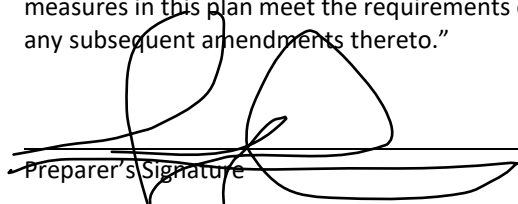
Date

President

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

Angel Cesar

Preparer's Printed Name

1-28-2025

Date

President/CEO

Preparer's Title/Position

Preparer's Licensure:



Table of Contents

Section A: Project and Site Information.....	6
A.1 Maps and Site Plans.....	7
A.2 Identify Receiving Waters.....	7
A.3 Additional Permits/Approvals required for the Project:	8
Section B: Optimize Site Utilization (LID Principles)	9
Section C: Delineate Drainage Management Areas (DMAs).....	10
Section D: Implement LID BMPs	12
D.1 Infiltration Applicability	12
D.2 Harvest and Use Assessment.....	13
D.3 Bioretention and Biotreatment Assessment	15
D.4 Feasibility Assessment Summaries	16
D.5 LID BMP Sizing	17
Section E: Alternative Compliance (LID Waiver Program)	19
E.1 Identify Pollutants of Concern	20
E.2 Stormwater Credits	21
E.3 Sizing Criteria.....	21
E.4 Treatment Control BMP Selection	22
Section F: Hydromodification	23
F.1 Hydrologic Conditions of Concern (HCOC) Analysis.....	23
F.2 HCOC Mitigation.....	24
Section G: Source Control BMPs.....	25
Section H: Construction Plan Checklist	29
Section I: Operation, Maintenance and Funding.....	30

List of Tables

Table A.1 Identification of Receiving Waters.....	7
Table A.2 Other Applicable Permits.....	8
Table C.1 DMA Classifications.....	10
Table C.2 Type 'A', Self-Treating Areas.....	10
Table C.3 Type 'B', Self-Retaining Areas.....	10
Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas.....	11
Table C.5 Type 'D', Areas Draining to BMPs.....	11
Table D.1 Infiltration Feasibility.....	12
Table D.2 LID Prioritization Summary Matrix.....	16
Table D.3 DCV Calculations for LID BMPs.....	17
Table E.1 Potential Pollutants by Land Use Type.....	20
Table E.2 Water Quality Credits.....	21
Table E.3 Treatment Control BMP Sizing.....	21
Table E.4 Treatment Control BMP Selection.....	22
Table F.1 Hydrologic Conditions of Concern Summary.....	23
Table G.1 Permanent and Operational Source Control Measures.....	26
Table H.1 Construction Plan Cross-reference.....	29

List of Appendices

Appendix 1: Maps and Site Plans.....	31
Appendix 2: Construction Plans.....	32
Appendix 3: Soils Information.....	33
Appendix 4: Historical Site Conditions.....	34
Appendix 5: LID Infeasibility.....	35
Appendix 6: BMP Design Details.....	36
Appendix 7: Hydromodification.....	37
Appendix 8: Source Control.....	38
Appendix 9: O&M.....	39
Appendix 10: Educational Materials.....	- 6 -

Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Residential
Planning Area:	Residential
Community Name:	Cottonwood Village
Development Name:	Cottonwood Apartments Development Project
PROJECT LOCATION	
Latitude & Longitude (DMS): 33°55'31.83"N, 117°13'23.59"W	
Project Watershed and Sub-Watershed: Middle Santa Ana River Watershed	
Gross Acres: 9.3	
APN(s): 479-140-022	
Map Book and Page No.: 11/10	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Residential
Proposed or Potential SIC Code(s)	N/A
Area of Impervious Project Footprint (SF)	403,539
Total Area of <u>proposed</u> Impervious Surfaces within the Project Footprint (SF)/or Replacement	288,249
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 Footprint (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:	n/a
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)	n/a
What is the Water Quality Design Storm Depth for the project?	0.66
<p>Project Description</p> <p>Tentative Tract No 34544 is a subdivision project of approximately 9.40 acres located along the north side of Cottonwood Avenue, east of Perris Boulevard and west of Kitching Street in the City of Moreno Valley.</p> <p>The site is a relatively flat grass area, drains towards the southeast into an existing catch basin connecting to an existing 96-inch public storm drain system in Cottonwood Avenue (Sunnymead Line "P"). The existing drainage along the north property line flows north and south. Storm water runoff from the proposed development will maintain same existing drainage pattern and will be collected by on-site drainage system and connect to underground system.</p> <p>Due to the constrains of the site, drainage mitigation is split up into 5 different BMPs. Modular wetland systems (MWS) with upstream storage will be used for each of the BMPs. Low flow to the MWS and high flow bypass through the manhole to an existing 96" offsite storm drain line along Cottonwood Ave.</p>	

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
- BMP Locations (Lat/Long)

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
Kitching Street Channel	N/A	N/A	n/a
Perris Valley Storm Drain	None	REC1, REC2, WARM, WILD, RARE	0.5 miles
San Jacinto River Reach 3	None	AGR,GWR,REC1,REC2,WARM,WILD,RARE	1.5 miles
Canyon Lake (Railroad Canyon Reservoir)	Dissolved Oxygen, PH, Total Dissolved Solids, Ammonia, Nutrients	AGR, GWR, ,MUN, REC1,REC2, WARM,WILD,COMM	n/a
San Jacinto River Reach 1	Aluminum	AGR ,GWR, MUN,RARE,REC1,REC2,WARM,WILD	9 miles
Lake Elsinore	Nutrients, Ammonia,microcystins, ddt,pH,Dissolved Oxygen, Total Dissolved Solids, Organic enrichment/Low dissolved oxygen, PCBs, toxicity	REC1, REC2,COMM,WARM,WILD,RARE	18 miles
Temescal Wash	None	AGR,GWR,MUN,REC1,REC2,WARM,WILD,RARE	17 miles
Santa Ana River, reach 3	Pathogens, Bifenthrin, copper, lead pyrethroid, toxicity	AGR, GWR , REC1,REC2, WARM, WILD, RARE,SPWN	19 miles
Santa Ana River, reach 2	Cadmium	AGR,GWR,REC1,REC2,WARM,WILD,RARE,SPWN	27 miles
Santa Ana River, reach 1	None	REC1,REC2, WARM, WILD	n/a

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 type="checkbox"/> Y	<input checked="" 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> City of Moreno Valley Building and Grading Permits Riverside County FCD - Connection Permit to public storm drain in Cottonwood Ave.	<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.

Consideration of "highest and best use" of the discharge should also be considered. For example, Lake Elsinore is evaporating faster than runoff from natural precipitation can recharge it. Requiring infiltration of 85% of runoff events for projects tributary to Lake Elsinore would only exacerbate current water quality problems associated with Pollutant concentration due to lake water evaporation. In cases where rainfall events have low potential to recharge Lake Elsinore (i.e. no hydraulic connection between groundwater to Lake Elsinore, or other factors), requiring infiltration of Urban Runoff from projects is counterproductive to the overall watershed goals. Project proponents, in these cases, would be allowed to discharge Urban Runoff, provided they used equally effective filtration-based BMPs.

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?*Yes. The Site mimics the existing topography by draining from Northwest to Southeast.*

Did you identify and protect existing vegetation? If so, how? If not, why?*No, trees do not exist on site. The planting of new vegetation will occur throughout the site to enhance vegetation.*

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?*Yes, compaction will be limited to non-landscape areas.*

Did you identify and minimize impervious area? If so, how? If not, why?*Yes, the drive aisles, parking stalls, and hardscape are set to City minimal to increase pervious area.*

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?*Yes, water will be directed to pervious areas.*

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) ¹²	Area (Sq. Ft.)	DMA Type
DMA-1	Mixed Surface	51,877	D
DMA-2	Mixed Surface	97,890	D
DMA-3	Mixed Surface	133,429	D
DMA-4	Mixed Surface	106,147	D
DMA-5	Mixed Surface	14,367	D

¹Reference Table 2-1 in the WQMP Guidance Document to populate this column

²If multi-surface provide back-up

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

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
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 Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]
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	Impervious fraction	Product	DMA name /ID	Area (square feet)	Ratio
	[A]		[B]			[C] = [A] x [B]	[D]
N/A							

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

DMA Name or ID	BMP Name or ID
DMA-1	Modular Wetland with upstream detention
DMA-2	Modular Wetland with upstream detention
DMA-3	Modular Wetland with upstream detention
DMA-4	Modular Wetland with upstream detention
DMA-5	Modular Wetland with upstream detention

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; proceed to section D.3

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

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

Infiltration Feasibility

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

Table D.1 Infiltration Feasibility

Does the project site...	YES	NO
...have any DMAs with a seasonal high groundwater mark shallower than 10 feet? 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:	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 identify other site-specific factors that would preclude effective and safe infiltration? Describe here:		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.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If none 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: 2.65

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: 6.62

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: 1.05

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: 6.95

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)
6.95	2.65

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: 276

Project Type: Residential

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: 6.62

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: 108

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: 715

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

Minimum required Toilet Users (Step 4)	Projected number of toilet users (Step 1)
715	276

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: Projected Average Daily Use (gpd)

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: Insert Area (Acres)

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-4 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-4: Enter Value

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 gallons per day of non-potable use that would be required.

Minimum required use: Minimum use required (gpd)

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the projected average daily use (Step 1) to the minimum required non-potable use (Step 4).

Minimum required non-potable use (Step 4)	Projected average daily use (Step 1)
Minimum use required (gpd)	Projected Average Daily Use (gpd)

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 per Section 3.4.2 of the WQMP Guidance Document.

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.

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				No LID (Alternative Compliance)
	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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input 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.

N/A

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	BMP1		
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
	[A]		[B]	[C]	[A] x [C]			
DMA- 1	51,877	Mixed	0.8	0.60	31,090			
	$A_T = \Sigma[A]$				$\Sigma = [D]$ 31,090	[E] 0.66	$[F] = \frac{[D] \times [E]}{12}$ 1,710	[G] 1,728

[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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP2		
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
	[A]		[B]	[C]	[A] x [C]			
DMA- 2	97,870	Mixed	0.8	0.60	58,653			
	$A_T = \Sigma[A]$				$\Sigma = [D]$ 58,653	[E] 0.66	$[F] = \frac{[D] \times [E]}{12}$ 3,226	[G] 3,259

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I _f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP3		
	[A]		[B]	[C]	[A] x [C]			
DMA-3	133,429	Mixed	0.8	0.60	79963.5	Design Storm Depth (in)	Design Capture Volume, V _{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
	A _T = Σ[A]				Σ= [D] 79,963.5	[E] 0.66	[F] = $\frac{[D] \times [E]}{12}$ 4,398	[G] 4,437

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I _f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP4		
	[A]		[B]	[C]	[A] x [C]			
DMA-4	106,147	Mixed	0.8	0.60	63,614	Design Storm Depth (in)	Design Capture Volume, V _{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
	A _T = Σ[A]				Σ= [D] 63,614	[E] 0.66	[F] = $\frac{[D] \times [E]}{12}$ 3,499	[G] 3,554

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I _f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP5		
	[A]		[B]	[C]	[A] x [C]			
DMA-5	14,367	Mixed	0.8	0.60	8,620	Design Storm Depth (in)	Design Capture Volume, V _{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
	A _T = Σ[A]				Σ= [D] 8,620	[E] 0.66	[F] = $\frac{[D] \times [E]}{12}$ 474	[G] 488

Section E: Alternative Compliance (LID Waiver Program)

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

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

- Or -

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

E.1 Identify Pollutants of Concern

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

Table E.1 Potential Pollutants by Land Use Type

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

P = Potential

N = Not Potential

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

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

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

⁽⁴⁾ *Specifically petroleum hydrocarbons*

⁽⁵⁾ *Specifically solvents*

⁽⁶⁾ *Bacterial indicators are routinely detected in pavement runoff*

E.2 Stormwater Credits

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

Table E.2 Water Quality Credits

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

¹Cannot Exceed 50%

²Obtain 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 Impervious Fraction, I _f	DMA Runoff Factor	DMA Area x Runoff Factor	Enter BMP Name / Identifier Here			
	[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 or Design Flow Rate (cubic feet or cfs)	Total Storm Water Credit % Reduction	Proposed Volume or Flow on Plans (cubic feet or cfs)
	$A_T = \sum[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D] \times [E]}{[G]}$	$[F] \times (1-[H])$	[I]

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

[E] is for Flow-Based Treatment Control BMPs [E] = .2, for Volume-Based Control Treatment BMPs, [E] obtained from Exhibit A in the WQMP Guidance Document

[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12

[H] is from the Total Credit Percentage as Calculated from Table E.2 above

[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

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

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

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

Table E.4 Treatment Control BMP Selection

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

¹ Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.

² Cross Reference Table E.1 above to populate this column.

³ As documented in a Co-Permittee Approved Study and provided in Appendix 6.

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

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

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The 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 concentration¹ of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

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

Does the project qualify for this HCOC Exemption? Y N

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

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	Post-condition	% Difference
Time of Concentration	INSERT VALUE	INSERT VALUE	INSERT VALUE
Volume (Cubic Feet)	INSERT VALUE	INSERT VALUE	INSERT VALUE

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

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, Santa Ana River, or other lake, reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Susceptibility 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:

Canyon Lake

F.2 HCOC Mitigation

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

- a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.
- b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.
- c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

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

Section G: Source Control BMPs

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

1. **Identify Pollutant Sources:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.
2. **Note Locations on Project-Specific WQMP Exhibit:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.
3. **Prepare a Table and Narrative:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.
4. **Identify Operational Source Control BMPs:** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
On-Site Storm Drain Inlets	<p>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.</p>	<p>Maintain and periodically repaint or replace inlet markings.</p> <p>Provide stormwater pollution prevention information to new site owners, lessees, or operators.</p> <p>See applicable operational BMPs in Fact Sheet SC-44, “Drainage System Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com</p> <p>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.”</p>
Landscape/Outdoor Pesticide Use	<p>Final landscape plans will accomplish all of the following: Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.</p> <p>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.</p> <p>Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.</p> <p>Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological</p>	<p>Maintain landscaping using minimum or no pesticides.</p> <p>Provide IPM information to new owners, lessees and operators.</p> <p>See applicable operational BMPs in “What you should know for...Landscaping and Gardening” at http://reflood.org/stormwater/</p>

	consistency, and plant interactions.	
Pools, spas, ponds, decorative fountains, and other water features	If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	See applicable operational BMPs in “Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain” at http://reflood.org/stormwater/
Refuse areas	State how site refuse will be handled and provide supporting detail to what is shown on plans. State that signs will be posted on or near dumpsters with the words, “Do not dump hazardous materials here” or similar.	Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post “no hazardous materials” signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, “Waste Handling and Disposal” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Outdoor storage of equipment or materials	Sth is prohibited on this site	
Vehicle and Equipment Cleaning	State that it is prohibited on this site	
Vehicle/Equipment Repair and Maintenance	State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.	
Fire Sprinkler Test Water	Provide a means to drain fire sprinkler test water to the sanitary sewer.	See the note in Fact Sheet SC-41, “Building and Grounds Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Roofing, gutters, and trim; condensate drain lines	Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. Considerate drain lines may discharge to landscaped areas if	

	<p>the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.</p> <p>Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.</p> <p>Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.</p> <p>Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.</p> <p>Include controls for other sources as specified by local reviewer.</p>	
Plazas, sidewalks, and parking lots		Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect wash water containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Section H: Construction Plan Checklist

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

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	BMP Location (Lat/Long)
1	Biofiltration for DMA-1	WQMP Exhibit – Sheet 9 of 9	33°55'29.41"N, 117°13'22.10"W
2	Biofiltration for DMA-2	WQMP Exhibit – Sheet 9 of 9	33°55'29.12"N, 117°13'19.82"W
3	Biofiltration for DMA-3	WQMP Exhibit – Sheet 9 of 9	33°55'29.23"N, 117°13'01.23"W
4	Biofiltration for DMA-4	WQMP Exhibit – Sheet 9 of 9	33°55'29.98"N, 117°13'95.01"W
5	Biofiltration for DMA-5	WQMP Exhibit – Sheet 9 of 9	33°55'29.01"N, 117°13'65.56"W

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: The owner will maintain the BMPS until an HOA is established.

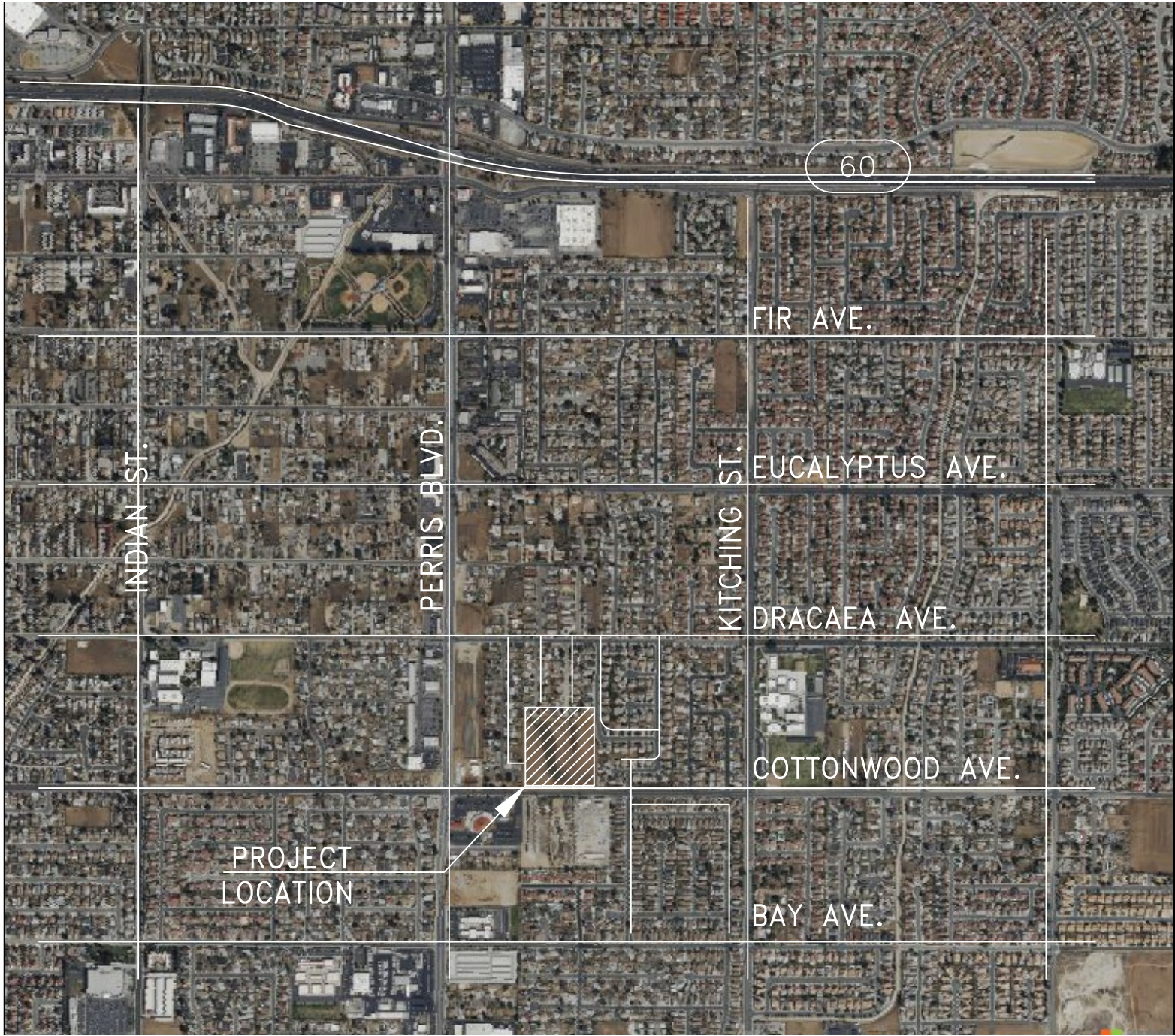
Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

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



60

FIR AVE.

INDIAN ST.

PERRIS BLVD.

KITCHING ST.

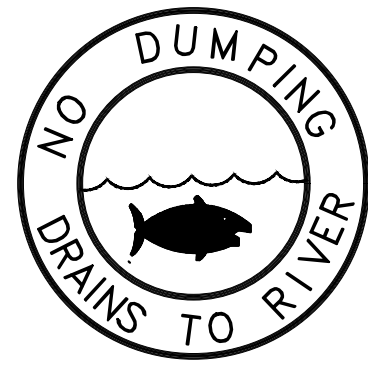
EUCALYPTUS AVE.

DRACAEA AVE.

COTTONWOOD AVE.

PROJECT
LOCATION

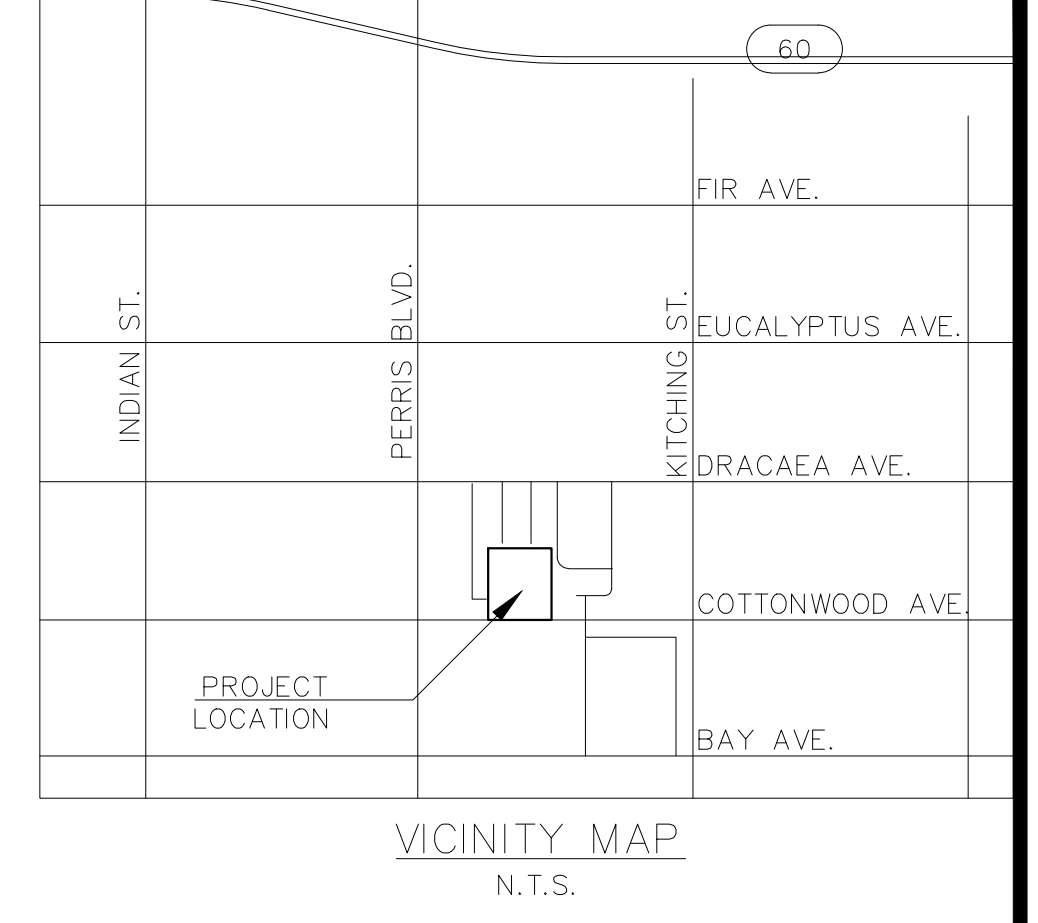
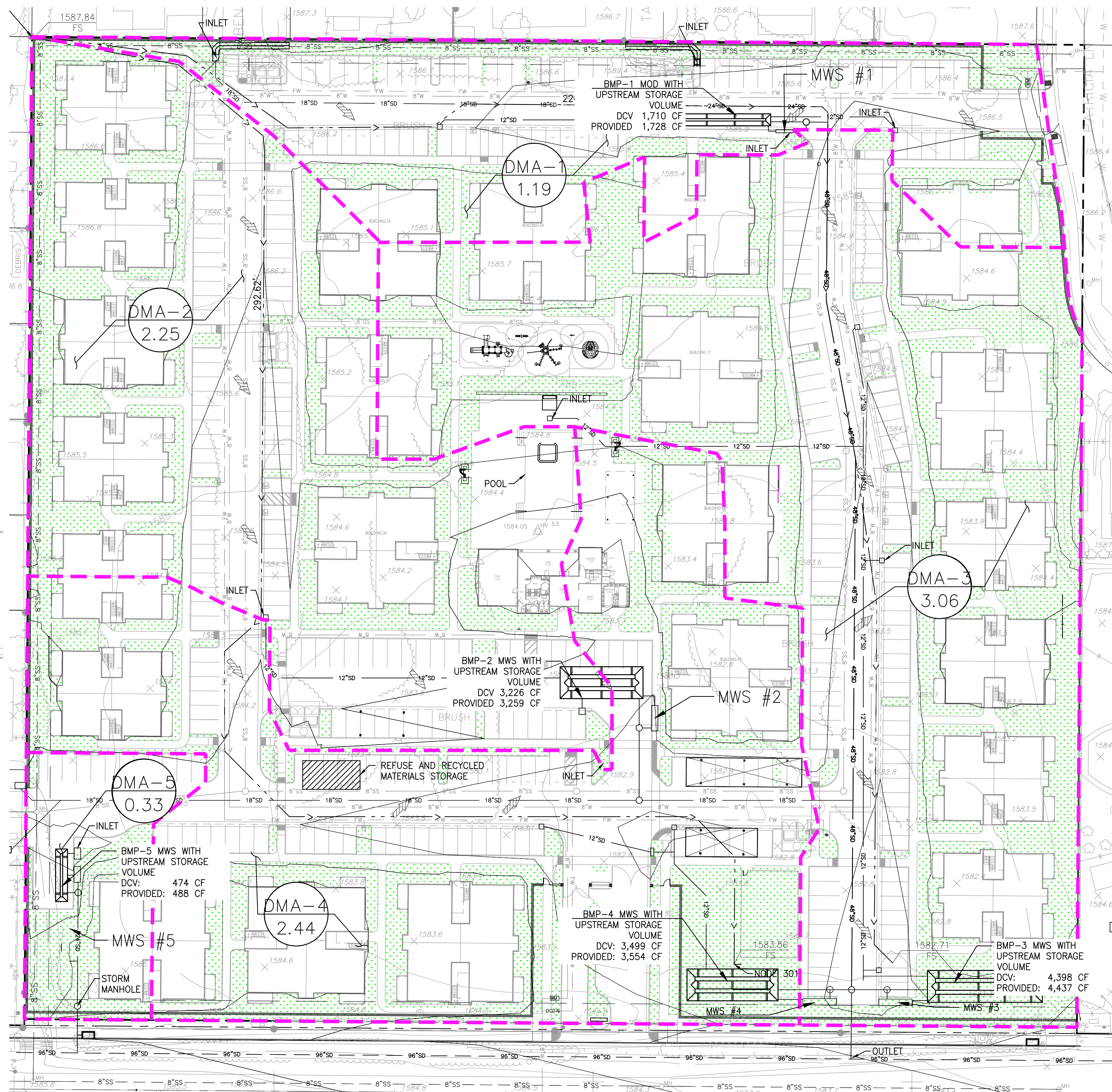
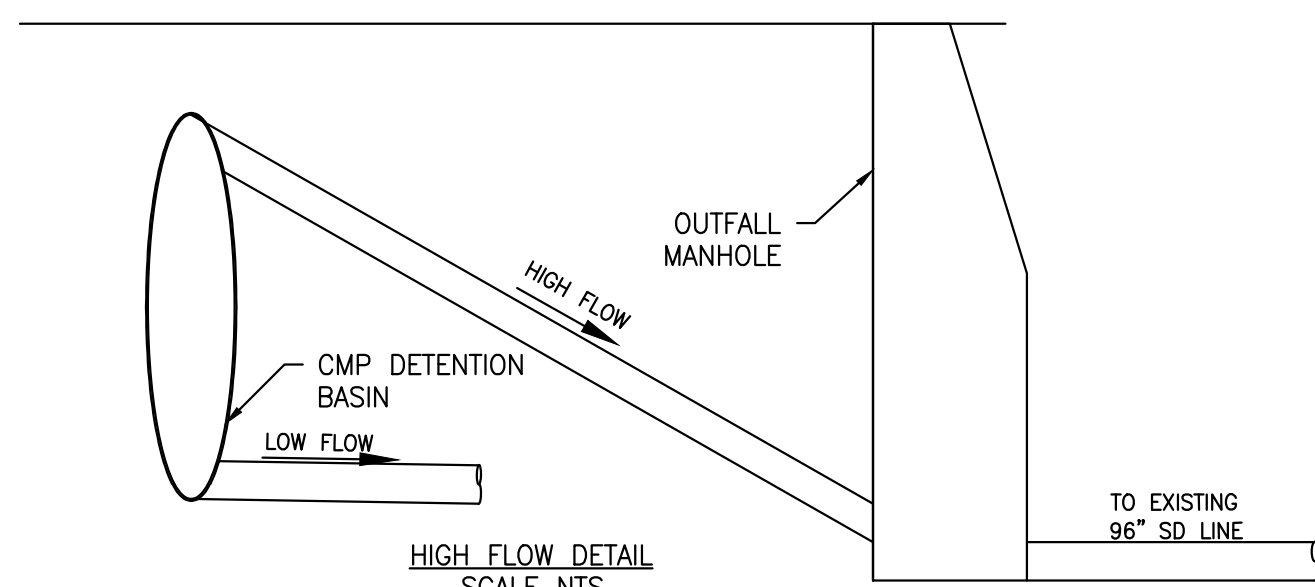
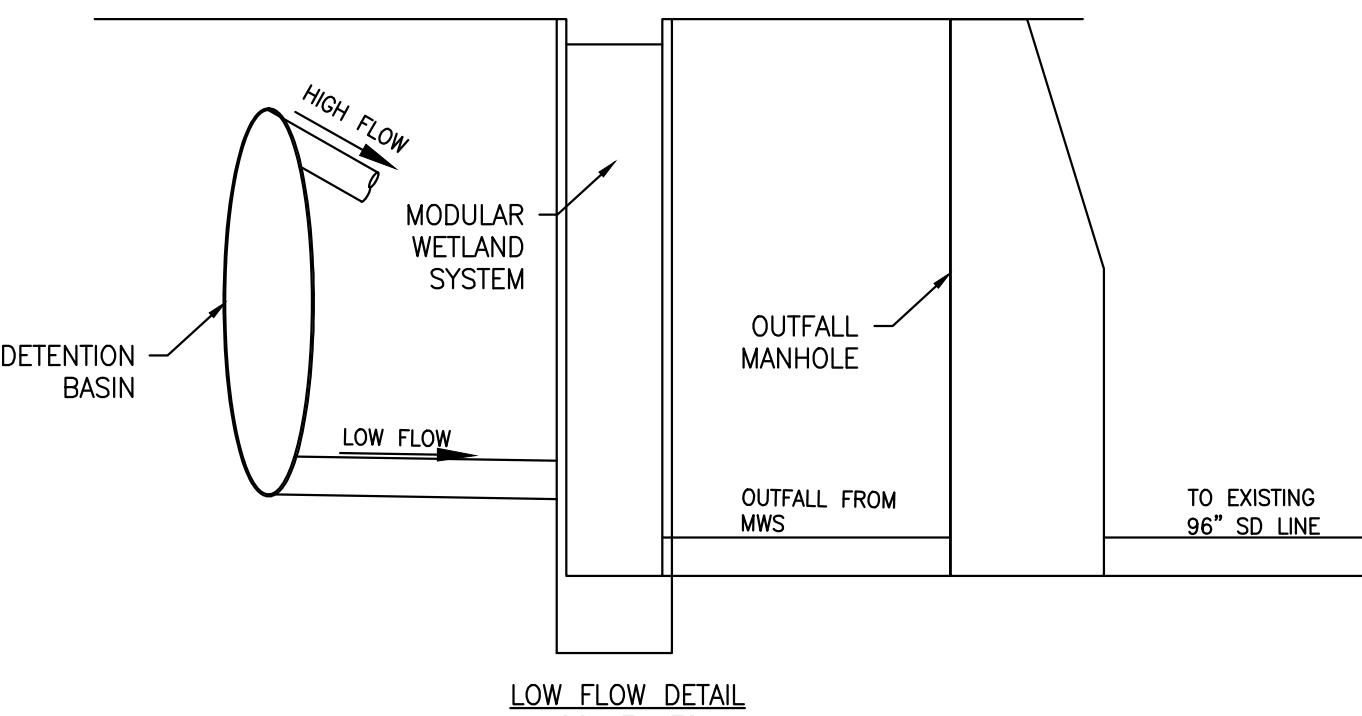
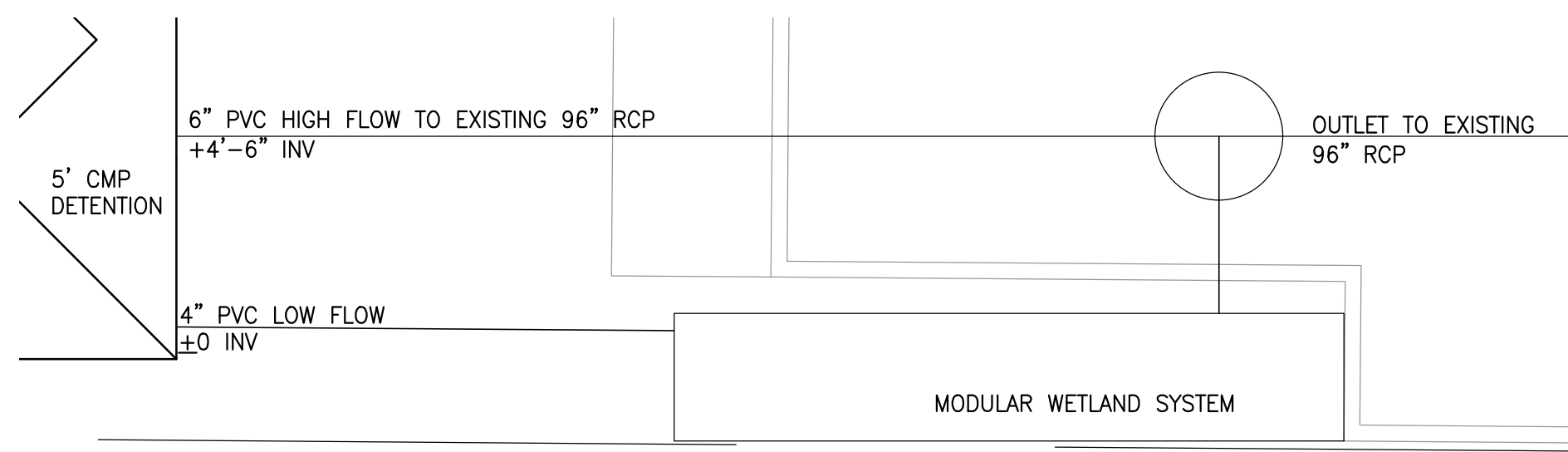
BAY AVE.



STORM DRAIN INLET STENCIL
N.T.S.

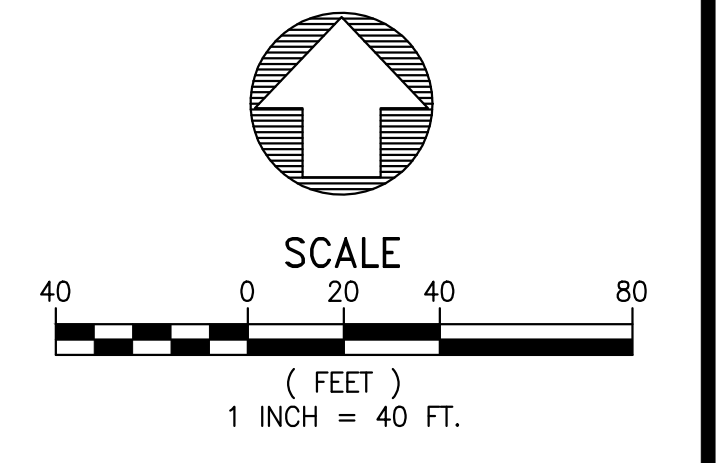
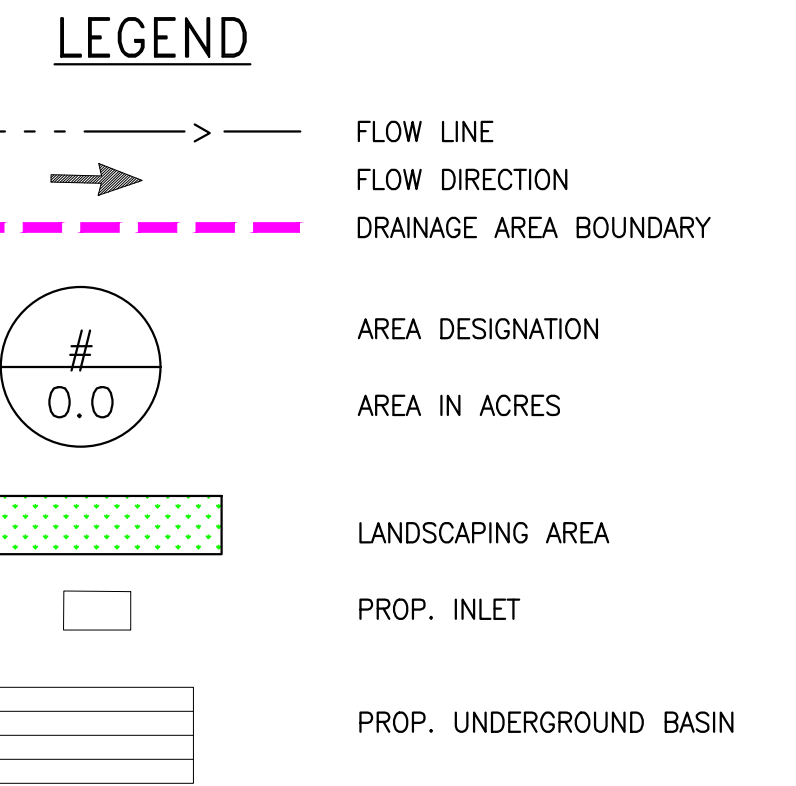
SOURCE CONTROL	
SOURCE CONTROL	LOCATION
STORM DRAIN INLET STENCIL	ALL INLETS
UNDERGROUND STORAGE	MARKED ON PLAN
POOL CLEANOUT	NORTH OF POOL
REFUSE AREA	MARKED ON PLAN

OUTDOOR STORAGE OF EQUIPMENT OR MATERIALS IS PROHIBITED ON THIS SITE
 VEHICLE AND EQUIPMENT CLEANING IS PROHIBITED ON THIS SITE
 VEHICLE EQUIPMENT REPAIR AND MAINTENANCE IS PROHIBITED ON THIS SITE



DMA AREA SUMMARY TABLE		
DMA ID	SURFACE TYPE	
	PERVIOUS AREA (S.F.)	IMPERVIOUS AREA (S.F.)
DMA 1	14,837	37,040
DMA 2	27,997	69,893
DMA 3	38,161	95,268
DMA 4	30,358	75,789
DMA 5	4,109	10,258
TOTAL	115,461	288,249
%	28.6	71.4

DMA ID	DMA TRIBUTARY AREA (S.F.)	DESIGN CAPTURE VOLUME (DCV)(C.F.)	VOLUME PROVIDED (C.F.)*
1	51,877	1,712	1,728
2	97,890	3,230	3,259
3	133,429	4,403	4,437
4	106,147	3,503	3,554
5	14,367	474	488
TOTAL	403,710	13,322	13,466



NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

CALL 811 or 1-800-422-4133 2 Working Days Before You Dig WWW.CALL811.COM

REVIEW BY CITY STAFF

BENCHMARK

BASIS OF BEARING

THE BEARING OF N 89°33'40" W FOR THE CENTERLINE OF DRACEA AVENUE AS SHOWN ON TRACT NO. 7735-1 FILED IN BOOK 96 PAGES 15-17 OF RIVERSIDE COUNTY RECORDS, WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR./DATE
		E.O.R.	REVISION		

CITY OF MORENO VALLEY
ACCEPTED BY:

ENGINEER OF RECORD'S SEAL



BLUE ENGINEERING
10535 FOOTHILL BLVD., SUITE 440, RANCHO CUCAMONGA, CA, 91730

UNDER THE SUPERVISION OF:
ANGEL CESAR RCE 87222 DATE

CITY OF MORENO VALLEY

WQMP
COTTONWOOD APARTMENTS
DEVELOPMENT

SHEET 9 OF 9
CITY ID No

Receiving Map

Write a description for your map.

Legend

- Project Site
- Receiving Water Path



SANTA ANA RIVER, REACH 1

SANTA ANA RIVER, REACH 2

SANTA ANA RIVER, REACH 3

TEMESCULA CREEK, REACH 1

TEMESCULA CREEK, REACH 2

LEE LAKE

TEMESCULA CREEK, REACH 4

LAKE ELSINORE

SAN JACINTO RIVER REACH 3

TEMESCULA CREEK, REACH 5

Project Location

Kitching Street Channel

PERRIS VALLEY STORM DRAIN

SAN JACINTO RIVER REACH 1

CANYON LAKE



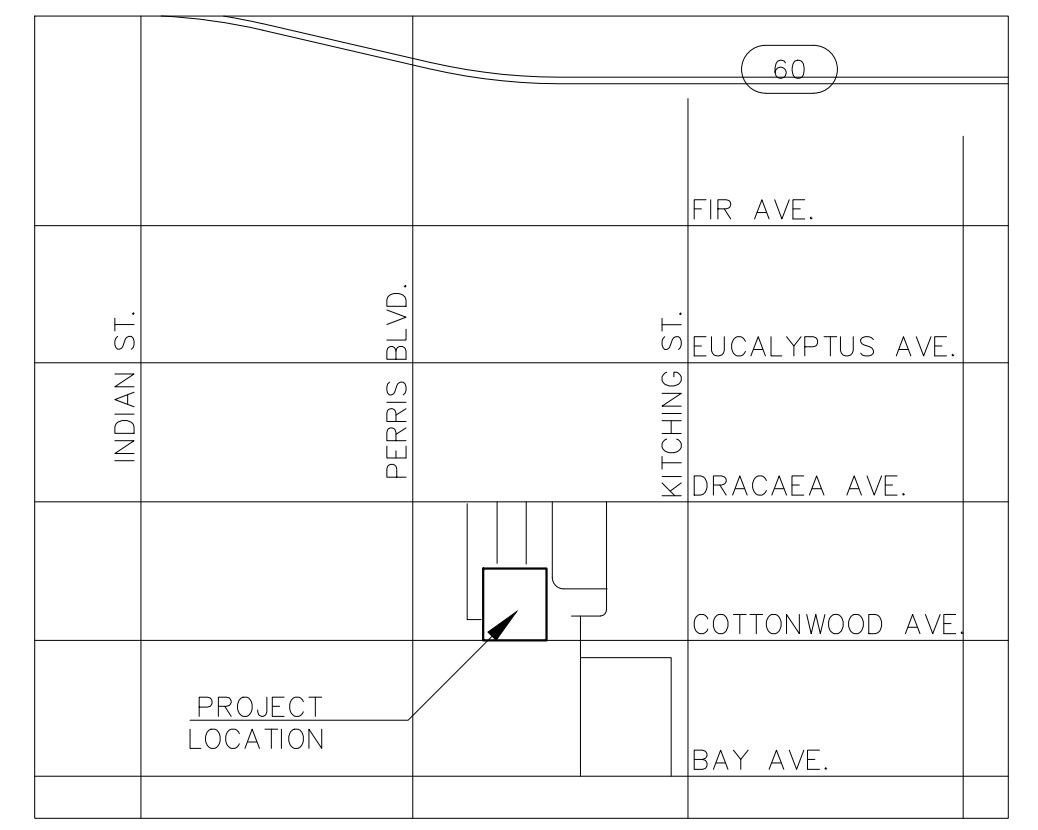
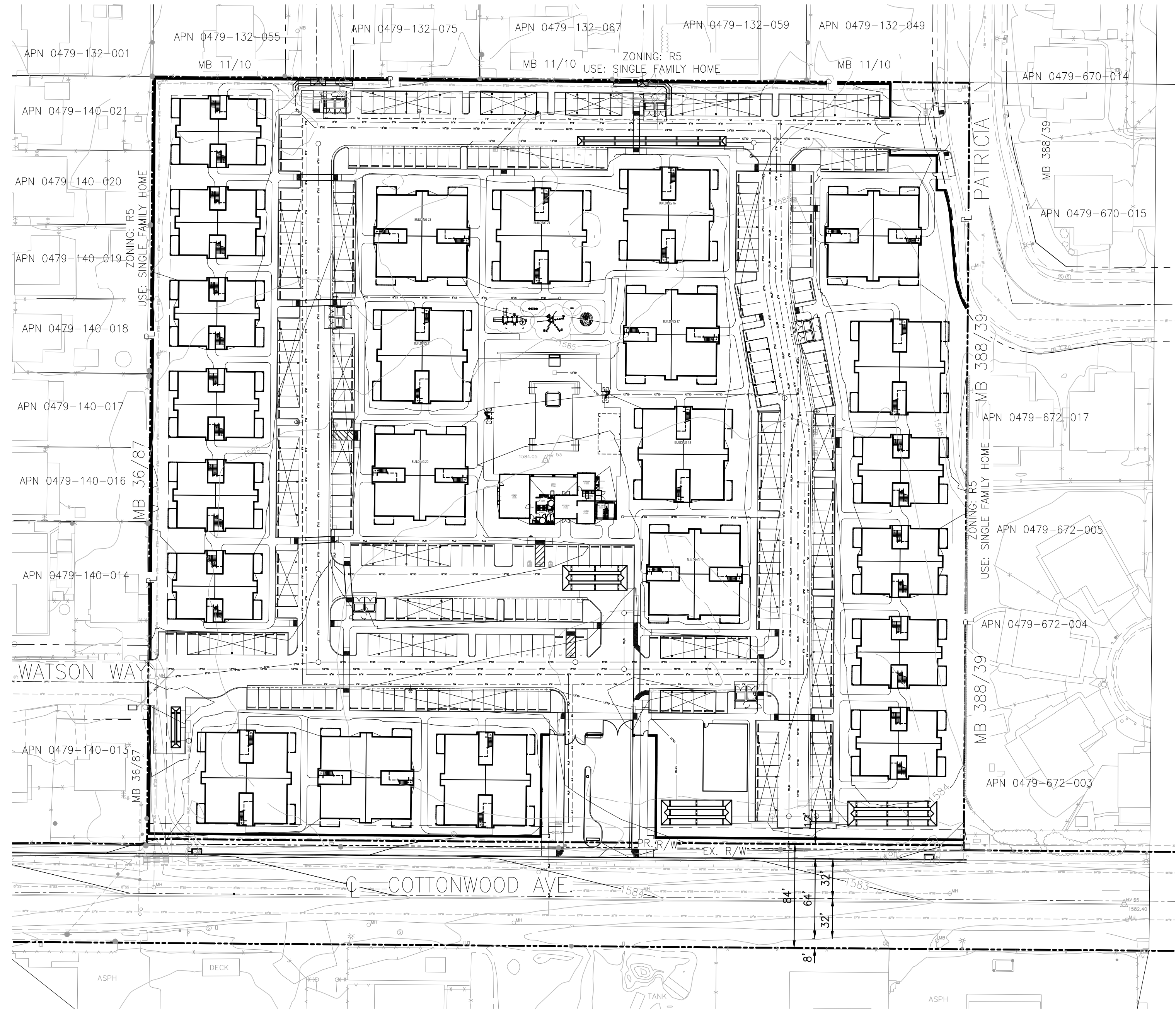
Appendix 2: Construction Plans

Grading and Drainage Plans

GRADING NOTES

- ALL GRADING SHALL CONFORM TO THE LATEST CALIFORNIA BUILDING CODE (CBC) CHAPTERS 17, 18, APPENDIX-J AND ALL APPLICABLE SECTIONS.
- A GRADING PERMIT SHALL BE OBTAINED PRIOR TO COMMENCEMENT OF ANY WORK ON THE SITE.
- ISSUANCE OF A GRADING PERMIT DOES NOT ELIMINATE THE NEED FOR PERMITS FROM OTHER REGULATORY AGENCIES WITH REGULATORY RESPONSIBILITIES FOR CONSTRUCTION ACTIVITIES ASSOCIATED WITH THE WORK AUTHORIZED IN THIS PLAN.
- ALL WORK UNDER THIS PERMIT SHALL BE LIMITED TO WORK WITHIN THE PROPERTY LINES. A SEPARATE CONSTRUCTION, EXCAVATION OR ENCROACHMENT PERMIT FROM THE DEPARTMENT OF PUBLIC WORKS MAY BE REQUIRED FOR ANY WORK WITHIN THE COUNTY RIGHT-OF-WAY.
- APPROVAL OF THESE PLANS DOES NOT AUTHORIZE ANY WORK OR GRADING TO BE PERFORMED UNTIL THE EFFECTIVE PROPERTY OWNER'S PERMISSION HAS BEEN OBTAINED AND VALID GRADING PERMIT HAS BEEN ISSUED.
- THIS PLAN IS FOR GRADING PURPOSES ONLY AND IS NOT TO BE USED FOR THE PURPOSE OF CONSTRUCTING ONSITE OR OFFSITE IMPROVEMENTS. ISSUANCE OF A PERMIT BASED ON THIS PLAN DOES NOT CONSTITUTE APPROVAL OF DRIVEWAY LOCATIONS OR SIZES, PARKING LOT STRUCTURAL SECTIONS OR LAYOUT, ADA-RELATED REQUIREMENTS, BUILDING LOCATIONS OR FOUNDATIONS, WALLS, CURBING, OFFSITE DRAINAGE FACILITIES OR OTHER ITEMS NOT RELATED DIRECTLY TO THE BASIC GRADING OPERATION. ONSITE IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE TO THE APPROVED BUILDING PERMIT PLANS. OFFSITE IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE TO PLANS APPROVED FOR THIS PURPOSE BY THE PUBLIC WORKS DEPARTMENT.
- MAXIMUM CUT AND FILL SLOPE = 2:1 (HORIZONTAL TO VERTICAL) AND MAXIMUM VERTICAL HEIGHT = 30 FEET, UNLESS AN APPROVED GEOTECHNICAL REPORT CAN JUSTIFY A STEEPER AND TALLER SLOPE.
- NO FILL SHALL BE PLACED ON EXISTING GROUND UNTIL THE GROUND HAS BEEN CLEARED OF WEEDS, DEBRIS, TOPSOIL AND OTHER DELETERIOUS MATERIAL.
- FILL SLOPES SHALL NOT HAVE LESS THAN 90% RELATIVE COMPACTION, OR AS RECOMMENDED ON THE APPROVED GEOTECHNICAL REPORT.
- IT IS THE GRADING CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ADEQUATE COMPACTION HAS BEEN ATTAINED ON THE ENTIRE GRADING SITE, INCLUDING FILL AREAS OUTSIDE THE BUILDING PADS AND ON ALL FILL SLOPES.
- UNLESS OTHERWISE RECOMMENDED IN AN APPROVED GEOTECHNICAL REPORT, OVER-EXCAVATION SHALL BE AT LEAST 24 INCHES MINIMUM BELOW THE BOTTOM OF FOOTINGS OR TO COMPETENT NATIVE SOIL OR BEDROCK MATERIALS, WHICHEVER IS DEEPER, AS APPROVED BY THE PROJECT'S GEOTECHNICAL ENGINEER OR GEOLOGIST.
- EARTHWORK VOLUMES:
CUT: 805 (CY), FILL: 14,893 (CY)
- EARTHWORK QUANTITIES ARE SHOWN FOR GRADING PERMIT PURPOSES ONLY, AND SAN BERNARDINO COUNTY IS NOT RESPONSIBLE FOR THEIR ACCURACY.
385 N. ARROWHEAD AVENUE, FIRST FLOOR, SAN BERNARDINO, CA 92415 | PHONE:909.387.8311 FAX:909.387.3223
LAND USE SERVICES DEPARTMENT LAND DEVELOPMENT
- A COPY OF THE GRADING PERMIT AND APPROVED GRADING PLANS MUST BE IN THE POSSESSION OF A RESPONSIBLE PERSON AND AVAILABLE AT THE SITE AT ALL TIMES.
- ANY ONSITE RETAINING WALLS SHOWN ON THE GRADING PLANS THAT ARE OVER 4' IN HEIGHT, MEASURED FROM TOP OF WALL TO BOTTOM OF FOOTING, ARE FOR REFERENCE ONLY. RETAINING WALLS OVER 4' IN HEIGHT ARE NOT CHECKED, PERMITTED, OR INSPECTED PER THE GRADING PERMIT. A SEPARATE RETAINING WALL PERMIT IS REQUIRED FOR ALL RETAINING WALLS OVER 4' IN HEIGHT.
- ANY WALLS, FENCES, STRUCTURES AND/OR APPURTENANCES ADJACENT TO THIS PROJECT ARE TO BE PROTECTED IN PLACE. IF GRADING OPERATIONS DAMAGE OR ADVERSELY AFFECT SAID ITEMS IN ANY WAY, THE CONTRACTOR AND/OR DEVELOPER IS RESPONSIBLE FOR WORKING OUT AN ACCEPTABLE SOLUTION TO THE SATISFACTION OF THE AFFECTED PROPERTY OWNER(S).
- FOR SITES WITH PROTECTED SPECIES OR TREES, THE PROPOSED GRADING MAY BE SUBJECT TO A SEPARATE PERMIT.
- ADEQUATE FIRE ACCESS AROUND BUILDINGS (INCLUDING GARAGES) SHOULD BE PROVIDED AS APPROVED BY COUNTY FIRE.
- EXISTING DRAINAGE COURSES SHALL NOT BE OBSTRUCTED, ALTERED, OR DIVERTED WITHOUT PRIOR APPROVAL FROM THE COUNTY OF SAN BERNARDINO, LAND DEVELOPMENT DIVISION. A STREAMBED ALTERATION AGREEMENT MAY ALSO BE REQUIRED FROM THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE.
- DRAINAGE EASEMENTS SHALL NOT BE OBSTRUCTED, ALTERED OR DIVERTED WITHOUT PRIOR APPROVAL OF THE COUNTY OF SAN BERNARDINO, LAND DEVELOPMENT DIVISION.
- SETBACKS AND BUILDING LOCATIONS SHOWN ON THIS PLAN ARE FOR REFERENCE ONLY AND MUST BE REVIEWED AND APPROVED UNDER A SEPARATE BUILDING PERMIT.
- UTILITY AND SEPTIC IMPROVEMENTS SHOWN ON THIS PLAN ARE FOR REFERENCE ONLY AND MUST BE REVIEWED AND APPROVED UNDER A SEPARATE BUILDING PERMIT.
- ON PROJECTS DISTURBING ONE ACRE OR MORE, THE FOLLOWING NOTE MUST BE ADDED: A NOTICE OF INTENT (NOI) HAS BEEN, OR WILL BE FILED WITH THE STATE WATER RESOURCES CONTROL BOARD (SWRCB) AND A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) HAS BEEN OR WILL BE PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF CALIFORNIA GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY (PERMIT NO. CAS000002) FOR ALL OPERATIONS ASSOCIATED WITH THESE PLANS. THE PERMITTEE SHALL KEEP A COPY OF THE SWPPP ON SITE AND AVAILABLE FOR REVIEW BY COUNTY.
- IN CONJUNCTION WITH THE CALIFORNIA GENERAL PERMIT FOR PROPOSED DISTURBANCE OVER ONE ACRE, AN ACTIVE WASTEWATER DISCHARGE ID # (WDID) MUST BE INCLUDED ON THE FINAL GRADING PLAN.
- FOR ENGINEERED GRADING, A FINAL GRADING CERTIFICATION WILL BE COLLECTED BY THE BUILDING INSPECTOR AT THE FINAL BUILDING INSPECTION OR PRIOR A GRADING FINAL STATUS ON THE PERMIT. THE FINAL GRADING CERTIFICATION IS TO BE COMPLETED BY THE ENGINEER OF RECORD ON THE APPROVED GRADING PLANS.
- ALL FLOOD ZONE REQUIREMENTS MUST BE REFLECTED OR ACCOUNTED FOR ON THE GRADING PLANS. ELEVATIONS OR CONSTRUCTION NOTES MUST BE INCLUDED IN THE PLANS TO ENSURE COMPLIANCE WITH ALL APPLICABLE FIRST FLOOR ELEVATION REQUIREMENTS PER FEMA AND SAN BERNARDINO COUNTY DEVELOPMENT CODE GUIDELINES.
- FOR NONRESIDENTIAL PROJECTS, PROVIDE FOLLOWING NOTE ON PLANS:
CALIFORNIA GREEN BUILDING STANDARDS CODE
5.408.3 EXCAVATED SOIL AND LAND CLEARING DEBRIS.
100 PERCENT OF TREES, STUMPS, ROCKS AND ASSOCIATED VEGETATION AND SOILS RESULTING PRIMARILY FROM LAND CLEARING SHALL BE REUSED OR RECYCLED. FOR A PHASED PROJECT, SUCH MATERIAL MAY BE STOCKPILED ON SITE UNTIL THE STORAGE SITE IS DEVELOPED.
EXCEPTION: REUSE, EITHER ON-OR OFF-SITE, OF VEGETATION OR SOIL CONTAMINATED BY DISEASE OR PEST INFESTATION.

IN THE CITY OF MORENO VALLEY, IN RIVERSIDE COUNTY, STATE OF CALIFORNIA
COTTONWOOD APARTMENTS DEVELOPMENT



PROPERTY OWNER:
GRANT KEENE
WJK DEVELOPMENT CO.
28392 AIROSO ST.
RANCHO MISSION VIEJO, CA
TEL: GRANT@WJKDEVELOPMENT.COM

LANDSCAPE ARCHITECT:
C-SCAPE CREATIVE
1411 RIMPAU AVE., STE.109#1036
CORONA, CA 92879
TEL: 949-295-3740
EMAIL: CKUSANO@C-SCAPE-CREATIVE.COM

CIVIL ENGINEER:
ANGEL CESAR, P.E.
BLUE ENGINEERING AND CONSULTING, INC.
9320 BASELINE RD., STE. D,
RANCHO CUCAMONGA, CA 91701
TEL: (909)248-6557
EMAIL: ANGEL@BLUECIVILENG.COM

ARCHITECT:
MCHALE ARCHITECTS
601 W. SANTA FE #29
PLACENTIA, CA 92870
TEL: (949) 566-4951
EMAIL: MCHALEARCHITECTS@YAHOO.COM

UTILITY AND SERVICE PURVEYORS:
POWER:SOUTHERN CALIFORNIA EDISON
GAS:THE GAS COMPANY
PHONE:FRONTIER
CABLE: FRONTIER
WATER: EASTERN MUNICIPAL WATER DISTRICT
SEWER: EASTERN MUNICIPAL WATER DISTRICT
SCHOOL DISTRICT: MORENO VALLEY UNITED SCHOOL DISTRICT

ABBREVIATIONS

- AC. ACRE
- CL CENTER LINE
- C.Y. CUBIC YARD
- EX. EXISTING
- FS FINISH SURFACE
- PL PROPERTY LINE
- PR. PROPOSED
- SPA. SPACES

LEGEND

- 8" W PROPOSED DOMESTIC WATER LINE
- 8" W PROPOSED FIRE WATER LINE
- 8" SS PROPOSED SEWER LINE
- 8" SS PROPOSED 48" STORM DRAIN LINE
- 8" SS PROPOSED STORM DRAIN LINE
- 8" SS PROPOSED VALLEY GUTTER
- 8" SS PROPOSED PROPERTY LINE
- 8" SS PROPOSED ROAD EASEMENT
- W EXISTING WATER LINE
- W EXISTING WATER LINE
- 8" SS PROPOSED 6' HIGH SPLIT-FACE CMU BLOCK WALL WITH 4" THICK PRECISION CMU BLOCK CAP

EARTHWORK QUANTITIES (C.Y.)
805 CUT 14,893 FILL
± 112 SHRINKAGE
15,005 <14,200 FILL>

TOPOGRAPHY SOURCE
B&E ENGINEERS
20 E. FOOTHILL AVE., STE 230
ARCADIA CA 91006

SURVEY DATE: 04-3-14
04-4-14
04-24-14

LEGEND DESCRIPTION
9.39 ACRES M/L IN LOT 6 BLK 73 MB 011 / 011
SB BEAR VALLEY AND ALESSANDRO DEVELOPMENT CO.
FLOOD HAZARD
THE SUBJECT TRACT OUTSIDE THE 500 YEAR ZONE X FLOOD PLAIN. FLOOD INSURANCE PANEL NO. 065074 0025a. THE SUBJECT TRACT IS WITHIN THE SUNNYMEAD MASTER DRAINAGE PLAN AND SERVED BY LINE "S-2"

THOMAS BROTHERS GUIDE
PAGE 717 G-4, 2005 EDITION

LAND USE AND ZONING
CURRENT GENERAL PLAN R20
CURRENT ZONING MAP R20
EXISTING LAND USE VACANT
PROPOSED LAND USE CONDOMINIUM
PROPOSED GENERAL PLAN COMU
PROPOSED ZONING MAP COMU

FEMA FLOOD ZONE
PROJECT SITE IS LOCATED IN ZONE X (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN) PER FLOOD INSURANCE RATE MAP NO. 06065C0761G

AREA AND DENSITY
GROSS ACREAGE 9.398 ACRES
NET ACREAGE 9.264 ACRES
TOTAL NO. OF UNITS CREATED 184
DENSITY 19.86 DU/AC

PARKING REQUIRED:
1 BDRM: 80 D.U. X 1.5 SPA. = 120 SPA.
2 BDRM: 104 D.U. X 2 SPA. = 208 SPA.
TOTAL: 328 SPA.
PROVIDED: 334 SPA.

TYPE	REQUIRED	PROVIDED
CARPSPORTS:	184 SPA.	190 SPA.
OPEN SPACES:	144 SPA.	144 SPA.
HANDICAP SPACES:		
CARPSPORTS:193X2%	4 SPA.	4 SPA.
OPEN SPACES:		
ASSIGNED: 104X2%	3 SPA.	3 SPA.
GUEST: 40X5%	2 SPA.	2 SPA.

EVC STATIONS
TOTAL EVC ACTIVE SPA. REQUIRED: 18 SPA.
TOTAL EVC READY SPA. REQUIRED: 86 SPA.
TOTAL EVC CAPABLE SPA. REQUIRED: 34 SPA.

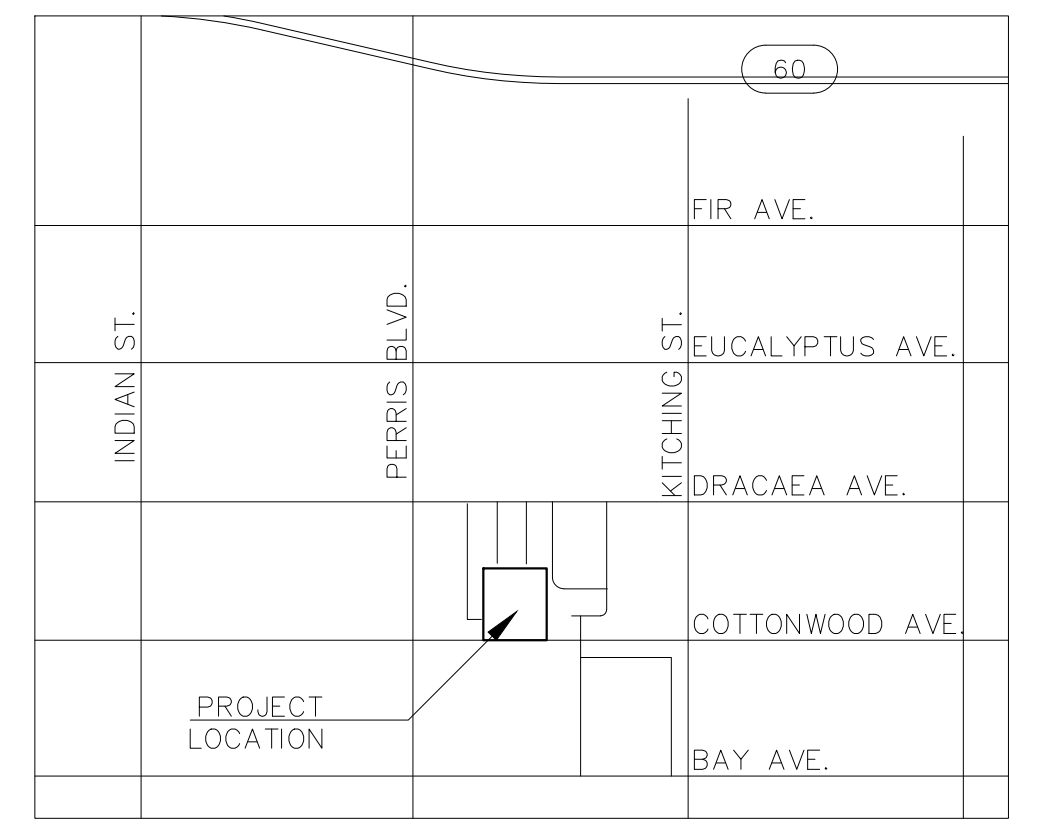
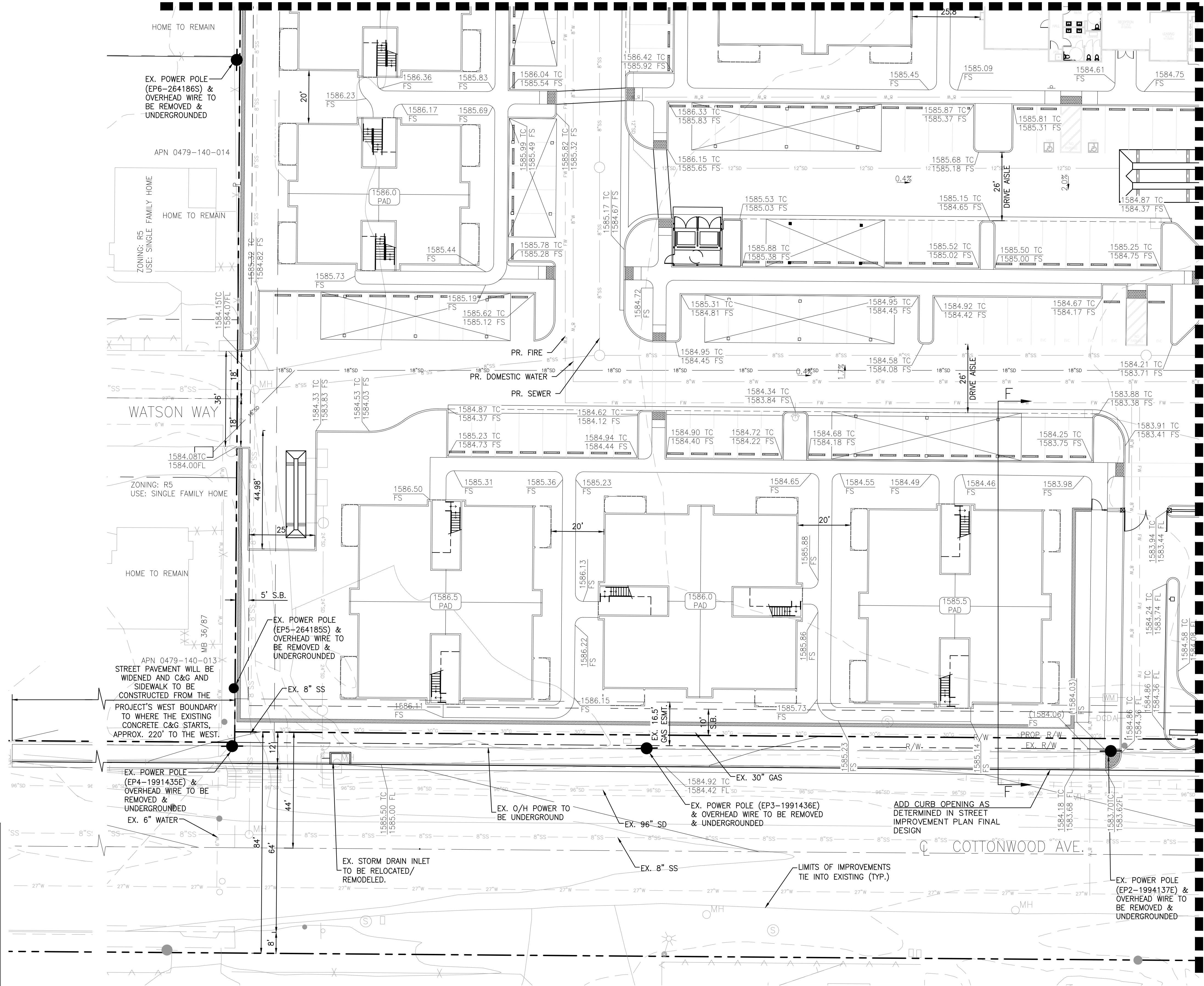
NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

CALL
811 or
1-800-422-4133
2 Working Days Before You Dig
WWW.CALL811.COM

INDEX MAP
SCALE 1" = 60'

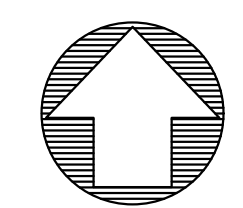
REVIEW BY CITY STAFF	BENCHMARK	BASIS OF BEARING	CITY OF MORENO VALLEY ACCEPTED BY:		ENGINEER OF RECORD'S SEAL	10535 FOOTHILL BLVD, SUITE 440 RANCHO CUCAMONGA, CA 91730 BLUE ENGINEERING YOUR LAND DEVELOPMENT CONSULTANTS	CITY OF MORENO VALLEY	
		THE BEARING OF N 89°33'40" W FOR THE CENTERLINE OF DRACAE AVENUE AS SHOWN ON TRACT NO. 7735-1 FILED IN BOOK 96 PAGES 15-17 OF RIVERSIDE COUNTY RECORDS, WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.				UNDER THE SUPERVISION OF:	TITLE SHEET	
						ANGEL CESAR RCE 87222	COTTONWOOD APARTMENTS DEVELOPMENT	
						DATE	SHEET 1 OF 9	
							CITY ID No	
MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR./DATE			
		E.O.R.	REVISION					

MATCH LINE - SEE SHEET 3

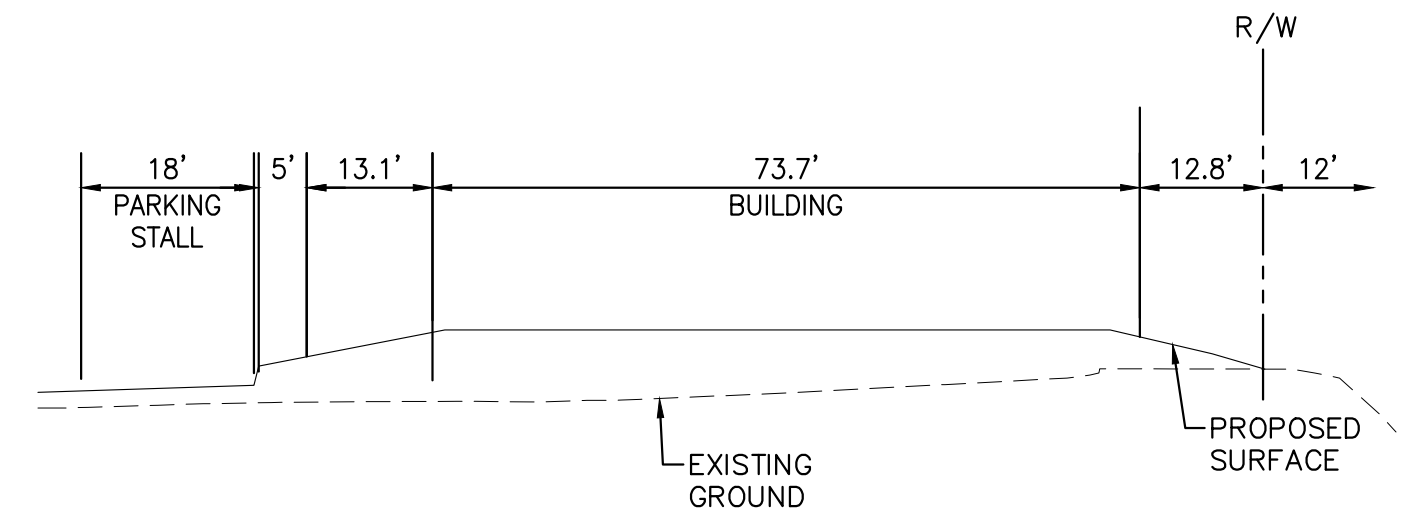


VICINITY MAP
N.T.S.

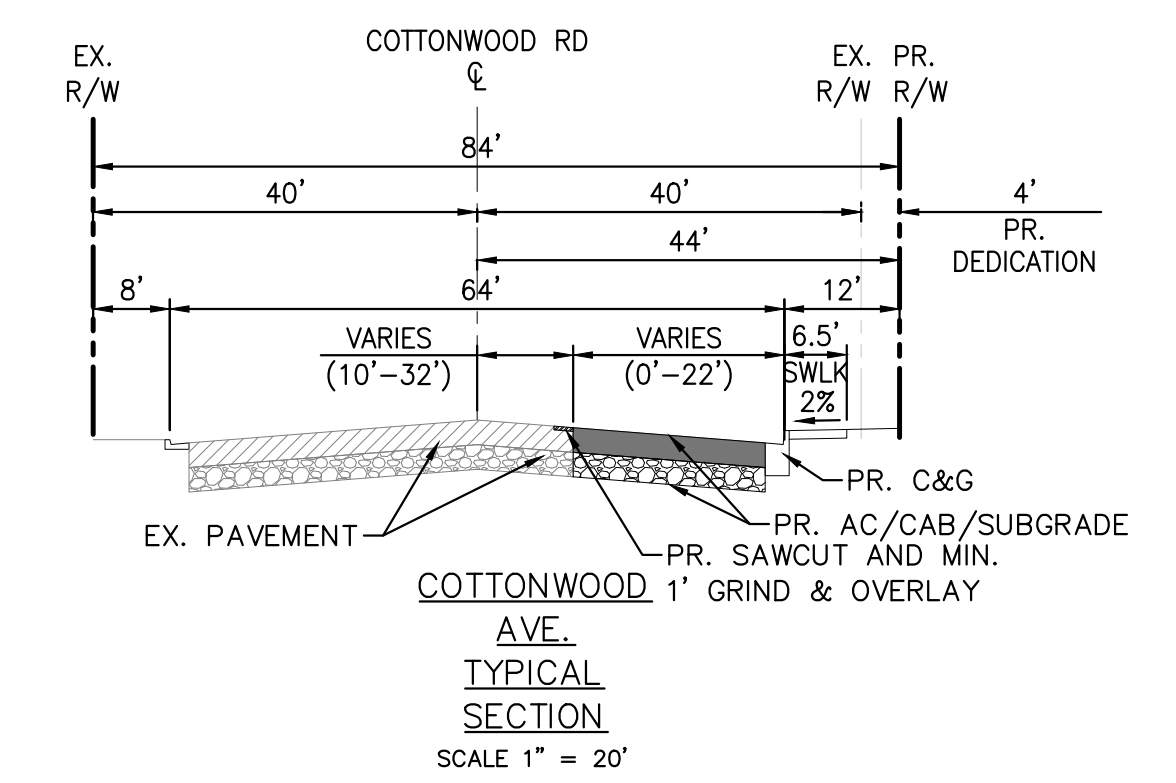
- LEGEND**
- 8" W PROPOSED DOMESTIC WATER LINE
 - FW PROPOSED FIRE WATER LINE
 - 6" SS PROPOSED SEWER LINE
 - SD PROPOSED 48" STORM DRAIN LINE
 - SD PROPOSED STORM DRAIN LINE
 - VG PROPOSED VALLEY GUTTER
 - PP PROPOSED PROPERTY LINE
 - RE PROPOSED ROAD EASEMENT
 - 8" SS EXISTING SEWER LINE
 - W EXISTING WATER LINE
 - 6" H PROPOSED 6" HIGH SPLIT-FLANGE CMU BLOCK WALL WITH 4" THICK PRECISION CMU BLOCK CAP



SCALE: 1" = 20'



SECTION F-F
SCALE 1" = 20'



SCALE 1" = 20'

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

DIGALERT

CALL 811 or 1-800-422-4133 2 Working Days Before You Dig WWW.CALL811.COM

REVIEW BY CITY STAFF

BENCHMARK

BASIS OF BEARING

THE BEARING OF N 89°33'40" W FOR THE CENTERLINE OF DRACEA AVENUE AS SHOWN ON TRACT NO. 7755-1 FILED IN BOOK 96 PAGES 15-17 OF RIVERSIDE COUNTY RECORDS, WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR./DATE
		E.O.R.	REVISION		

CITY OF MORENO VALLEY
ACCEPTED BY:

ENGINEER OF RECORD'S SEAL



BLUE ENGINEERING
10535 FOOTHILL BLVD., SUITE 440, RANCHO CUCAMONGA, CA, 91730

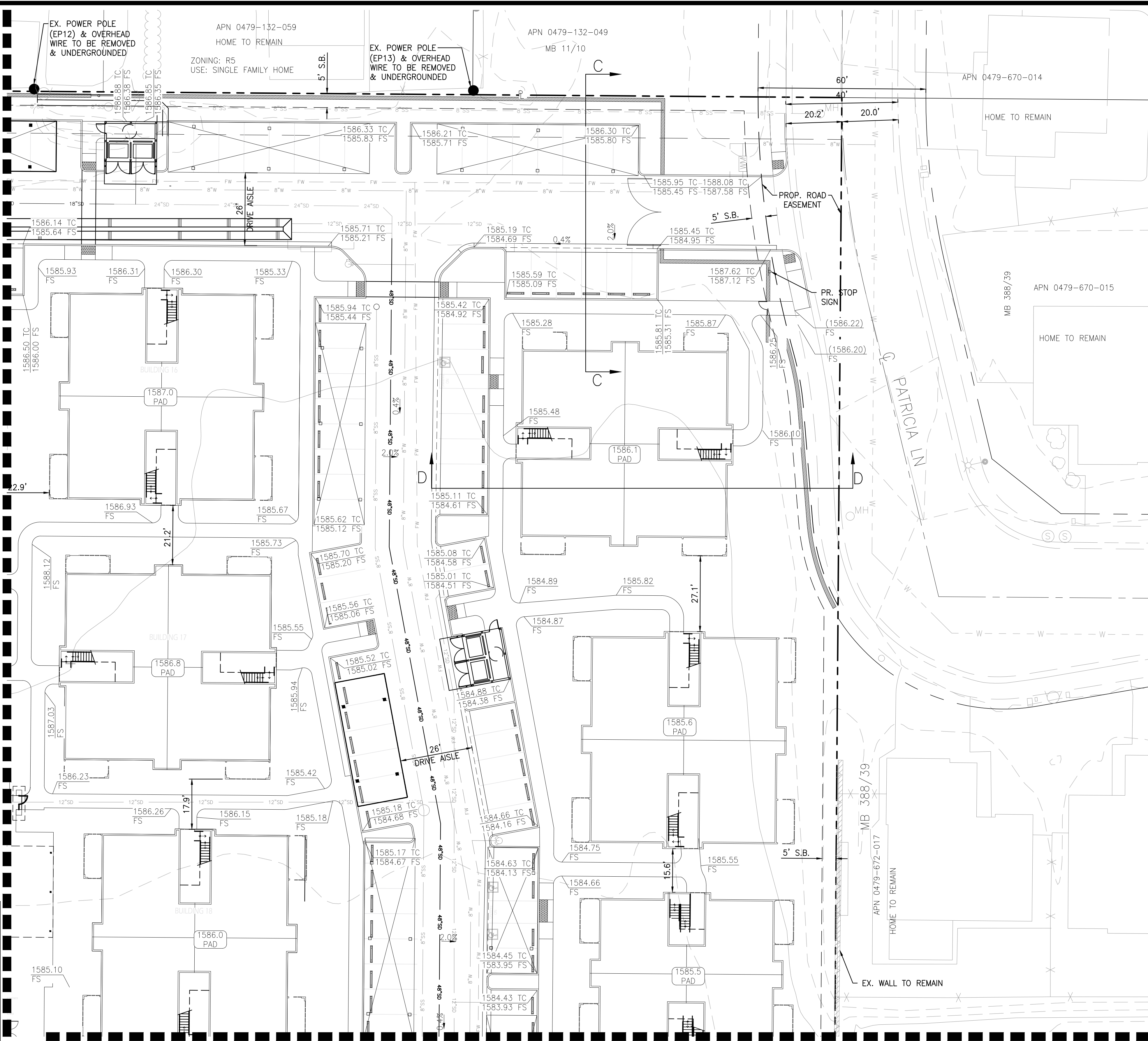
YOUR LAND DEVELOPMENT CONSULTANTS
UNDER THE SUPERVISION OF:
ANGEL CESAR RCE 87222 DATE

CITY OF MORENO VALLEY

CONCEPTUAL GRADING PLAN
COTTONWOOD APARTMENTS DEVELOPMENT

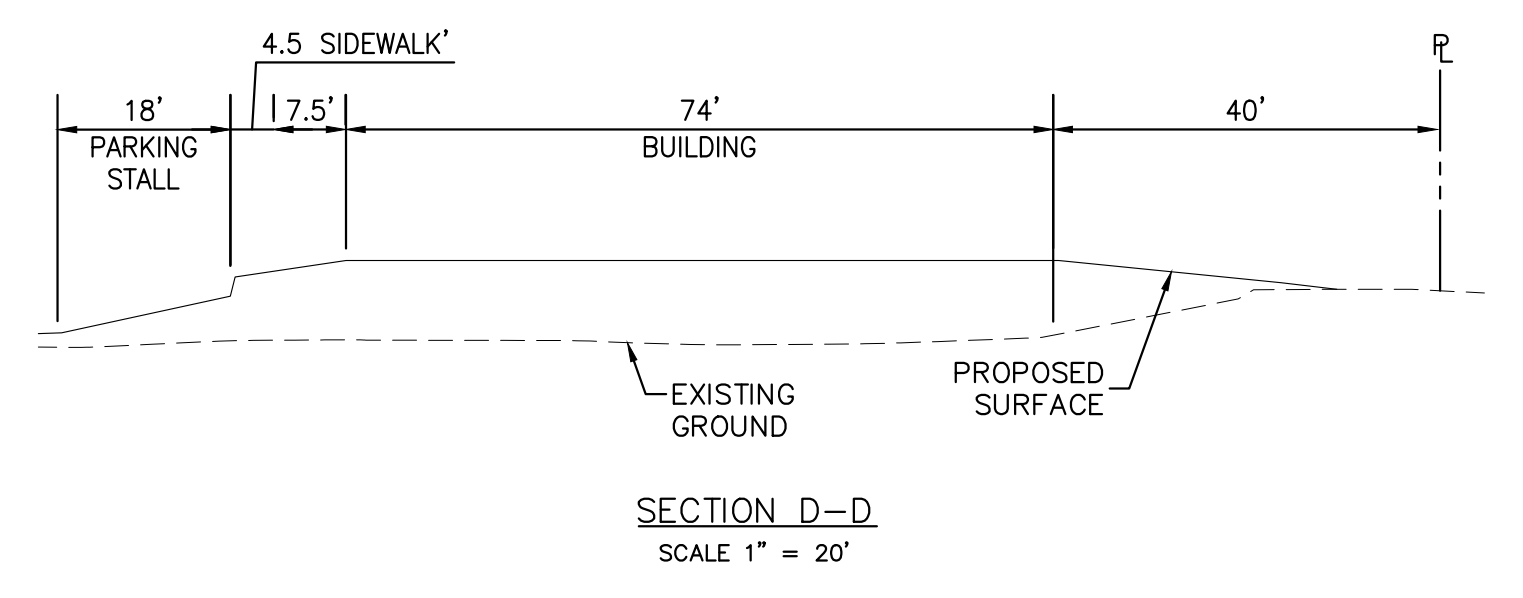
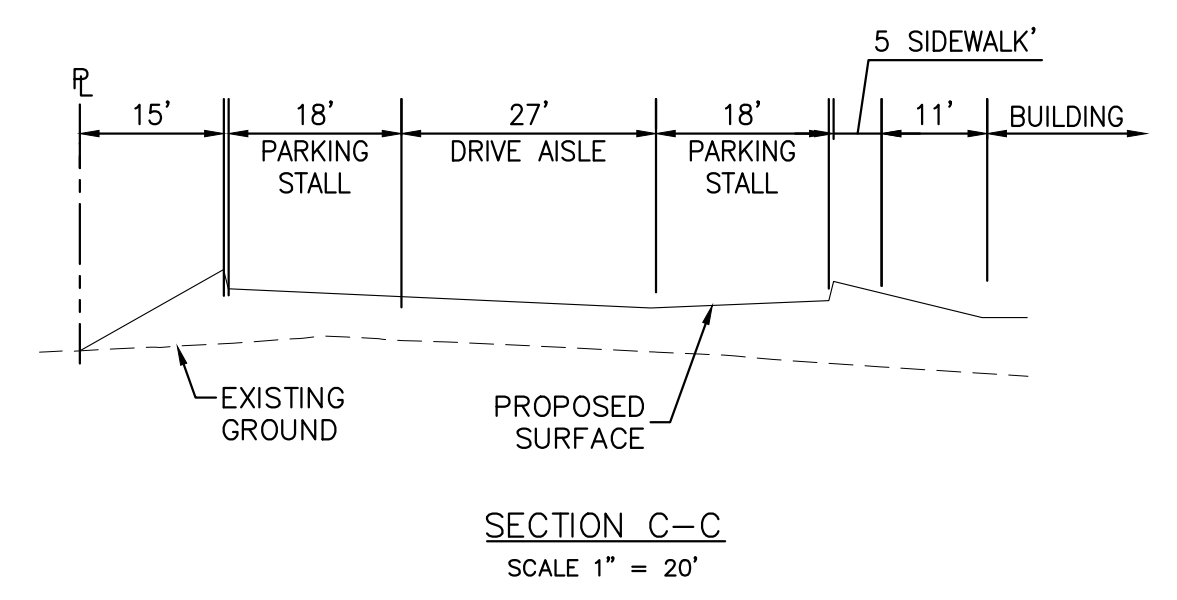
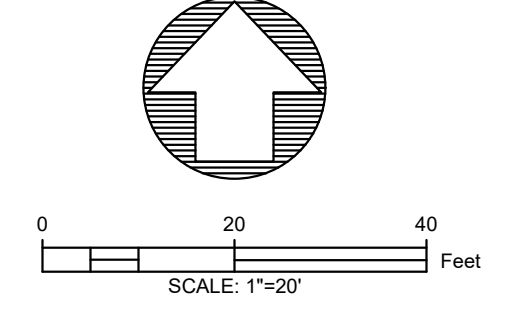
SHEET 3 OF 9
CITY ID No

MATCH LINE - SEE SHEET 3



MATCH LINE - SEE SHEET 2

- LEGEND**
- 6" W — PROPOSED DOMESTIC WATER LINE
 - FW — PROPOSED FIRE WATER LINE
 - 8" SS — PROPOSED 48" STORM DRAIN LINE
 - SD — PROPOSED STORM DRAIN LINE
 - V — PROPOSED VALLEY GUTTER
 - P — PROPOSED PROPERTY LINE
 - RE — PROPOSED ROAD EASEMENT
 - S — EXISTING SEWER LINE
 - W — EXISTING WATER LINE
 - 6" — PROPOSED 6' HIGH SPLIT-FACE CMU BLOCK WALL WITH 4" THICK PRECISION CMU BLOCK CAP



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REVIEW BY CITY STAFF

BENCHMARK

BASIS OF BEARING

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MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR./DATE
		E.O.R.	REVISION		

CITY OF MORENO VALLEY
ACCEPTED BY:

ENGINEER OF RECORD'S SEAL



BLUE ENGINEERING
YOUR LAND DEVELOPMENT CONSULTANTS
10535 FOOTHILL BLVD., SUITE 440, RANCHO CUCAMONGA, CA, 91730

UNDER THE SUPERVISION OF:
ANGEL CESAR RCE 87222
DATE

CITY OF MORENO VALLEY

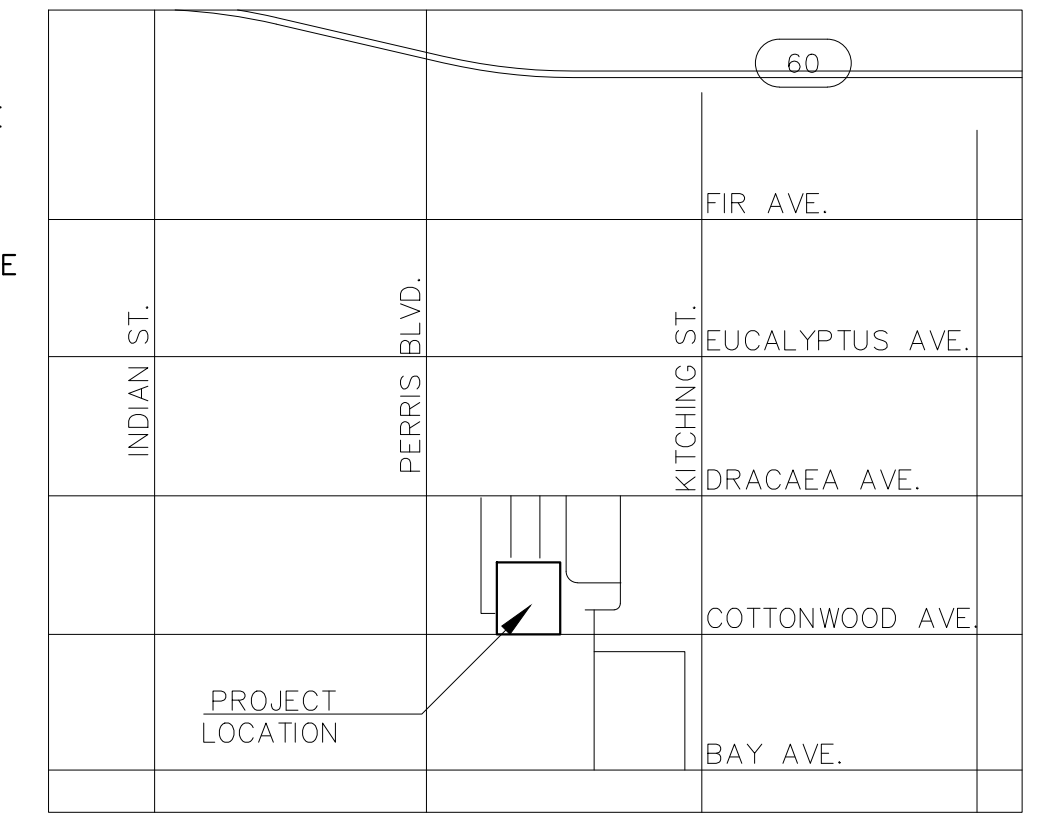
CONCEPTUAL GRADING PLAN
COTTONWOOD APARTMENTS DEVELOPMENT

SHEET 4 OF 9
CITY ID No

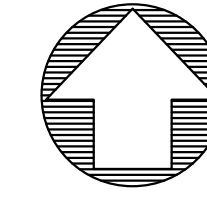
MATCH LINE - SEE SHEET 5

LEGEND

- 8" W PROPOSED DOMESTIC WATER LINE
- FW PROPOSED FIRE WATER LINE
- 8" SS PROPOSED SEWER LINE
- 48" SD PROPOSED 48" STORM DRAIN LINE
- SD PROPOSED STORM DRAIN LINE
- VG PROPOSED VALLEY GUTTER
- PL PROPOSED PROPERTY LINE
- PE PROPOSED ROAD EASEMENT
- ESL EXISTING SEWER LINE
- EWL EXISTING WATER LINE
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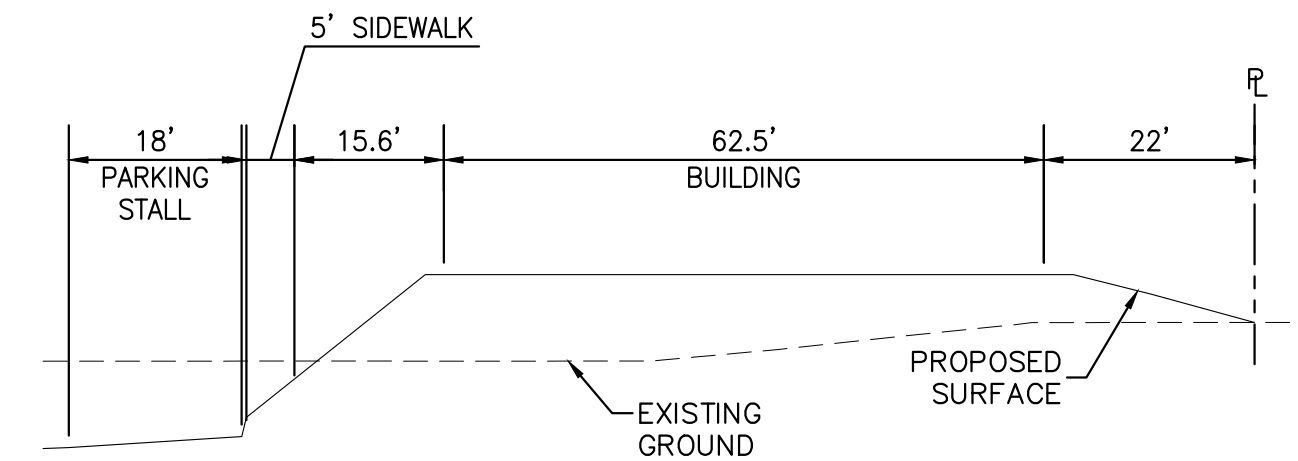
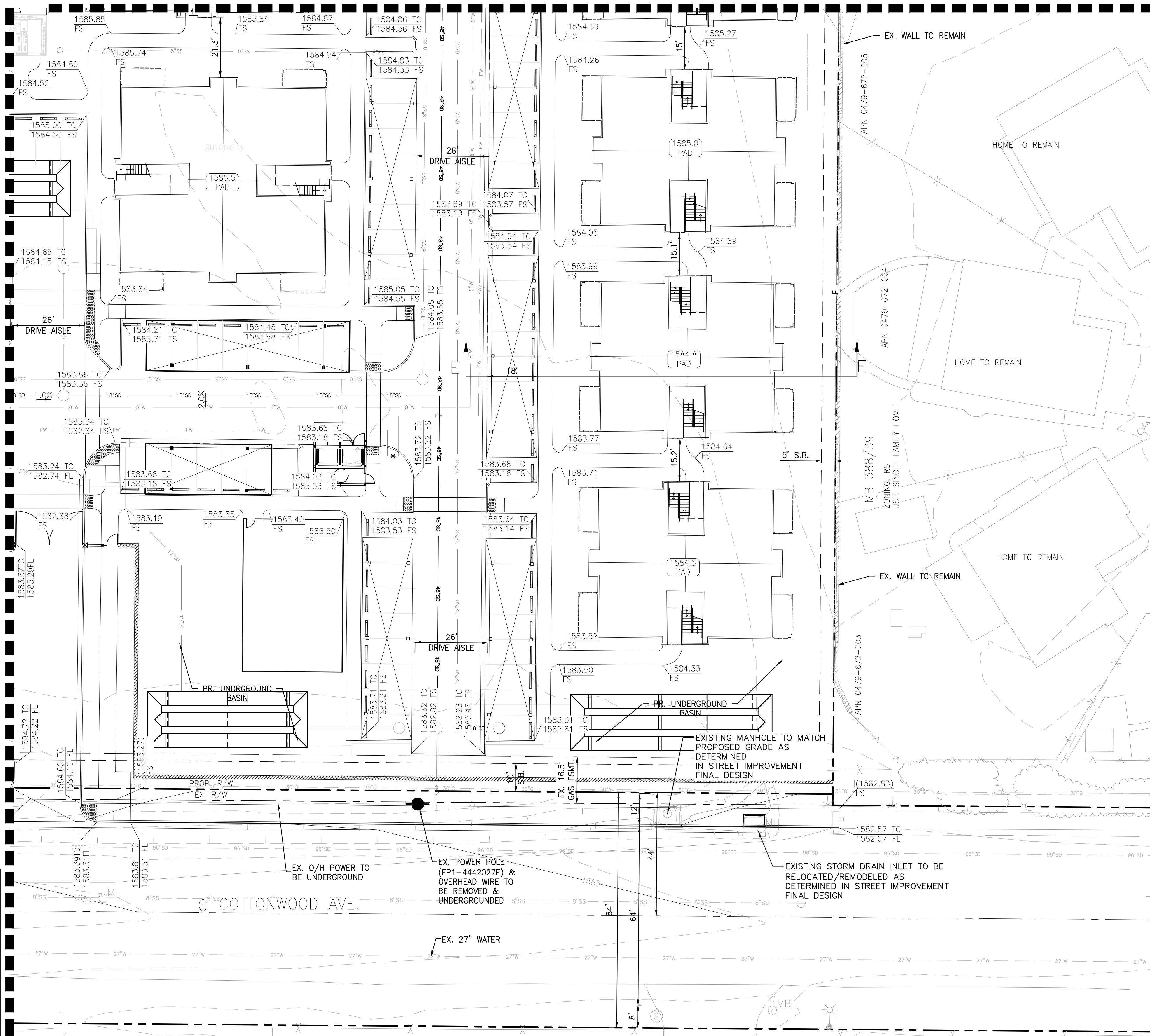


VICINITY MAP
N.T.S.

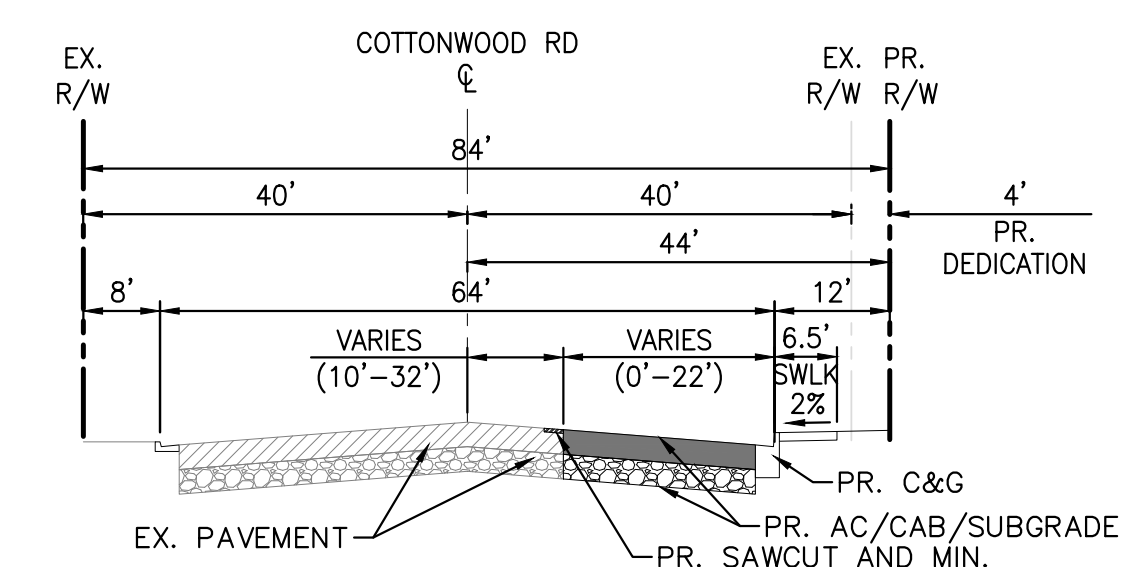


0 20 40
SCALE: 1"=20'
Feet

MATCH LINE - SEE SHEET 4



SECTION E-E
SCALE 1" = 20'



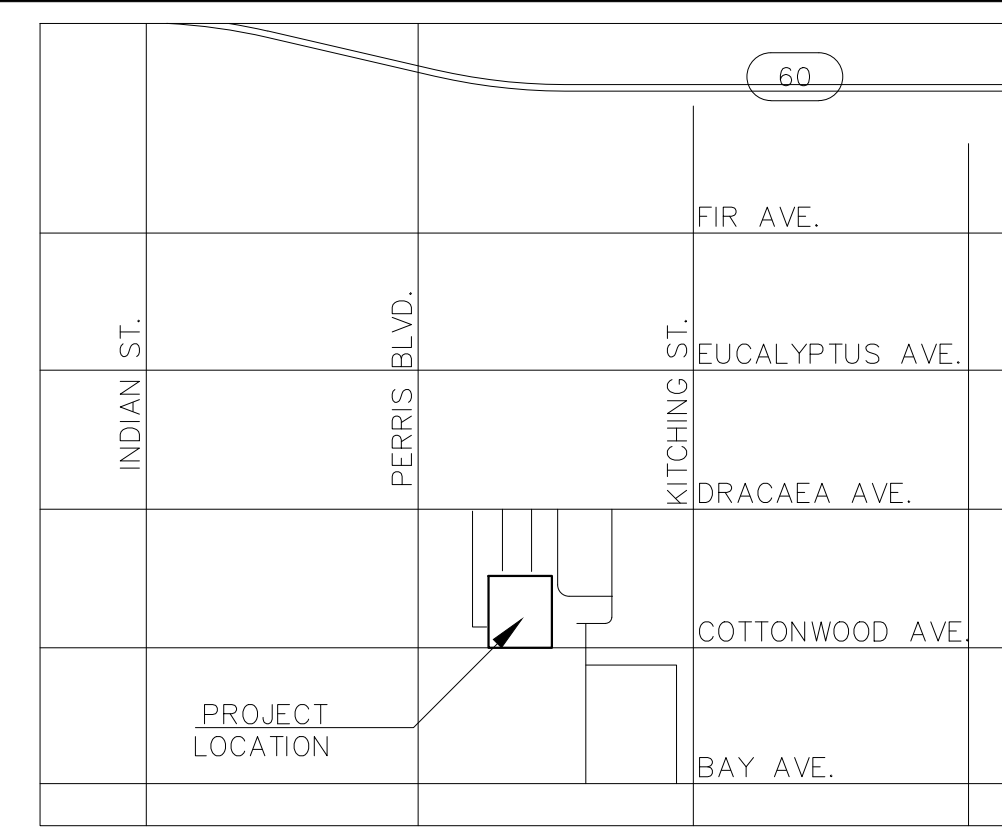
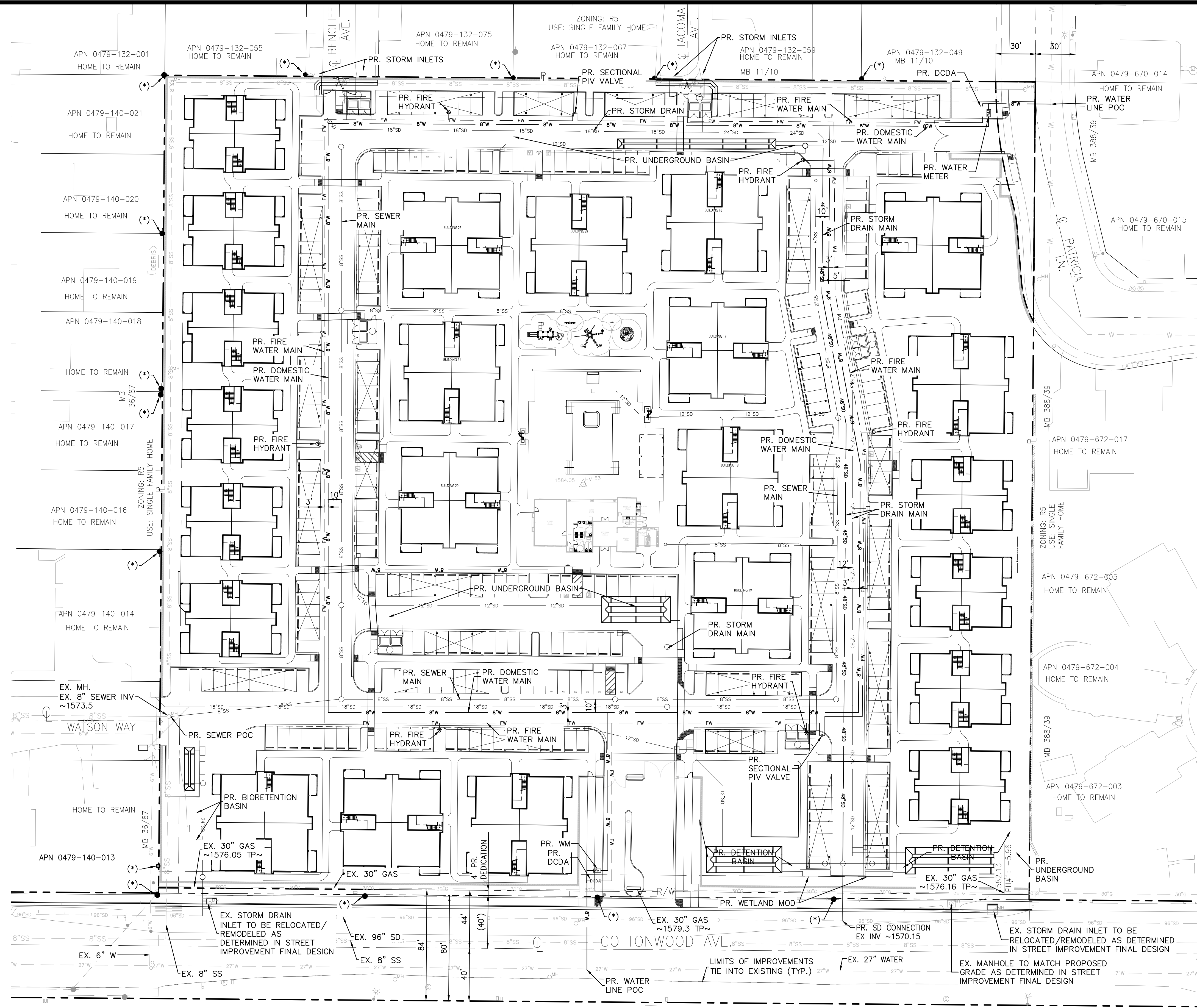
TYPICAL SECTION
SCALE 1" = 20'

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DIGALERT

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REVIEW BY CITY STAFF	BENCHMARK	BASIS OF BEARING	CITY OF MORENO VALLEY ACCEPTED BY:		ENGINEER OF RECORD'S SEAL	 10535 Foothill Blvd., Suite 440, Rancho Cucamonga, CA 91730 YOUR LAND DEVELOPMENT CONSULTANTS UNDER THE SUPERVISION OF: ANGEL CESAR RCE 87222 DATE:	CITY OF MORENO VALLEY CONCEPTUAL GRADING PLAN COTTONWOOD APARTMENTS DEVELOPMENT	SHEET 5 OF 9 CITY ID No
		THE BEARING OF N 89°33'40" W FOR THE CENTERLINE OF DRACEA AVENUE AS SHOWN ON TRACT NO. 7735-1 FILED IN BOOK 96 PAGES 15-17 OF RIVERSIDE COUNTY RECORDS, WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.	MARK DATE INITIAL DESCRIPTION REC. APPR/DATE E.O.R. REVISION					



VICINITY MAP
N.T.S.

NOTE:
(*) EX. POWER POLE AND OVERHEAD LINE TO BE REMOVED AND UNDERGROUNDED

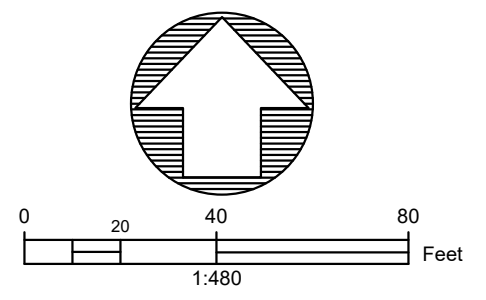
LEGEND

- 8"W — PROPOSED DOMESTIC WATER LINE
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- PROPOSED PROPERTY LINE
- 8"SS — EXISTING SEWER LINE
- W — EXISTING WATER LINE

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DIGALERT

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REVIEW BY CITY STAFF

BENCHMARK

BASIS OF BEARING

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CITY OF MORENO VALLEY
ACCEPTED BY:

ENGINEER OF RECORD'S SEAL



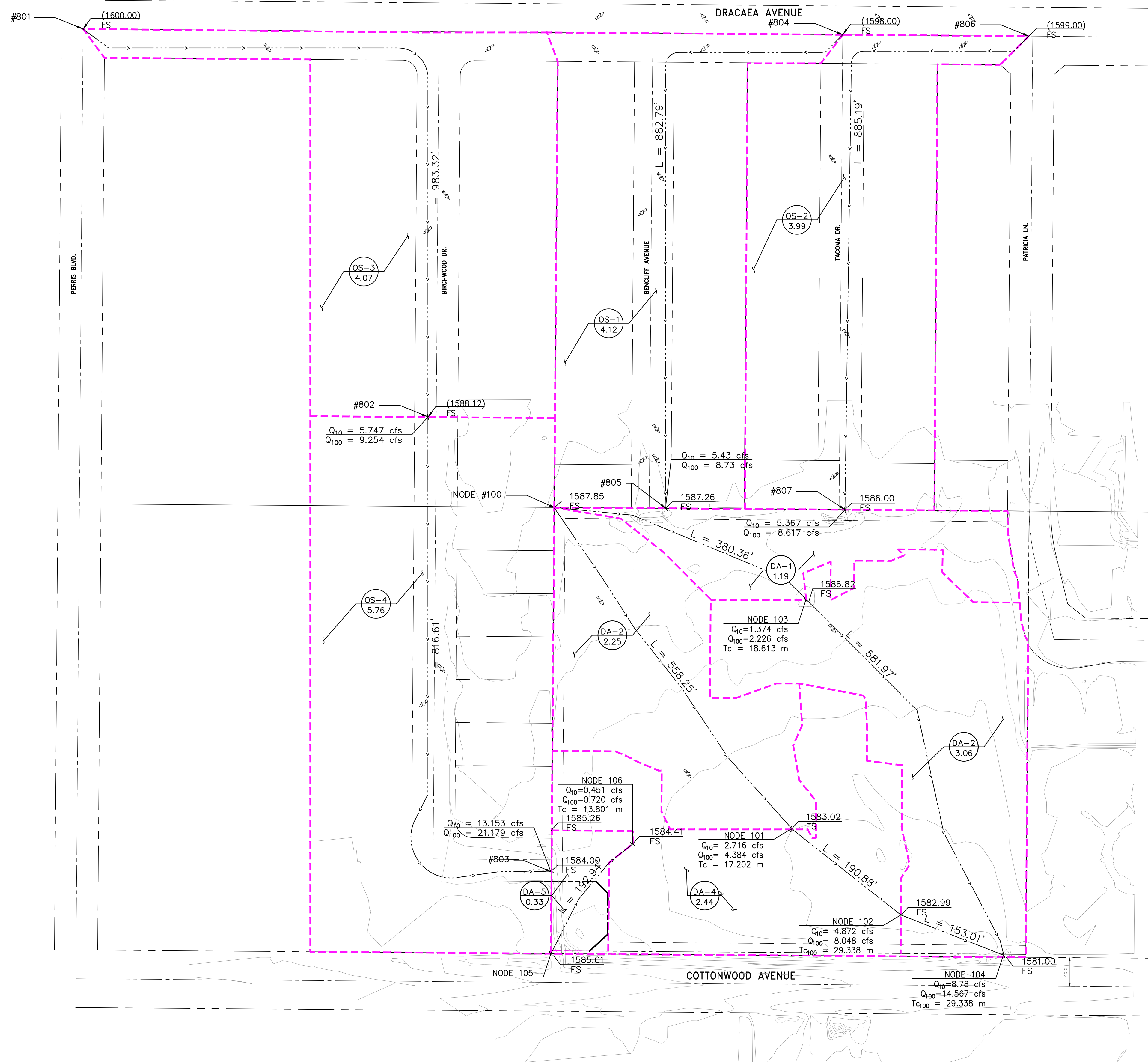
BLUE ENGINEERING
10535 FOOTHILL BLVD. SUITE 400 RANCHO CUCAMONGA, CA 91730
YOUR LAND DEVELOPMENT CONSULTANTS

UNDER THE SUPERVISION OF:
ANGEL CESAR RCE 87222 DATE

CITY OF MORENO VALLEY

CONCEPTUAL UTILITY PLAN
COTTONWOOD APARTMENTS DEVELOPMENT

SHEET 6 OF 9
CITY ID No



LEGEND

- FLOW LINE
- FLOW DIRECTION
- DRAINAGE AREA BOUNDARY
- DRAINAGE AREA DESIGNATION
- DRAINAGE AREA IN ACRES

SCALE

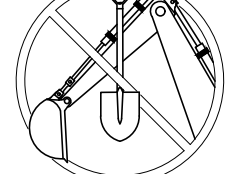
80 0 40 80 160

(FEET)

1 INCH = 80 FT.

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

DIGALERT



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REVIEW BY CITY STAFF

BENCHMARK

BASIS OF BEARING

THE BEARING OF N 89°33'40" W FOR THE CENTERLINE OF DRACAEA AVENUE AS SHOWN ON TRACT NO. 7755-1 FILED IN BOOK 96 PAGES 15-17 OF RIVERSIDE COUNTY RECORDS, WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR./DATE
		E.O.R.	REVISION		

CITY OF MORENO VALLEY
ACCEPTED BY:

ENGINEER OF
RECORD'S SEAL



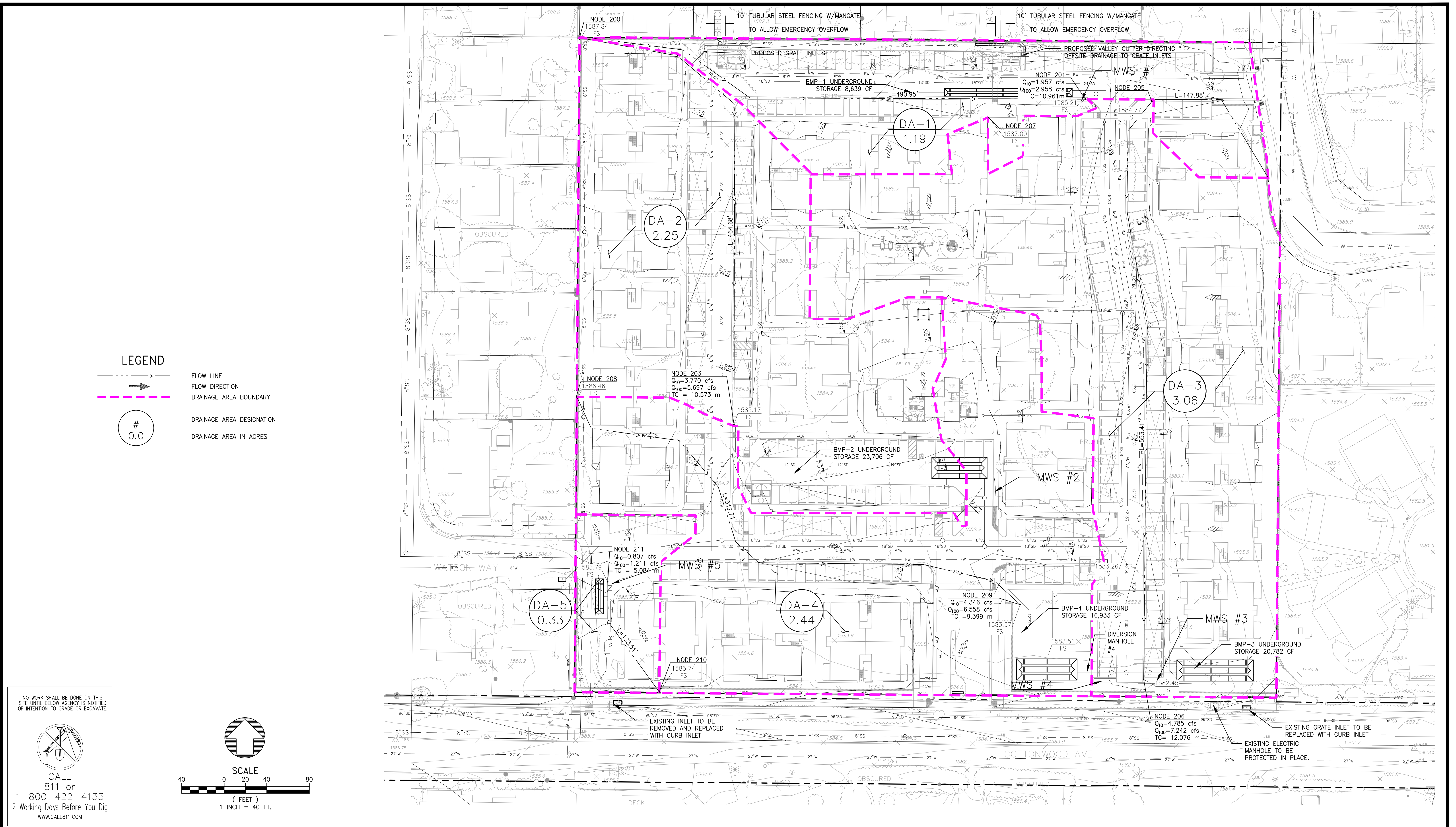
BLUE ENGINEERING
10535 FOOTHILL BLVD., SUITE 440
RANCHO CUCAMONGA, CA, 91730

YOUR LAND DEVELOPMENT CONSULTANTS
UNDER THE SUPERVISION OF:
ANGEL CESAR
RCE 87222

CITY OF MORENO VALLEY

PRE HYDROLOGY DEVELOPMENT - RATIONAL
COTTONWOOD APARTMENTS
DEVELOPMENT

SHEET 7 OF 9
CITY ID No



REVIEW BY CITY STAFF

BENCHMARK

BASIS OF BEARING
THE BEARING OF N 89°33'40" W FOR THE CENTERLINE OF DRAVEA AVENUE AS SHOWN ON TRACT NO. 7755-1 FILED IN BOOK 96 PAGES 15-17 OF RIVERSIDE COUNTY RECORDS, WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

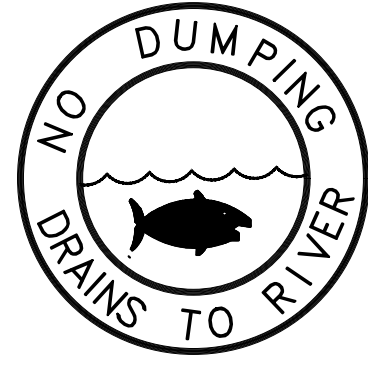
MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR./DATE
		E.O.R.	REVISION		

CITY OF MORENO VALLEY
ACCEPTED BY:

ENGINEER OF RECORD'S SEAL
ANGEL CESAR
RCE 87222
CIVIL
STATE OF CALIFORNIA

BLUE ENGINEERING
10535 FOOTHILL BLVD. SUITE 440 RANCHO CUCAMONGA, CA 91730
YOUR LAND DEVELOPMENT CONSULTANTS
UNDER THE SUPERVISION OF:
ANGEL CESAR RCE 87222 DATE

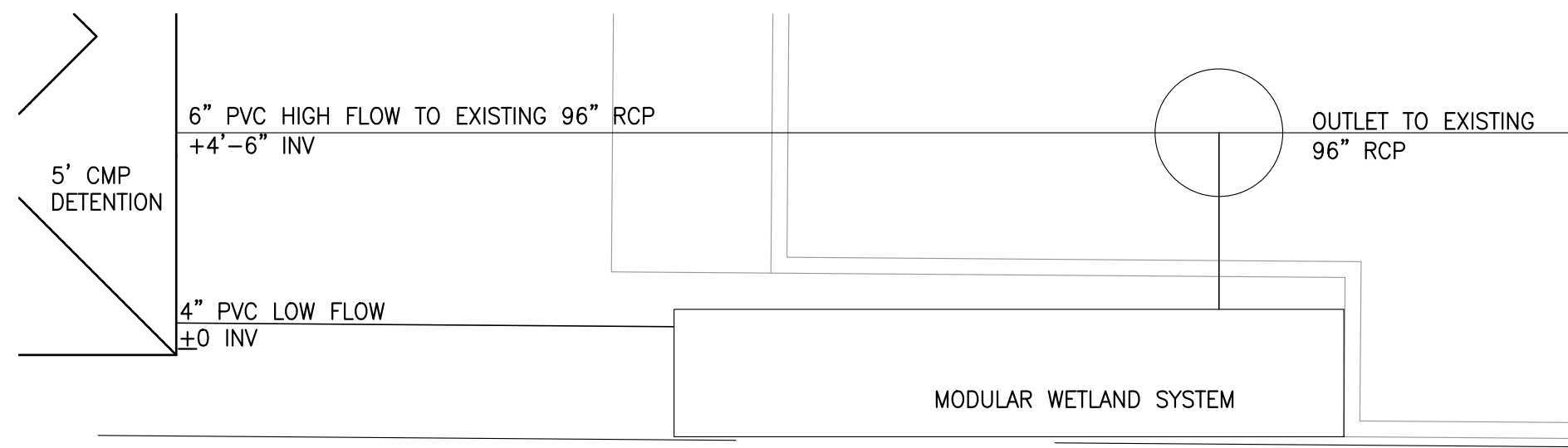
CITY OF MORENO VALLEY
POST HYDROLOGY - RATIONAL
COTTONWOOD APARTMENTS
DEVELOPMENT
SHEET 8 OF 9
CITY ID No



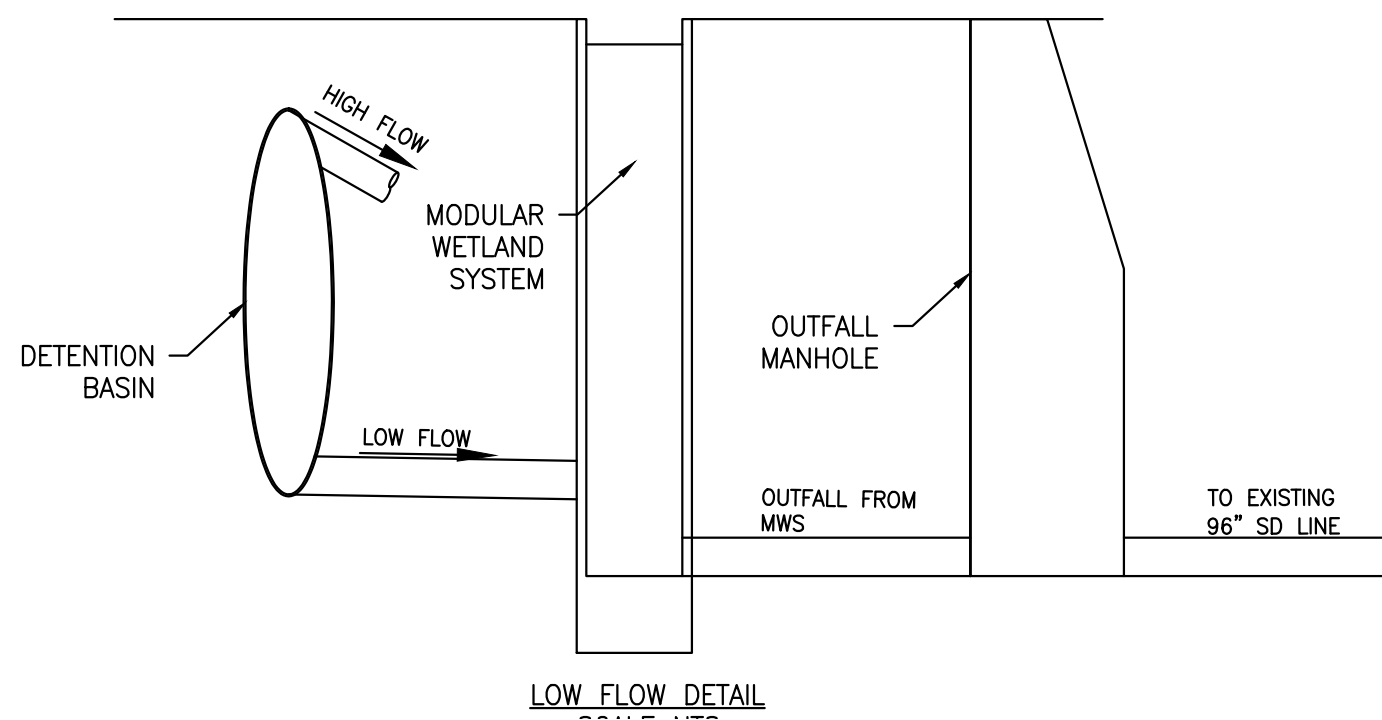
STORM DRAIN INLET STENCIL
N.T.S.

SOURCE CONTROL	
SOURCE CONTROL	LOCATION
STORM DRAIN INLET STENCIL	ALL INLETS
UNDERGROUND STORAGE	MARKED ON PLAN
POOL CLEANOUT	NORTH OF POOL
REFUSE AREA	MARKED ON PLAN

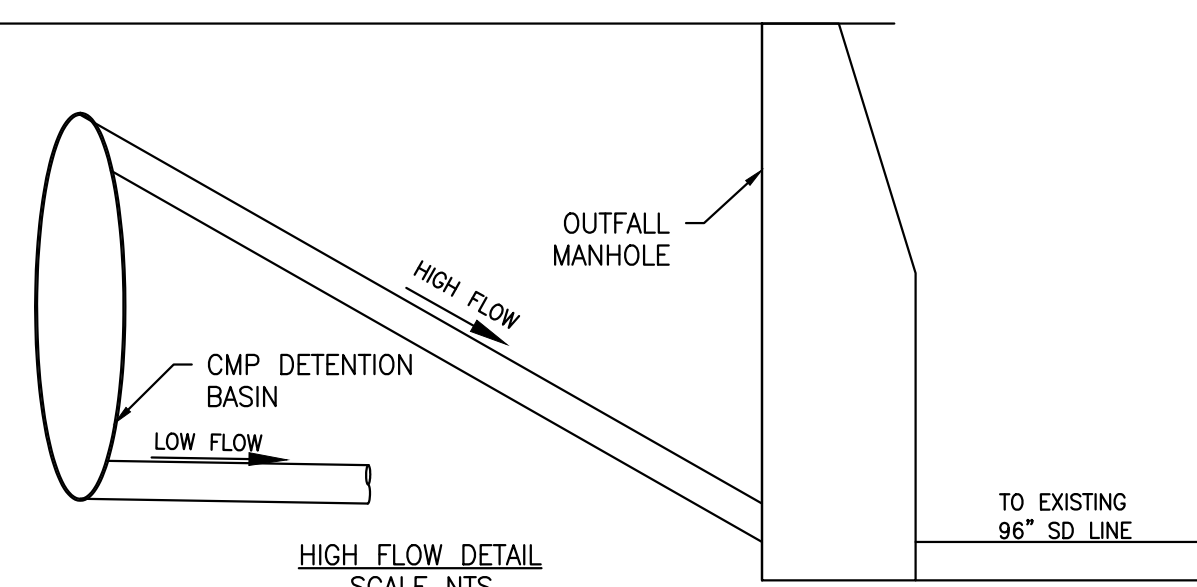
OUTDOOR STORAGE OF EQUIPMENT OR MATERIALS IS PROHIBITED ON THIS SITE
 VEHICLE AND EQUIPMENT CLEANING IS PROHIBITED ON THIS SITE
 VEHICLE EQUIPMENT REPAIR AND MAINTENANCE IS PROHIBITED ON THIS SITE



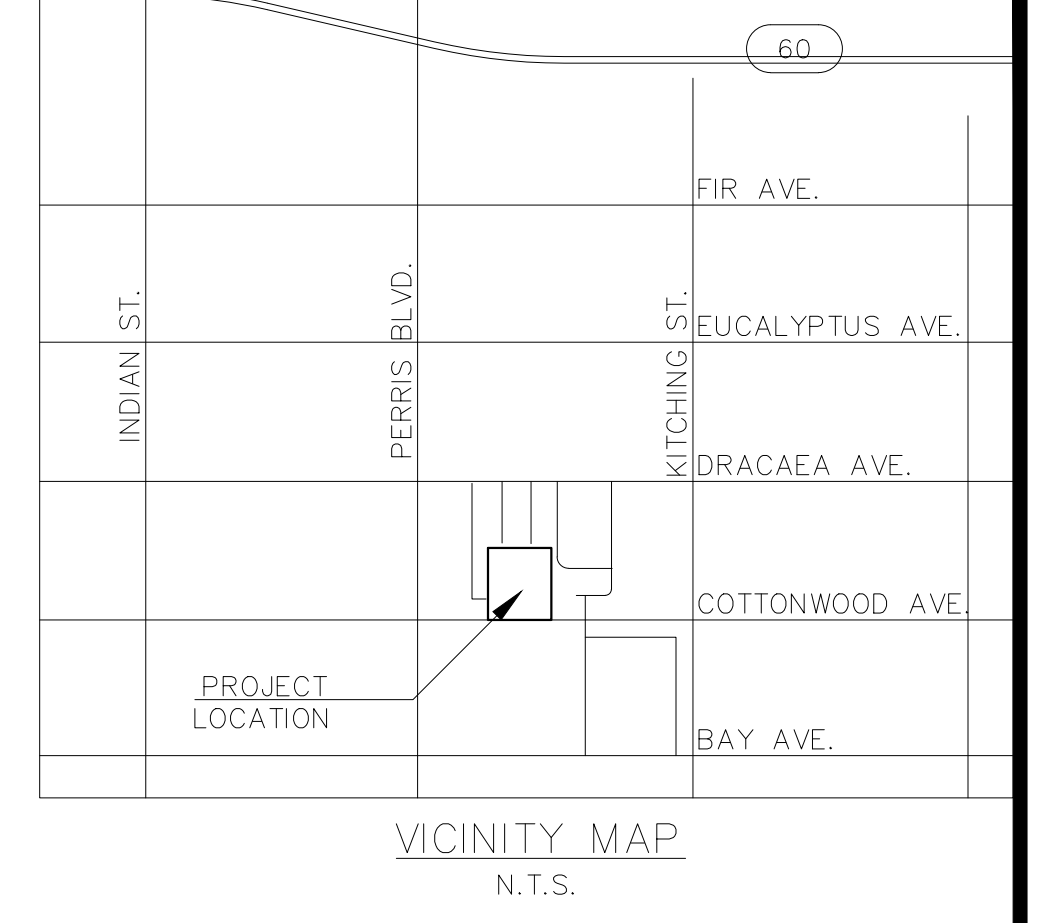
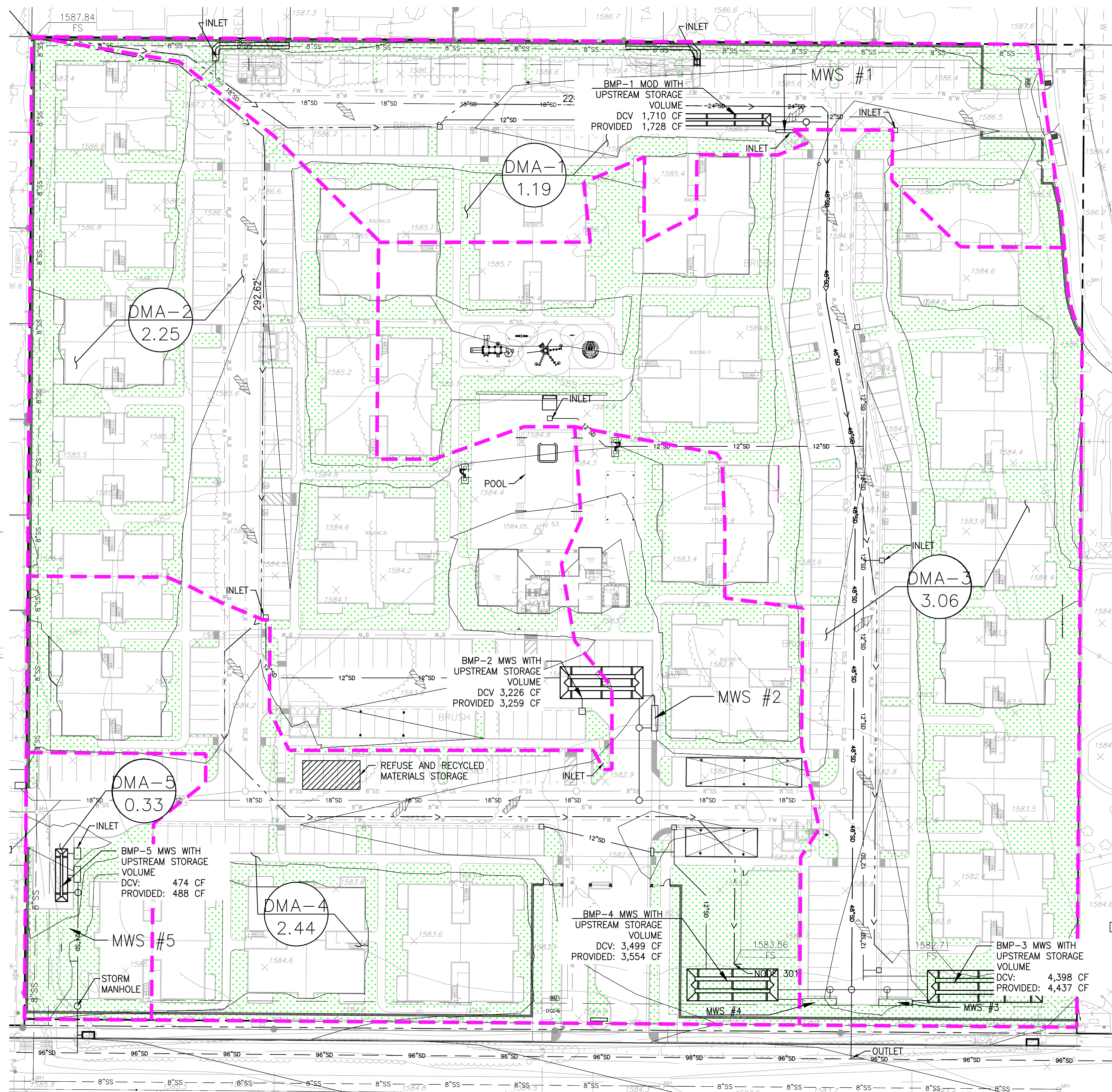
TYPICAL MODULAR WETLAND SYSTEM



LOW FLOW DETAIL



HIGH FLOW DETAIL SCALE N.T.S.

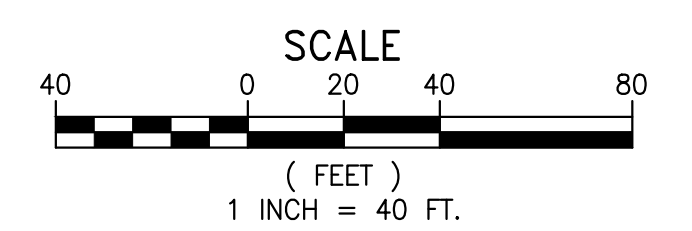
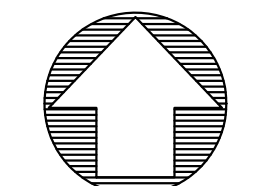


DMA AREA SUMMARY TABLE		
DMA ID	SURFACE TYPE	
	PERVIOUS AREA (S.F.)	IMPERVIOUS AREA (S.F.)
DMA 1	14,837	37,040
DMA 2	27,997	69,893
DMA 3	38,161	95,268
DMA 4	30,358	75,789
DMA 5	4,109	10,258
TOTAL	115,461	288,249
%	28.6	71.4

DMA ID	DMA TRIBUTARY AREA (S.F.)	DESIGN CAPTURE VOLUME (DCV)(C.F.)	VOLUME PROVIDED (C.F.)*
1	51,877	1,712	1,728
2	97,890	3,230	3,259
3	133,429	4,403	4,437
4	106,147	3,503	3,554
5	14,367	474	488
TOTAL	403,710	13,322	13,466

LEGEND

- > FLOW LINE
- > FLOW DIRECTION
- - - - - DRAINAGE AREA BOUNDARY
- # 0.0 AREA DESIGNATION
- # 0.0 AREA IN ACRES
- [Green Dotted Box] LANDSCAPING AREA
- [Square] PROP. INLET
- [Rectangle] PROP. UNDERGROUND BASIN



NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

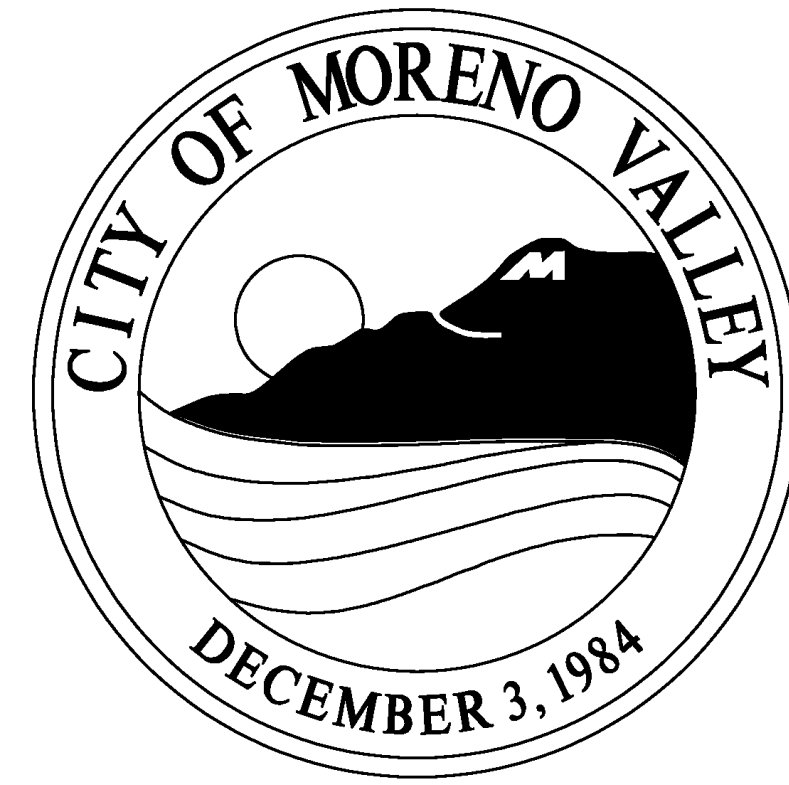
CALL 811 or 1-800-422-4133 2 Working Days Before You Dig WWW.CALL811.COM

REVIEW BY CITY STAFF	BENCHMARK	BASIS OF BEARING	CITY OF MORENO VALLEY ACCEPTED BY:		ENGINEER OF RECORD'S SEAL	 10535 FOOTHILL BLVD. SUITE 440 RANCHO CUCAMONGA, CA 91730 YOUR LAND DEVELOPMENT CONSULTANTS UNDER THE SUPERVISION OF: ANGEL CESAR RCE 87222 DATE	CITY OF MORENO VALLEY WQMP COTTONWOOD APARTMENTS DEVELOPMENT	SHEET 9 OF 9 CITY ID No											
		THE BEARING OF N 89°33'40" W FOR THE CENTERLINE OF DRACAEA AVENUE AS SHOWN ON TRACT NO. 7755-1 FILED IN BOOK 96 PAGES 15-17 OF RIVERSIDE COUNTY RECORDS, WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.	<table border="1"> <thead> <tr> <th>MARK</th> <th>DATE</th> <th>INITIAL</th> <th>DESCRIPTION</th> <th>REC.</th> <th>APPR./DATE</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>E.O.R.</td> <td>REVISION</td> <td></td> <td></td> </tr> </tbody> </table>	MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR./DATE			E.O.R.	REVISION						
MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR./DATE														
		E.O.R.	REVISION																

STREET IMPROVEMENTS

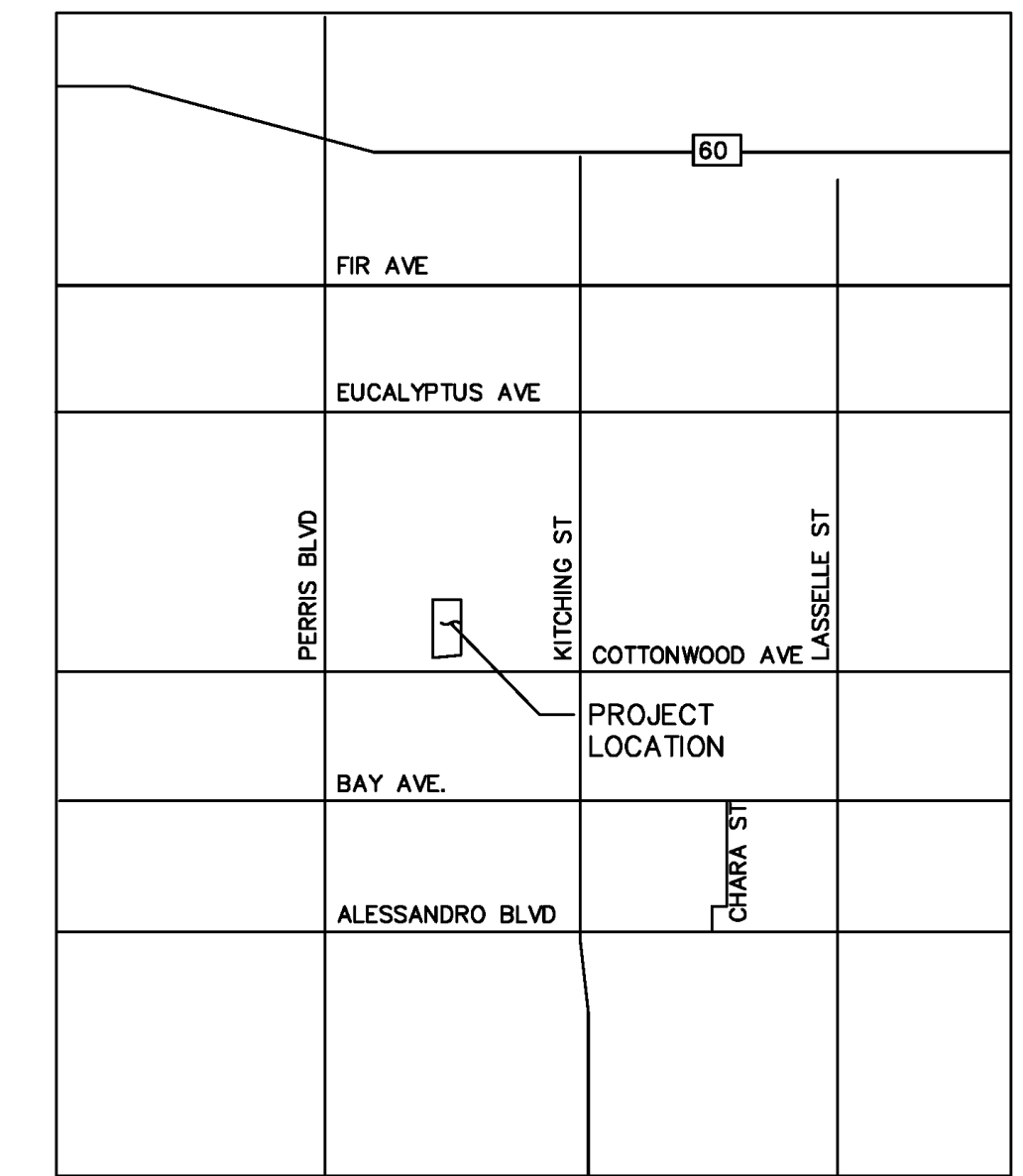
COTTONWOOD AVE - 4+39.98 TO 13+20.07

PROJECT No XXX XXXX



GENERAL STREET IMPROVEMENT NOTES:

1. ALL WORK SHALL CONFORM TO THE CONTRACT DOCUMENTS IN EFFECT AT THE TIME OF BID, THE CITY OF MORENO VALLEY "STANDARD PLANS," AND OTHER AGENCIES' APPLICABLE "STANDARD PLANS" AS NOTED ON THE PLANS AND IN THE SPECIAL PROVISIONS.
2. ALL TRAFFIC SIGNAL WORK SHALL CONFORM TO THE CONTRACT DOCUMENTS IN EFFECT AT THE TIME OF BID, SECTION 86 "SIGNALS AND LIGHTING" OF CALTRANS STANDARD SPECIFICATIONS, CALTRANS STANDARD PLANS, AND THE SPECIAL PROVISIONS.
3. TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE CA MUTCD PART 6 "TEMPORARY TRAFFIC CONTROL."
4. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL OBTAIN A CITY OF MORENO VALLEY BUSINESS LICENSE AND ENCROACHMENT PERMIT.
5. PRIOR TO START OF CONSTRUCTION, THE CONTRACTOR SHALL CONTACT UNDERGROUND SERVICE ALERT, PROVIDE ALERT NUMBER TO CITY ENGINEER AND ALL NECESSARY UTILITY COMPANIES.
6. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL FILE AN APPLICATION FOR A FIRE HYDRANT METER WITH THE APPROPRIATE WATER AGENCY.
7. REQUEST FOR INSPECTION TO THE CITY OF MORENO VALLEY SHALL BE MADE BY THE CONTRACTOR AT LEAST TWENTY-FOUR (24) HOURS BEFORE THE SERVICES THEREOF WILL BE REQUIRED AT (951) 413-3130.
8. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE WITHOUT DELAY SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT RESIDENTS, BUSINESSES, AND TO THE TRAVELING PUBLIC. FAILURE TO COMPLY WILL BE A VIOLATION OF THE CONTRACT. CONTRACTOR SHALL PROVIDE ACCESS TO RESIDENCES AND BUSINESSES AT ALL TIMES.
9. NO PUBLIC TRAVELED STREET SHALL BE CLOSED TO TRAFFIC WITHOUT PRIOR CITY COUNCIL APPROVAL.
10. PROVISIONS SHALL BE MADE BY THE CONTRACTOR AT ALL TIMES FOR CONTRIBUTORY DRAINAGE.
11. THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES, CONDUITS OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS, THESE LOCATIONS ARE APPROXIMATE. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT ANY UTILITY FACILITIES SHOWN AND OTHER FACILITIES NOT ON RECORD OR NOT SHOWN ON THESE PLANS.
12. THE CONTRACTOR SHALL EXCAVATE INSPECTION HOLES (POT HOLES) AND DETERMINE THE LOCATION AND DEPTH OF ALL UNDERGROUND STRUCTURES AND UTILITIES THAT ARE IN THE VICINITY OF OR THAT MAY BE AFFECTED BY THE PROPOSED IMPROVEMENT WORK PRIOR TO ANY CONSTRUCTION WORK WHICH COULD DAMAGE OR CONFLICT WITH SAID STRUCTURES OR UTILITIES.
13. THE CONTRACTOR SHALL PROTECT IN PLACE ALL EXISTING TRAFFIC SIGNAL CONDUIT WITHIN 6" ABOVE PROPOSED SUB GRADE SURFACE AND ALL CONDUIT BELOW PROPOSED SUBGRADE SURFACE. ALL EXISTING CONDUIT THAT IS MORE THAN 6" ABOVE THE PROPOSED SUBGRADE SURFACE SHALL BE RELOCATED TO WITHIN 6" BELOW PROPOSED SUBGRADE SURFACE.
14. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY IF THE IMPROVEMENTS CONFLICT WITH EXISTING FACILITIES, AND WORK IN THE CONFLICTING LOCATION SHALL STOP.
15. ANY ALTERATIONS OR VARIANCES FROM THE PLANS, EXCEPT MINOR ADJUSTMENTS IN THE FIELD TO MEET EXISTING CONDITIONS, SHALL BE REQUESTED IN WRITING AND MAY NOT BE INSTITUTED UNTIL APPROVED BY THE CITY ENGINEER OR REPRESENTATIVES ACTING SPECIFICALLY ON THE CITY ENGINEER'S INSTRUCTIONS.
16. INSPECTION BY THE CITY INSPECTOR SHALL NOT, IN ANY WAY, RELIEVE THE CONTRACTOR OF HIS/HER OBLIGATIONS TO COMPLETELY AND DILIGENTLY PERFORM ALL WORK IN COMPLIANCE WITH THE APPROVED PLANS AND SPECIFICATIONS.
17. ALL ELEVATIONS SHOWN ON THE PLANS ARE ESTABLISHED BY LOCAL BENCH MARKS. SURVEY MONUMENTS SHALL BE PROTECTED IN PLACE.
18. ALL ASPHALT CONCRETE AND PORTLAND CEMENT CONCRETE SHALL BE SAWCUT UNLESS OTHERWISE SPECIFIED.
19. NO TRENCHES EXCEPT CURB AND GUTTER, SHALL BE LEFT OPEN OVERNIGHT UNLESS APPROVED BY THE CITY ENGINEER IN WRITING.
20. ALL UTILITIES SHALL BE INSTALLED, INSPECTED, TESTED AND APPROVED BY THE APPROPRIATE UTILITY COMPANY PRIOR TO PAVING. PROOF OF SUCH INSPECTION/APPROVAL SHALL BE SUPPLIED TO THE CITY INSPECTOR OR REPRESENTATIVE.
21. IRRIGATION LINES WITHIN ANY CITY STREET SHALL HAVE A 30" MINIMUM COVER FROM FINISH SURFACE, UNLESS SAID IRRIGATION LINE HAS BEEN APPROVED BY THE CITY ENGINEER IN WRITING TO BE ENCASED IN CONCRETE OR BEDDED IN A SPECIAL CONCRETE CRADLE.
22. THE CONTRACTOR SHALL COMPACT THE UPPER SIX INCHES OF SUBGRADE/AGGREGATE BASE TO A MINIMUM RELATIVE DENSITY OF 90/95 PERCENT RESPECTIVELY PER ASTM 1556-82 TESTING METHOD, OR AS DIRECTED BY THE ENGINEER.
23. SUBGRADE MATERIALS PLACED FOR CURBS, GUTTERS, AND DRIVEWAY APPROACHES SHALL BE TO A RELATIVE COMPACTION OF 95 PERCENT; 90 PERCENT FOR SIDEWALKS.
24. ALL PORTLAND CEMENT CONCRETE (PCC) REMOVALS, INCLUDING, BUT NOT LIMITED TO CROSS GUTTERS, CURBS, DRIVEWAY APPROACHES, SIDEWALKS AND SPANDRELS SHALL BE MADE BY REMOVING AND REPLACING THE ENTIRE SECTION BETWEEN JOINTS. IF ANY UTILITY CUTS ARE MADE IN PCC IMPROVEMENTS, THE ENTIRE SECTION SHALL BE REMOVED AND REPLACED.
25. CONCRETE SIDEWALKS, CURBS AND GUTTERS, OR OTHER CONCRETE STRUCTURES WHICH WILL NOT BE SUBJECTED TO VEHICULAR TRAFFIC, SHALL BE BARRICADED FOR A PERIOD OF AT LEAST SEVEN (7) DAYS FOLLOWING PLACEMENT OF THE SAID CONCRETE STRUCTURE. FOR DRIVEWAYS, CROSS GUTTERS, SPANDRELS OR OTHER STRUCTURES WHICH WILL BE SUBJECTED TO VEHICULAR TRAFFIC, THE CONTRACTOR SHALL USE CONCRETE CONTAINING EIGHT SACKS OF CEMENT AND ADDITIVES THAT PROVIDE HIGH EARLY STRENGTH IN ORDER TO UTILIZE EARLIER USE OF CONSTRUCTED FACILITIES, AS EARLY AS 24-HOUR AFTER PLACING OF CONCRETE. THE CONTRACTOR SHALL OBTAIN WRITTEN APPROVAL FROM THE CITY ENGINEER FOR TRAFFIC USE TO BE PERMITTED THEREON TWENTY-FOUR HOURS AFTER THE PLACING OF CONCRETE.
26. ALL TRAFFIC CONTROL DEVICES AND SIGNS SHALL BE IN PLACE AND APPROVED BY THE CITY PRIOR TO PAVING. DELINEATION SHALL BE COMPLETED PRIOR TO STREET OPEN.
27. THE CONTRACTOR SHALL NOT PLACE ASPHALT CONCRETE PAVING UNTIL SUBGRADE OR AGGREGATE BASE HAS BEEN INSPECTED AND APPROVED BY THE CITY AND SHALL INCLUDE A COPY OF THE CERTIFICATION OF BASE/COMPACTION BY THE GEOTECHNICAL ENGINEER.
28. THE CONTRACTOR SHALL PLACE THE ARHM FINISH SURFACE COURSE PAVING AFTER ALL BASE COURSE PAVING HAS BEEN COMPLETED AND ACCEPTED. TACK COAT SHALL BE PLACED BETWEEN ALL COURSES OF PAVING.
29. THE CONTRACTOR SHALL ADJUST WATER VALVE COVERS TO FINISH GRADE DURING PAVING, LOOSEN AFTER PAVING, AND PAINT BLUE.
30. BLUE DOTS SHALL BE INSTALLED TO INDICATE THE LOCATION OF FIRE HYDRANTS.
31. ALL TREE BRANCHES OVER-HANGING THE SIDEWALK SHALL BE TRIMMED CLEAR TO A MINIMUM HEIGHT OF 10 FEET ABOVE FINISHED SURFACE/GROUND SURFACE AND BRANCHES OVER-HANGING THE ROADWAY SHALL BE TRIMMED CLEAR TO A MINIMUM HEIGHT OF 18 FEET.
32. ALL IRRIGATION SHALL BE RELOCATED BEHIND IMPROVEMENTS AND REPLACED WITH THE SAME STANDARD OF MATERIALS OR HIGHER. ALL LANDSCAPING SHALL COMPLY WITH THE CONTRACT DOCUMENTS.
33. ALL PAVEMENT REPAIR SURFACE COURSE SHALL BE PG 64-16 ASPHALT RUBBER HOT MIX (ARHM-G6-C) OR AS APPROVED BY THE CITY ENGINEER. SEE STANDARDS No MVS-132, A THROUGH F. ARHM SHALL CONFORM TO SECTION 203-11 OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, LATEST EDITION.



VICINITY MAP
NTS

LEGEND:

UNLESS SHOWN HEREON, USE SYMBOLS, LINETYPES, HATCHING, ETC. PER MVS1 STD. PLAN MVS1-010 SERIES.

BCR - BEGINNING OF CURVE RETURN

ECR - END OF CURVE RETURN

CONSTRUCTION NOTES

- ① CONSTRUCT 3" AC PAVEMENT OVER 4" CLASS II AGGREGATE BASE
- ② CONSTRUCT 6" CURB AND GUTTER PER CITY OF ADELANTO STD DWG 116
- ③ CONSTRUCT DRIVEWAY PER CITY STD. MVS1-107A-0*
- ④ CONSTRUCT OFFSITE CONCRETE SIDEWALK PER CITY STD. MVS1-115A-0
- ⑤ SAW CUT AND JOIN EXISTING PAVEMENT PER STD. PLAN MVS1-131-0
- ⑥ EXISTING POLE AND OVERHEAD WIRE TO BE UNDERGROUND
- ⑦ CONSTRUCT SPANDREL PER STD. PLAN MVS1-127-0

REMOVAL NOTES

- [A] REMOVE EXISTING A.C. PAVEMENT
- [B] AT CITY ENGINEERS DISCRETION, REMOVE AND RECONSTRUCT A.C. PAVEMENT OR GRIND AND OVERLAY TOP 0.10' OF A.C. PAVEMENT

UNDERGROUND STRUCTURES

ALL UNDERGROUND UTILITIES OR STRUCTURES REPORTED BY THE OWNER OR OTHERS AND THOSE SHOWN ON THE RECORDS EXAMINED ARE INDICATED WITH THEIR APPROXIMATE LOCATION AND EXTENT. THE OWNER ACCEPTING THESE PLANS OR PROCEEDING WITH IMPROVEMENTS PURSUANT THERETO AGREE'S TO ASSUME LIABILITY AND TO HOLD UNDERSIGNED HARMLESS FOR ANY DAMAGE RESULTING FROM THE EXISTENCE OF UNDERGROUND UTILITIES OR STRUCTURES NOT REPORTED TO THE UNDERSIGNED NOT INDICATED ON THE PUBLIC RECORDS EXAMINED, LOCATED AT VARIANCE WITH THAT REPORTED OR SHOWN ON RECORDS EXAMINED. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR STRUCTURES SHOWN AND ANY OTHER UTILITIES OR STRUCTURES FOUND AT THE SITE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNER OF THE UTILITIES OR STRUCTURES CONCERNED BEFORE STARTING WORK.

ENGINEER NOTICE TO CONTRACTORS

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE INVITING BIDS" OF THE BID DOCUMENTS.

DECLARATION OF ENGINEER OF RECORD

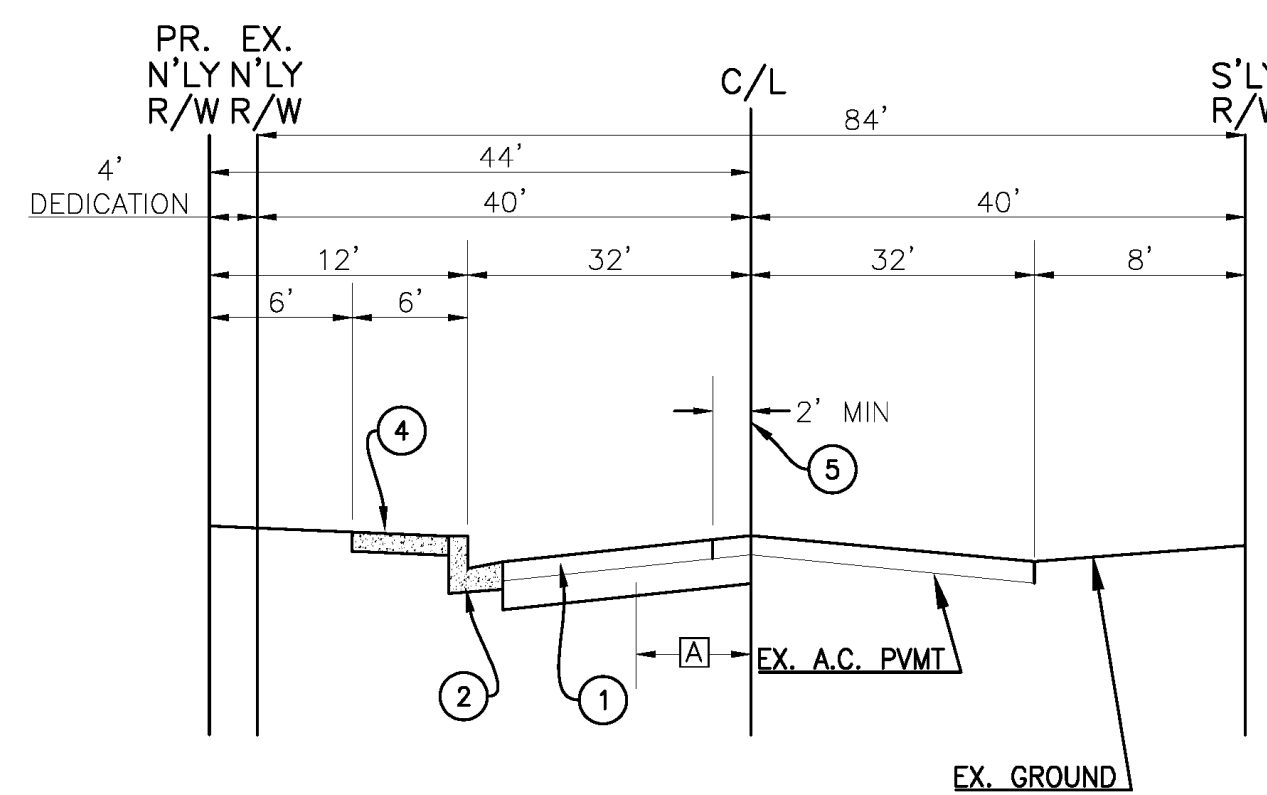
I HEREBY DECLARE THAT THE DESIGN OF THE IMPROVEMENTS AS SHOWN ON THESE PLANS COMPLIES WITH PROFESSIONAL ENGINEERING STANDARDS AND PRACTICES. AS THE ENGINEER IN RESPONSIBLE CHARGE OF DESIGN OF THESE IMPROVEMENTS, I ASSUME FULL RESPONSIBLE CHARGE FOR SUCH DESIGN. I UNDERSTAND AND ACKNOWLEDGE THAT THE PLAN CHECK OF THESE PLANS BY THE CITY OF MORENO VALLEY IS A REVIEW FOR THE LIMITED PURPOSE OF ENSURING THAT THE PLANS COMPLY WITH CITY PROCEDURES, APPLICABLE POLICIES AND ORDINANCES. THE PLAN CHECK IS NOT A DETERMINATION OF THE TECHNICAL ADEQUACY OF THE DESIGN OF THE IMPROVEMENTS. SUCH PLAN CHECK DOES NOT, THEREFORE, RELIEVE ME OF MY RESPONSIBILITY FOR THE DESIGN OF THESE IMPROVEMENTS. AS ENGINEER OF RECORD (EOR), I AGREE TO INDEMNIFY AND HOLD THE CITY OF MORENO VALLEY, THE MORENO VALLEY HOUSING AUTHORITY, AND THE MORENO VALLEY COMMUNITY SERVICE DISTRICT (CSD), ITS OFFICERS, AGENTS AND EMPLOYEES HARMLESS FROM ANY AND ALL LIABILITY OF CLAIMS, DAMAGES OR INJURIES TO ANY PERSON OR PROPERTY WHICH MIGHT ARISE FROM THE NEGLIGENCE, ACTS, ERRORS OR OMISSIONS OF THE ENGINEER OF RECORD. I HAVE READ AND INFORMED THE PROJECT APPLICANT/DEVELOPER THAT APPROVAL OF THESE PLANS DO NOT RELIEVE THEM FROM THE REQUIREMENTS OF THE CONDITIONS OF APPROVAL (ATTACHED HEREIN OR IN OTHER APPROVED IMPROVEMENT PLANS).

I ALSO HEREBY DECLARE THAT I HAVE COMPARED THESE PLANS WITH ALL APPLICABLE ADA TITLE II AND TITLE 24 REQUIREMENTS FOR DISABILITY ACCESS FOR THIS PROJECT, AND THESE PLANS ARE IN FULL COMPLIANCE WITH THOSE REQUIREMENTS.

NAME: ANGEL CESAR

RCE: 87222

DATE



TYPICAL SECTION - COTTONWOOD AVE.

NTS

PER CITY STD. MVS1-207A-0, TI=6

UTILITY COMPANIES

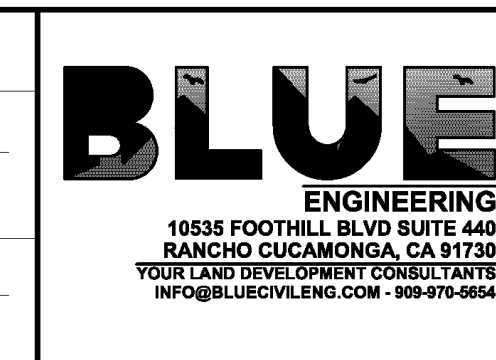
BOX SPRINGS MUTUAL WATER COMPANY	(951) 653-6419
CHARTER SPECTRUM	(877) 906-9121
CROWN CASTLE	(855) 913-4237
EASTERN MUNICIPAL WATER DISTRICT	(951) 928-3777
EDGEMONT COMMUNITY SERVICES DISTRICT	(951) 784-2632
FRONTIER COMMUNICATION	(800) 921-8101
MORENO VALLEY SPECIAL DISTRICTS	(951) 413-3480
MORENO VALLEY UTILITY	(951) 413-3500
RIVERSIDE TRANSIT AGENCY	(951) 565-5000
SOUTHERN CA EDISON	(800) 655-4555
SOUTHERN CA GAS COMPANY	(800) 427-2200
TRAFFIC SIGNAL MAINTENANCE (CITY)	(951) 413-3140
UNDERGROUND SERVICE ALERT	(800) 422-4133
VERIZON WIRELESS	(800) 922-0204



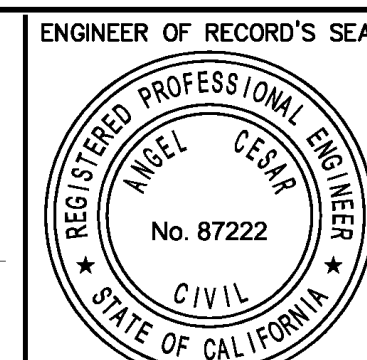
BASIS OF BEARINGS:	BENCH MARK:
ELEVATION: 1584.29'	THE BEARING OF N 89°33'40" W FOR THE CENTERLINE OF DRACEA AVENUE AS SHOWN ON TRACT NO. 7755-1 FILED IN BOOK 96 PAGES 15-17 OF RIVERSIDE COUNTY RECORDS; WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.
DESCRIPTION: TOP OF A DRAINAGE STRUCTURE	
LOCATION: LOCATED AT 19+75 PER RFG&WD PLANS OF "SUNNYMEAN LINE P" OF COTTONWOOD AVE	

MARK	REVISIONS	APPR	DATE
DESIGNED BY	DRAWN BY	CHECKED BY	

CITY OF MORENO VALLEY APPROVALS			
APPROVED BY	DATE	BY	RECOMMENDED:
			QUANG NGUYEN, PE CAPITAL PROJECTS PRINCIPAL ENGINEER RCE 65288
			APPROVED:
CITY TRAFFIC ENGINEER			MELISSA WALKER, PE PUBLIC WORKS DIRECTOR/CITY ENGINEER RCE 62940
SENIOR ENGINEER			



PREPARED UNDER SUPERVISION OF	ENGINEER OF RECORD'S SEAL
ANGEL CESAR	
RCE: 87222	



TITLE SHEET
COTTONWOOD AVE STREET IMPROVEMENTS 4+39.98 TO 13+20.07

ACCT No XXX-77-XXXX
SHEET X of X
PROJECT No XXX XXXX

1580 LT-

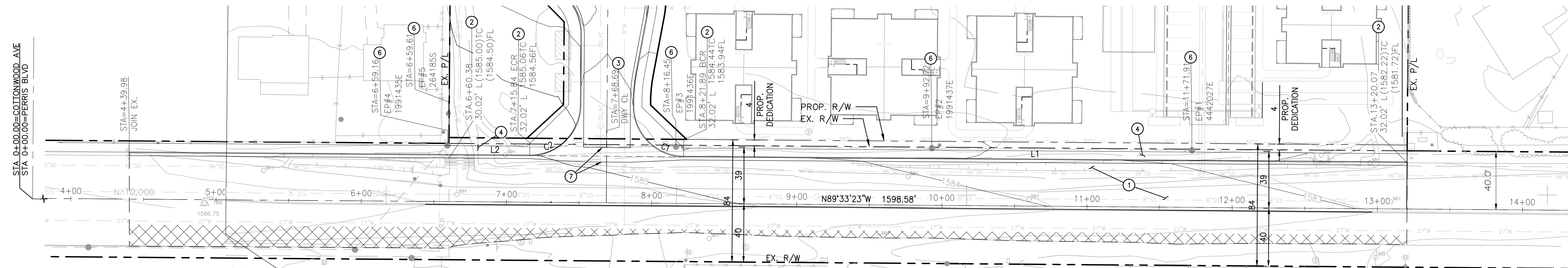
1580 LT-

1580 CL-

1580 CL-

5+00 6+00 7+00 8+00 9+00 10+00 11+00 12+00 13+00 14+00

PROFILE SCALES
HORIZ. 1"=10'
VERT. 1"=4'

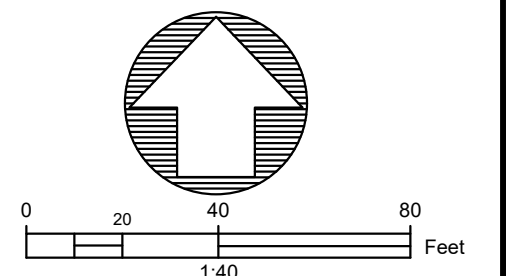


CONSTRUCTION NOTES

- ① CONSTRUCT 3" AC PAVEMENT OVER 4" CLASS II AGGREGATE BASE
- ② CONSTRUCT 6" CURB AND GUTTER PER CITY OF ADELANTO STD DWG 116
- ③ CONSTRUCT DRIVEWAY PER CITY STD. MVSJ-107A-0*
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- ⑦ CONSTRUCT SPANDREL PER STD. PLAN MVSJ-127-0

LINE DATA		
LINE #	BEARING	DISTANCE
L1	N89°33'23"W	498.33'
L2	N89°33'23"W	55.72'

CURVE DATA			
CURVE #	RADIUS	LENGTH	DELTA
C1	35.00'	29.88'	48°55'04"
C2	35.00'	29.88'	48°55'04"



NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

DIGALERT

CALL 811 or 1-800-422-4133 2 Working Days Before You Dig www.call811.com

BASIS OF BEARINGS:
ELEVATION: 1584.29'
DESCRIPTION: TOP OF A DRAINAGE STRUCTURE
LOCATION: LOCATED AT 19+75 PER R/C&WCD PLANS OF "SUNNYMEAN LINE P" OF COTTONWOOD AVE

BENCH MARK:
THE BEARING OF N 89°33'40" W FOR THE CENTERLINE OF DRACEA AVENUE AS SHOWN ON TRACT NO. 7755-1 FILED IN BOOK 96 PAGES 15-17 OF RIVERSIDE COUNTY RECORDS; WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

MARK REVISIONS APPR DATE
DESIGNED BY _____ DRAWN BY _____ CHECKED BY _____

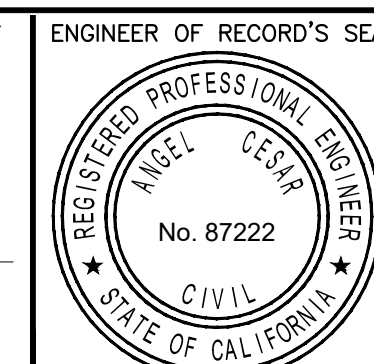
CITY OF MORENO VALLEY APPROVALS

APPROVED BY: QUANG NGUYEN, PE
CAPITAL PROJECTS PRINCIPAL ENGINEER
RCE: 65286

APPROVED: MELISSA WALKER, PE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
RCE: 62940



PREPARED UNDER SUPERVISION OF: ANGEL CESAR, RCE: 87222



COTTONWOOD AVE
STREET IMPROVEMENTS
4+39.98 TO 13+20.07

ACCT No XXXX-70-77-XXXX
SHEET 2 OF X
PROJECT No XXX XXXX

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

**GEOTECHNICAL ENGINEERING REPORT,
PROPOSED MULTI-FAMILY RESIDENTIAL DEVELOPMENT,
APN 0479-140-022,
Cottonwood Avenue, Moreno Valley, California**

for

WJK Development Co.

April 29, 2024

W.O. 7907

MDN 24161



April 29, 2024
W.O. 7907

WJK DEVELOPMENT CO.
28392 Airoso Street
Rancho Mission Viejo, California 92694

Attention: Grant Keene

Subject: Geotechnical Engineering Report, Proposed Multi-Family Residential Development, APN 0479-140-022, Cottonwood Avenue, Moreno Valley, California

Dear Mr. Keene:

As requested, GeoSoils Consultants, Inc. (GSC) has prepared a geotechnical engineering report on the subject site. The purpose of this report is to provide geotechnical engineering recommendations for site grading and foundations. This report presents the results of our research, site reconnaissance, subsurface exploration, laboratory testing, and provides geotechnical engineering recommendations for site grading. Development of the site is considered feasible from a geotechnical engineering perspective, provided the recommendations presented herein are incorporated into the design and implemented during construction.

We appreciate this opportunity to be of service to you. If you have any questions regarding this report, or if we may be of further assistance to you, please do not hesitate to contact us.

Very truly yours,

GEOISOILS CONSULTANTS, INC.




KAREN L. MILLER
GE 2257


ROSS MILLER
Staff Engineer

cc: (1) Addressee

MDN 24161

TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	Site Description	1
1.2	Proposed Development.....	1
1.3	Previous Studies	2
1.4	Scope of Services	2
1.5	Limitations.....	2
2.0	FIELD EXPLORATION	3
3.0	LABORATORY TESTING.....	3
4.0	FINDINGS.....	5
4.1	Geologic Environment.....	5
4.1.1	Earth Materials	5
4.1.2	Groundwater	5
4.2	Faulting And Seismicity	5
4.2.1	Earthquake Characterization:	5
4.2.2	Earthquake Intensity:.....	6
4.2.3	2022 California Building Code (CBC) Seismic Design Criteria	6
4.3	Secondary Earthquake Effects.....	7
4.3.1	Ground Rupture	7
4.3.2	Landsliding	8
4.3.3	Seiches and Tsunamis	8
4.3.4	Dry Sand Settlement	9
4.3.5	Liquefaction.....	9
4.4	Hydro Collapse	9
5.0	CONCLUSIONS.....	10
6.0	RECOMMENDATIONS.....	10
6.1	Removals	10
6.2	Foundations	11
6.2.1	Continuous Footings	11
6.2.2	Foundation General Recommendations	13

6.3	Interior Slab-on-grade	15
6.4	Exterior Slabs-on-grade	16
6.5	Swimming Pool	17
6.6	Pavement Sections	19
6.6.1	Asphalt Concrete	19
6.7	Infiltration Testing.....	22
6.8	Grading	22
6.8.1	General	22
6.8.2	Site Preparation	23
6.8.3	Fill Placement.....	24
6.8.4	Construction Considerations	27
6.8.5	Temporary Excavation	28
6.8.6	Excavation Observation	29
6.8.7	Utility Trenching and Backfill	29
7.0	CLOSURE	31

Enclosures

References

Plate 1, Boring Location Map

Appendix A, Boring Logs

Plates A-1 to A-3, Boring Logs (GSC)

Plates B-1 to B-4, Boring Logs (Geotek)

Plate I-1, Infiltration Test Data

Appendix B, Laboratory Test Results

Plate EI-1, Expansion Index

Plates C-1 and C-2, Consolidation Test Diagram

Plate MDD-1, Maximum Dry Density

Plate RV-1, R-Value Test Result

Plate MD-1, Moisture Content and Dry Unit Weight Results

cc: (1) Addressee

1.0 INTRODUCTION

The purpose of this report is to provide geologic and geotechnical engineering data and recommendations to aid in the development of the subject site. The following sections provide a summary of our subsurface exploration, laboratory testing, general geologic and geotechnical engineering conditions, and recommendations for site grading, fill placement, and foundations.

This report has been prepared in accordance with generally accepted geotechnical engineering practices in the City of Moreno Valley at the time it was prepared. The report presents a brief description of the site, the geotechnical engineering characteristics of the area, the seismicity of the area, an engineering analysis of the site characteristics, conclusions, and recommendations to develop the site.

Opinions presented in this report are based on an inspection of the site, a review of the regional geologic maps and seismic hazard reports, review of any previous consultant reports for the subject area, subsurface exploration and lab testing, and our general knowledge of the geologic and soils engineering conditions in the site area. The opinions presented have been arrived at through the exercise of the generally understood standard of care for our profession and standard of engineering practice for the City of Moreno Valley, as we understand it.

1.1 Site Description

The subject site is located north of Cottonwood Avenue and west of Patricia Lane. The subject site is approximately 9.39 acres, vacant, and predominantly flat covered with tall grass and shrubs. The site is surrounded by single-family homes to the west, north, and east.

1.2 Proposed Development

The proposed development of the site will consist of constructing 23 two-story multi-family residential buildings along with an administration building, swimming pool,

associated streets and parking. Five (5) underground basins are proposed throughout the property for LID purposes.

1.3 Previous Studies

Previous studies have been performed on the subject property by GeoTek, Inc. in April 2014, June 2014, and June 2021 (references).

The work by GeoTek included excavating, sampling, and logging of four (4) borings to a maximum depth of 50 feet. Additionally, one (1) backhoe test pit was dug in order to perform infiltration testing of the proposed basins. Boring log copies are included in Appendix A.

GSC has reviewed the reports prepared by GeoTek, Inc. and accepts their data.

1.4 Scope of Services

Our scope of services included the following:

- Site reconnaissance.
- Review of regional geologic maps and seismic hazard reports.
- Review of available geologic and geotechnical engineering reports.
- Excavated, sampled, and logged two hollow stem auger borings to a maximum depth of 50 feet at the locations shown on Plate 1, Boring Location Map.
- Laboratory testing.
- Engineering analyses.
- Preparation of this report.

1.5 Limitations

The findings and recommendations of this report were prepared in accordance with generally accepted professional geotechnical engineering principles and practice for the City of Moreno Valley at this time. We make no other warranty, either express or implied. The conclusions and recommendations contained in this report are based on-site conditions disclosed in our site inspection and the referenced reports. Since

our investigation was based on the site conditions observed and engineering analyses, the conclusions and recommendations contained herein are professional opinions. However, soil/rock conditions can vary significantly between borings; therefore, further refinements of our recommendations contained herein may be necessary due to changes in the building plans or what is encountered during site grading.

2.0 FIELD EXPLORATION

For our study, two borings to the maximum depth of 50 feet, were excavated on the site at the locations shown on Plate 1. Soil samples were obtained with a California ring sampler, SPT sampler and bulk samples. The hollow stem auger borings used the standard 140 lb. hammer with a 30-inch drop.

A representative from our firm continuously observed the borings excavations, logged the subsurface conditions, and collected representative soil samples. All samples were stored in watertight containers and later transported to our laboratory for further visual examination and testing, as deemed necessary. After the borings were completed, they were backfilled with soil cuttings.

The enclosed boring logs (Plates A-1 to A-3) describe the vertical sequence of soils and materials encountered in the borings, based primarily on our field classifications, and supported by our subsequent laboratory examination and testing.

3.0 LABORATORY TESTING

In Situ Moisture Content and Dry Unit Weight

In-place moisture content and dry unit weight of selected, relatively undisturbed ring soil samples were determined in accordance with the current version of the Test Methods ASTM D2216 and ASTM D7263, respectively. Once the dry unit weights had been determined, in-place densities of underlying soil profile were estimated. In those cases where ring samples were obtained, the moisture content and dry unit weights are presented in Appendix B.

Expansion Index

Expansion index testing was performed on selected bulk samples of the on-site soils in accordance with the current version of Test Method ASTM D4829-07. The test results are presented in Plate EI-1. Additional testing will be performed at the completion of grading. The test results indicate an expansion index of 11 (Very Low range).

Consolidation Test

Consolidation tests were performed on the selected ring samples. This test was performed in general accordance with Test Method ASTM D 2435-04. The samples were inundated at an approximate load of one ton per square foot to monitor the hydro-consolidation. Loads were applied to the sample in several increments in geometric progression and resulting deformations were recorded at selected time intervals. Results of the consolidation are presented on Plates C-1 to C-2.

Compaction Tests

Compaction tests were performed on a sample taken from the borings to determine moisture density relationships of the typical surficial soils encountered on the site. The laboratory standard used was in accordance with ASTM Test Designation D-1557-12.

TABLE 1 COMPACTION TEST RESULTS			
Sample	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-2 @ 0-5'	Brown, silty, very fine to fine SAND	131.0	8.5

R-Value

An R-value test was performed per Caltrans standard CA 301 on a surficial sample and the result is in Appendix B.

4.0 FINDINGS

4.1 Geologic Environment

Geologic conditions on the subject site were determined through research, field mapping, and subsurface exploration, and the results were superimposed on the Boring Location Map, Plate 1. During grading, a geologist should be present to confirm the geologic conditions encountered on the site are consistent with those presented herein. The following sections present our findings concerning subsurface and groundwater conditions.

4.1.1 Earth Materials

Alluvium (Qa)

Alluvial deposit was encountered in our borings to a maximum depth of 50 feet. The fill consists of light to reddish brown, silty sand with some clay.

4.1.2 Groundwater

Groundwater was encountered at depths of 19 and 25 feet in our borings on the site. Fluctuations in the level of ground water can occur due to seasonal climatic variations, changes in land use and other factors.

4.2 Faulting And Seismicity

The project site is not located within an Alquist-Priolo Earthquake Fault Zone and there are no active faults on or adjacent to the property. Although there are no faults on or adjacent to the property, there are faults near the site that can cause moderate to intense ground shaking during the lifetime of the proposed development. Therefore, earthquake resistant design is recommended.

4.2.1 Earthquake Characterization:

Earthquakes are characterized by magnitude, which is a quantitative measure of the earthquake strength, based on strain energy released during a seismic

event. The magnitude of an earthquake is constant for any given site and is independent of the site in question.

4.2.2 Earthquake Intensity:

The intensity of an earthquake at a random site is not constant and is subject to variations. The intensity is an indirect measurement of ground motion at a particular site and is affected by the earthquake magnitude, the distance between the site and the hypocenter (the location on the fault at depth where the energy is released), and the geologic conditions between the site and the hypocenter. Intensity, which is often measured by the Mercalli scale, generally increases with increasing magnitude and decreases with increasing distance from the hypocenter. Topography may also affect the intensity of an earthquake from one site to another. Topographic effects such as steep sided ridges or slopes may result in a higher intensity than sites located in relatively flat-lying areas.

4.2.3 2022 California Building Code (CBC) Seismic Design Criteria

The 2022 CBC (California Building Code) seismic coefficient criteria are provided in the table below for structural design consideration. Under the Earthquake Design Regulations of Chapter 16, Section 1613 of the CBC 2022, the following coefficients apply for the proposed Type II structures at the site. Site Class D-Default should be used for the site. The following seismic data is presented for preliminary design purposes. Ground motion parameters based on the Mapped Risk-Targeted Maximum Considered Earthquake (MCE_r) were determined and adhere to requirements discussed in ASCE 7-16 referenced by the 2022 California Building Code. The parameters include 5% critical damping for 0.2- and 1.0-second time periods. A summary of parameters is provided in the table below for a Site Class D designation. These values may only be used when the value of the seismic response coefficient C_s satisfies equations 12.8-2, 12.8-3, or 12.8-4 of the ASCE 7-16 Standard.

TABLE 2 SEISMIC PARAMETERS	
Description	Value
Mapped Response (0.2 second), S_s	1.707
Mapped Spectral Response (1.0 second), S_1	0.666
Short Period Site Coefficient, F_a	1.0
1-second Period Site Coefficient, F_v	Null
Adjusted Maximum Considered Earthquake Spectral Response (0.2 second), S_{MS}	2.048
Adjusted Maximum Considered Earthquake Spectral Response (1.0 second), S_{M1}	Null
5-percent Damped Design Spectral Response (0.2 second), S_{DS}	1.365
5-percent Damped Design Spectral Response (1.0 second), S_{D1}	Null
Maximum Considered Earthquake Geometric Mean Peak Ground Acceleration, PGA_M	0.867
*Site Coordinates: Latitude: 33.925547 °, Longitude: -117.223159°	

Conformance to the above criteria for seismic excitation does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive. Following a major earthquake, a building may be damaged beyond repair, yet not collapse.

4.3 Secondary Earthquake Effects

Ground shaking produced during an earthquake can result in a number of potentially damaging phenomena classified as secondary earthquake effects. These secondary effects include ground rupture, landslides, seiches and tsunamis, seismically induced settlement, and liquefaction. Descriptions of each of these phenomena and how it could potentially affect the proposed site are described as follows:

4.3.1 Ground Rupture

Ground rupture occurs when movement on a fault breaks the ground surface and usually occurs along pre-existing fault traces where zones of weakness already exist. The State has established Earthquake Fault Zones for the purpose of mitigating the hazard of fault rupture by prohibiting the location of most human occupancy structures across the traces of active faults.

Earthquake fault zones are regulatory zones that encompass surface traces of active faults with a potential for future surface fault rupture. The site is not located within the State established Earthquake Fault Zone. The hazard associated with ground rupture for the site is considered low.

4.3.2 Landsliding

Landslides are slope failures that occur where the horizontal seismic forces act to induce soil and/or bedrock failures. The most common effect is reactivation or movement on a pre-existing landslide. Typically, existing slides that are stable under static conditions (i.e., factor-of-safety above one) become unstable and move during strong ground shaking. The site is relatively flat and not subject to landslide hazard.

4.3.3 Seiches and Tsunamis

A seiche is the resonant oscillation of a body of water, typically a lake or swimming pool caused by earthquake shaking (waves). The hazard exists where water can be splashed out of the body of water and impact nearby structures. No bodies of constant water are near the site, therefore, the hazards associated with seiches are considered low.

Tsunamis are seismic sea waves generated by undersea earthquakes or landslides. When the ocean floor is offset or tilted during an earthquake, a set of waves are generated similar to the concentric waves caused by an object dropped in water.

Tsunamis can have wavelengths of up to 120 miles and travel as fast as 500 miles per hour across hundreds of miles of deep Ocean. Upon reaching shallow coastal waters, the once two-foot-high wave can become up to 50 feet in height causing great devastation to structures within reach. Tsunamis can generate seiches as well. Due to the distance and elevation of the site relative to the ocean, seiches and tsunamis are not considered a hazard to the site.

4.3.4 Dry Sand Settlement

Dry sand settlement can occur during moderate and large earthquakes when loose, natural or fill sandy soils are densified and settle, often unevenly across a site. In order for dry sand settlement to occur, the following four factors are required: 1) Relatively dry soil or soil situated above the groundwater table; 2) undrained loading (strong ground shaking), such as by earthquake; 3) contractive soil response during shear loading, which is often the case for a soil which is initially in a loose or uncompacted state; and 4) susceptible soil type; such as clean, uniformly graded sands. Structures situated above seismically densifying dry sandy soils may experience settlement. Based on site exploration, this site is considered to have very low susceptibility to dry sand settlement.

4.3.5 Liquefaction

Liquefaction is a soil softening dynamic response, by which an increase in the excess pore water pressure results in partial to full loss of soil shear strength and post-liquefaction dissipation of this pore water pressure results in ground settlement shortly after the earthquake. In order for liquefaction to occur, the following four factors are required: 1) saturated soil or soil situated below the groundwater table; 2) undrained loading (strong ground shaking), such as by earthquake; 3) contractive soil response during shear loading, which is often the case for a soil which is initially in a loose or uncompacted state; and 4) susceptible soil type; such as clean, uniformly graded sands, non-plastic silts, or gravels. Based on site exploration, this site is considered to have very low susceptibility to liquefaction due to the very dense nature of the underlying soil.

4.4 Hydro Collapse

Hydro-collapse is a condition where dry or moist soils undergo settlement upon being wetted. In many cases no additional surcharge load is necessary to trigger the Hydro-collapse. The potential for Hydro-collapse has been evaluated based upon observations, the results of Swell/Collapse and Consolidation tests, and moisture-

density determinations for samples taken from the field. A general guideline, such as outlined by Los Angeles County, Department of Public Works, Materials Engineering Division, consider potentially collapsible soils as generally having (a) low moisture contents (<8%), (b) low in-situ density(<108pcf), and these soils can potentially be subject to 2% or greater collapse.

A total of 2 consolidation tests were performed and are presented within Appendix B. The samples have a range of -0.1% to 0.0% volume change. Therefore, it is our opinion that the subject site is not susceptible to hydrocollapse.

5.0 CONCLUSIONS

The development of the subject site is considered feasible from a geologic and geotechnical engineering viewpoint, provided that the recommendations presented in this report are followed during grading.

6.0 RECOMMENDATIONS

6.1 Removals

Removals shall extend a minimum of five (5) feet below existing ground surface or proposed grades in the building area, whichever is lower in elevation. Removals shall extend a minimum of five feet beyond the building footprint or equal to the depth of removal, whichever is greater. In the areas of streets and other miscellaneous structures, removals shall extend a minimum of 3 (three) feet below existing ground surface or proposed grades, whichever lower in elevation. All undocumented fill, if encountered, on the site shall be removed during grading and replaced as compacted fill. Deeper removals may be required if soft or dry soil conditions are observed during grading or if hardpan conditions are observed. Preparation of areas to receive fill and fill placement shall be performed as discussed under "*Grading section*".

6.2 Foundations

The following recommendations are provided for preliminary design purposes and the final expansion index should be determined following grading. In our opinion continuous footings may be used to support the proposed structures.

All foundations should meet current slope setback requirements. Foundations should be designed for low-expansive soil conditions. The proposed improvements should be found into the compacted fill with a minimum of three (3) feet of compacted fill below the bottom of footings. Under no circumstances should foundations be cast atop loose, soft, or slough, debris, existing artificial fill, topsoil, or surfaces covered by standing water. Prior to placing concrete in a foundation excavation, an inspection should be made by our representative to ensure that the foundation's subgrade is free of loose and disturbed soils and is embedded in the recommended material. We offer the following site-specific recommendations and comments for purposes of foundation design and construction.

6.2.1 Continuous Footings

The proposed structures may be supported on continuous footings. Exterior isolated pad footings should be connected to adjacent footings via tie beams at discretion of structural engineer.

Subgrade Preparation

All conventional footings should be constructed on firm, unyielding certified compacted fill. All compacted fills should be compacted to at least 90 percent of the Modified Proctor maximum laboratory density, as determined by ASTM D-1557-12 compaction method. Pre-moistening of all areas to receive concrete is recommended. The moisture content of the subgrade soils should be equal to or slightly greater than optimum moisture and verified by the Geotechnical Engineer to a depth of 12 inches below adjacent grade within 24 hours of concrete placement. Footing's subgrades shall be prepared in accordance with the *Grading* section of this report.

Minimum Dimensions

Continuous footings for the two-story structures should have a width of at least 15 inches. Interior and perimeter footings should extend at least 18 inches below the lowest adjacent grade. Exterior isolated pad footings intended for support of roof overhangs such as decks, patio covers, and similar miscellaneous construction should be a minimum of 18 inches square and founded at a minimum depth of 18 inches below the lowest adjacent final grade. The building’s exterior isolated pad footings should be connected to adjacent footings via tie beams. For single-story structures, the minimum design requirements can be viewed in the table below.

TABLE 3 BUILDING’S CONTINUOUS FOOTINGS DIMENSIONS					
Number of Stories	Expansion Index	Footing Width, Inch	Depth Below the lowest adjacent final grade, inch		Reinforcement
			Perimeter Footings	Interior Footings	
1	Low	12	15	12	Four No. 4 bars; two top, two bottom
2	Low	15	18	18	
Exterior Pad Footing	Low	18	18		

Bearing Capacity

Footings with at least above minimum dimensions may be designed for a preliminary allowable bearing pressure of 1,500 pounds per square foot (psf) for dead plus live loads, with a one-third increase allowed when considering additional short-term wind or seismic loading. The allowable bearing value may be increased by 300 pounds per square foot per foot increase in depth or width to a maximum of 3000 psf. The weight of the footings may be neglected for design purposes. All footings located adjacent to utility lines should be embedded below a 1:1 plane extending up from the bottom edge of the utility trench.

Settlement

The footings should be designed based on a low-expansive soils condition. Differential settlement due to static loads is not expected to exceed about ½ - inch over 30 feet span for the proposed improvements supported on footings, provided that the foundations are designed and constructed as recommended.

Lateral Capacity

Lateral loads may be resisted by friction between the bottom of the footings and the supporting subgrade, and by passive soil pressure acting against the footings cast neat in foundation excavations or backfilled with properly compacted structural fill. A coefficient of friction of 0.4 may be assumed for design for footings supported on compacted fill. We recommend an equivalent fluid pressure of 300 pounds per cubic foot for ultimate passive soil resistance and not to exceed 3,000 pounds per cubic foot, where appropriate. The upper foot of passive soil resistance should be neglected where soil adjacent to the footing is not covered and protected by a concrete slab or pavement. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

General Structural Design

We recommend that foundations be reinforced with a minimum 2, No. 4 rebar both top and bottom steel, to provide structural continuity and to permit spanning of local irregularities.

6.2.2 Foundation General Recommendations

The above parameters are applicable provided structures have gutters and downspouts and positive drainage is maintained away from structures. Therefore, it is important that information regarding drainage and site maintenance be passed on to future owners.

The above recommendations assume, and GeoSoils Consultants, Inc. strongly recommends, that surface water will be kept from infiltrating into the subgrade adjacent to the building foundation system. This may include, but not be limited to rainwater, roof water, landscape water and/or leaky plumbing. The lots are to be fine graded at the completion of construction to include positive drainage away from the structure and roof water will be collected via gutters, downspouts, and transported to the street in buried drainpipes. Homebuyers should be cautioned against constructing open draining planters adjacent to the houses or obstructing the yard drainage in any way.

- Utility trenches beneath the slabs should be backfilled with compacted native soil materials, free of rocks.
- Standard City of Moreno Valley structural setback guidelines are applicable, except where superseded by specific recommendations by the Project Geologist and Geotechnical Engineer.
- Building or structure footings shall be set back a horizontal distance, x , from the face of adjacent descending slope, if any. The horizontal distance is calculated as $x=H/3$, where H is the height of slope. The distance x should not be less than 5 feet nor more than 40 feet. The distance x may be provided by deepening the footings.
- The ground immediately adjacent to the foundations shall be sloped away from the building at a slope of not less (5%-slope) for a minimum distance of 10' measured perpendicular to the face of the wall. Impervious surfaces within 10' of the building foundation shall be sloped a minimum of 2% away from the building.
- To help reduce humidity in the crawl space, if any, a high-quality vapor barrier should be installed across the soil surface within the crawl space.

The vapor barrier will help keep moisture content more consistent within the soils supporting the foundations. The vapor barrier should be kept relatively free of large wrinkles and folds, and individual adjacent pieces of vapor barrier should be overlapped and taped where this can be achieved.

6.3 Interior Slab-on-grade

General Recommendations

Interior concrete slab-on-grade may be used along with footings. Interior slabs on grade should be at least 4 inches thick, and they may be dwelled into the foundation system in habitable areas at discretion of structural engineer. Concrete slabs should be reinforced with at least No. 4 rebar at 16 inches on-center in both directions for very low expansive soil. All slab reinforcement should be properly positioned at mid-height in the slab during placement of concrete.

Thickness

The design engineer should determine the actual thickness of the slabs based on proposed loadings and use. However, minimum slab thickness of four inches is recommended.

Moisture Protection

Concrete slabs should be underlain with a vapor barrier consisting of a minimum of 10-mil polyvinyl chloride membrane with all laps overlain 12 inches in each direction. A two-inch layer of sand should overlie this membrane.

Slab Sectioning

To minimize transgression of shrinkage cracks, slabs must not exceed 20-foot sections. Expansion joints, plastic joints, saw cutting, or proper tooling may be used to create sectioning during concrete placement. It is suggested that slabs not be tied

structurally to heavily loaded walls or columns, until most of the dead loads are in place to permit minor differential settlement.

Subgrade Preparation

The subgrade soils below concrete flatwork areas to a minimum depth of 18 inches should be compacted to a minimum relative compaction of 90 percent at or slightly above the optimum moisture content. Pre-saturation of the subgrade below slabs will not be required; however, prior to placing concrete, the subgrade below all dwelling and garage floor slab areas should be thoroughly moistened to achieve a moisture content that is at least equal to or no more than 5 percent greater than optimum moisture content to a minimum depth of 18 inches below the bottoms of the slabs.

6.4 Exterior Slabs-on-grade

Subgrade Preparation

To reduce the potential for distress to exterior concrete flatwork, the subgrade soils below concrete flatwork areas to a minimum depth of 12 inches (or deeper, as either prescribed elsewhere in this report or determined in the field) should be moisture conditioned to at least equal to, or slightly greater than, the optimum moisture content and then compacted to a minimum relative compaction of 90 percent.

Flooding or ponding of the subgrade is not considered feasible to achieve the above moisture conditions since this method would likely require construction of numerous earth berms to contain the water. Therefore, moisture conditioning should be achieved with sprinklers, or a light spray applied to the subgrade over a period of few to several days just prior to pouring concrete. Pre-watering of the soils is intended to promote uniform curing of the concrete, reduce the development of shrinkage cracks and reduce the potential for differential expansion pressure on freshly poured flatwork. A representative of the project geotechnical consultant should observe and verify the density and moisture content of the soils, and the depth of moisture penetration prior to pouring concrete.

Drainage

Drainage from patios and other flatwork areas should be directed to local area drains and/or graded earth swales designed to carry runoff water to the adjacent streets or other approved drainage structures. The concrete flatwork should be sloped at a minimum gradient of one percent, or as prescribed by project civil engineer or local codes, away from building foundations, retaining walls, masonry garden walls and slope areas.

Thickened Edge

To improve performance, exterior slabs-on-grade may be constructed with a thickened edge to improve edge stiffness and to reduce the potential for water seepage under the edge of the slabs and into the underlying base and subgrade. In our opinion, the thickened edges should be at least 8 inches wide and ideally should extend at least 8 inches below the bottom of the slab.

6.5 Swimming Pool

Bearing Conditions

Based on the currently proposed pool location, the pool may be designed as a conventional pool shell founded on native alluvium. We anticipate entire pool bottom will be supported in competent alluvium. If this is not the case then the pool excavation shall be deepened to provide a uniform underlayment beneath the pool (Such as 3 feet of compacted fill across the entire pool). For the proposed spa, we anticipate it to be supported in compacted fill of a minimum thickness of 3 feet. The surface and near-surface materials in the area of the proposed swimming pool and spa have a low-expansion potential.

Lateral Earth Pressures

The pool walls should be designed assuming that an earth pressure equivalent to a fluid having a minimum density of 45 pounds per cubic foot. Pool walls should also

be designed to resist an additional uniform pressure equivalent to one-half of any surcharge loads applied within a 45-degree (1:1) plane from bottom of pool wall.

Underlayment

We recommend that a pressure relief valve(s) be placed in the bottom of the deep end of the pool to limit potential damage from hydrostatic (buoyant) pressure, a condition that could result if the pool were empty and the groundwater level outside of the pool were high.

Decking

Pool decking should be cast free of the swimming pool/spa and water stops should be provided between the bond beam and the deck. In the case of a spa being planned structurally continuous with the pool shell, the spa should either be designed to be entirely supported by the pool shell (i.e., cantilevered) or the spa support be derived at a depth comparable to that of the pool (i.e. deep). The Structural Engineer should exercise extreme care in this area. The transition area between the pool and spa is a common area for cracks to develop. Surface drainage around the pool should be provided to keep water from ponding and seeping into the ground. Surface water shall be collected and conducted through non-erosive devices to the street, storm drain, or other approved watercourse or disposal area.

Structural Design

In many cases, we have found pool contractors who commonly use standard pool detail sheets instead of having a Structural Engineer design a pool for the specific criteria recommended. These detail sheets usually incorporate details for several site conditions and can be confusing as to exactly which detail is appropriate. Typical “standard detail” may not conform to the criteria recommended. As such, we strongly discourage the use of standard detail sheets. Instead, the Structural Engineer should prepare a specific design and details to conform to the criteria presented in this report, as well as other structural criteria. The detail should also consider provisions for deck

construction. We further recommend that the Structural Engineer review steel once in-place and leave a memo at the job site indicating for the benefit of the concerned parties (e.g., owner and City) that it is appropriate to proceed further. Deputy inspection of gunite placement is advised. Prior to placement of steel, the pool plans should be reviewed by this office, and the pool excavation must be observed by a Geologist or Geotechnical Engineer.

Plumbing Fixtures

Leakage from the swimming pool or any of the appurtenant plumbing could create an artificial groundwater condition which could have a deleterious effect on the underlying soil. Therefore, it is imperative that all plumbing and pool features be absolutely leak-free. Should any subdrain pipes, (i.e., such as a yard drain system) be broken or impacted during construction of the pool system, or any structure, these pipes should be repaired and/or rerouted where necessary to restore their intended function (i.e., to provide proper drainage).

6.6 Pavement Sections

6.6.1 Asphalt Concrete

Based on the materials encountered in our borings and laboratory test results, it is our opinion that an R-value of 28, is appropriate for design of the parking area and drive isle pavements.

Using estimated Traffic Indices for various pavement loading conditions, we calculated the minimum pavement section thicknesses presented in table below based on the pavement design procedure described in Chapter 630 of the Caltrans Highway Design Manual for design life of 20-year. We note that it is the civil engineer's responsibility to choose an appropriate traffic index for various pavement systems. Any local jurisdiction minimum pavement sections should be followed.

TABLE 4 MINIMUM PAVEMENT SECTION THICKNESSES		
Traffic Index	Asphalt Thickness (in)	Aggregate Base Thickness (in)
4	3.00	4.00
4.5	3.00	4.00
5	3.00	6.00
5.5	3.00	7.50
6	3.50	8.00
7	4.00	10.00
8	5.00	11.00
9	5.50	13.50

If the pavements are constructed in two stages, the above table provides the minimum pavement section, and for any traffic index, pavements should not have less than 3 inches AC over 4 inches of AB, and the initial course graded AC (Binder) layer for construction traffic should not have less than 2.5 inches thickness, while the final fine-grained AC (Surface) layer, should not have less than 1.5 inches thickness. We note that constructing pavements in two stages may pose some hazards for the overall performance of pavement due to heavy construction equipment traffic on the relatively thin initial layer.

The Asphalt Concrete pavements may be underlain by approximately 3 feet of compacted fill to a minimum relative compaction of 90 percent. Subgrade soils immediately below the aggregate base, to a minimum depth of 12 inches, should be compacted to a minimum relative compaction of 95 percent based on ASTM D1557. Final subgrade compaction should be performed prior to placing base materials and after utility-trench backfills have been compacted and tested.

Asphalt concrete and aggregate base should conform to and be placed in accordance with the requirements of the Caltrans Standard Specifications, latest edition, except that compaction of subgrades and aggregate base material should be based on ASTM Test D1557. The base course should be compacted to 95 percent or more of the maximum dry density as evaluated by ASTM D1557. The base materials should also meet the specifications for

Crushed Aggregate Base, Crushed Miscellaneous Base or Processed Miscellaneous Base as defined in Section 200-2 of the current edition of the Standard Specifications for Public Works Construction (Greenbook).

AC Paving:

Prime coat may be omitted if all of the following conditions are met:

1. The asphalt pavement layer is placed within two weeks of completion of base and/or subbase course.
2. Traffic is not routed over completed base before paving.
3. Construction is completed during the dry season of May through October.
4. The base is free of dirt and debris.

If construction is performed during the wet season of November through April, prime coat may be omitted if no rain occurs between completion of base course and paving, and the time between completion of base and paving is reduced to three days, provided the base is free of dirt and debris. Where prime coat has been omitted and rain occurs, traffic is routed over base course, or paving is delayed, measures shall be taken to restore base course, subbase course, and subgrade to conditions that will meet specifications as directed by the geotechnical engineer.

We recommend that measures be taken to limit the amount of surface water that seeps into the aggregate base and subgrade below vehicle pavements, particularly where the pavements are adjacent to landscape areas. Seepage of water into the pavement base material can soften the subgrade, thereby increasing the amount of pavement maintenance that is required and shortening the pavement service life. Deepened curbs extending 4-inches below the bottom of the aggregate base layer are generally effective in limiting excessive water seepage below the edges of pavement and into the subgrade.

Other types of water cutoff devices or edge drains may also be considered to maintain pavement service life.

6.7 Infiltration Testing

The proposed infiltration systems will consist of five underground basins as shown on Plate 1. The final design of the system should be reviewed by this office. Infiltration testing was performed by GeoTek, Inc. in June 2014. One backhoe test pit was excavated to a depth of five (5) feet below the existing grade at the location shown on Plate 1. Based on subsurface exploration, it is our opinion that the soil underlying the site is homogenous and the infiltration testing applies across the entire site. A double-ring infiltrometer test was performed in general conformance with ASTM D-3385 and the Riverside County of Flood Control and Water Conservation District Design Handbook for Low Impact Development Best Management Practices. The results are presented in Appendix A and the infiltration rate can be viewed in the table below.

The result of infiltration rate without factor of safety is included in the table below. A minimum factor of safety of 2 may be considered for design purposes.

TABLE 5 PERCOLATION TEST RESULTS	
TEST LOCATION	RATE (Inches per hour)
I-1	0.3
Note: This rate does not include the correction factor	

6.8 Grading

Grading of the site will consist of a cut/fill operation to create level pads and associated streets. The grading will involve the removing and recompacting of existing near surface material. We offer the following recommendations and construction considerations concerning earthwork grading at the site.

6.8.1 General

Monitoring: We recommend that all earthwork (i.e., clearing, site preparation, fill placement, etc.) should be conducted with engineering control under

observation and testing by the Geotechnical Engineer and in accordance with the requirements within the *Grading* section of this report.

Job Site Safety: At all times, safety should have precedence over production work. If an unsafe job condition is observed, it should be brought to the attention of the grading contractor or the developer's representative. Once this condition is noted, it should be corrected as soon as possible, or work related to the unsafe condition should be terminated.

The contractor for the project should realize that services provided by GSC do not include supervision or direction of the actual work performed by the contractor, his employees, or agents. GSC will use accepted geotechnical engineering and testing procedures; however, our testing and observations will not relieve the contractor of his primary responsibility to produce a completed project conforming to the project plans and specifications. Furthermore, our firm will not be responsible for job or site safety on this project, as this is the responsibility of the contractor.

6.8.2 Site Preparation

Existing Structure Location: The General Contractor should locate all surface and subsurface structures on the site or on the approved grading plan prior to preparing the ground.

Existing Structure Removal: Any underground structures (e.g., septic tanks, wells, pipelines, foundations, utilities, etc.) that have not been located prior to grading should be removed or treated in a manner recommended by the Geotechnical Engineer.

Clearing and Stripping: The construction areas should be cleared and stripped of all vegetation, trees, bushes, sod, topsoil, artificial fill, debris, asphalt, concrete, and other deleterious material prior to fill placement.

Removals: Please refer to the *Removals* section of this report for specific recommendations for removals.

Subgrade Preparation: We recommend that the subgrade for those areas receiving any fill be prepared by scarifying the upper 12 inches and moisture conditioning, as required to obtain at least optimum moisture, but not greater than 120 percent of optimum. The scarified areas shall be compacted to at least 90 percent of the maximum laboratory density, as determined by ASTM D-1557-12 compaction method. All areas to receive fill should be observed by the Geotechnical Engineer prior to fill placement.

Subgrade Verification and Compaction Testing: Regardless of material or location, all fill material should be placed over properly compacted subgrades in accordance with this section. The condition of all subgrades shall be verified by the Geotechnical Engineer before fill placement or earthwork grading begins. Earthwork monitoring and field density testing shall be performed during grading to provide a basis for opinions concerning the degree of soil compaction attained. The Contractor should be responsible for notifying the Geotechnical Engineer when such areas are ready for inspection. Inspection of the subgrade may also be required by the controlling governmental agency within the respective jurisdictions. Density tests should also be made on the prepared subgrade to receive fill, unless the areas are underlain by dense alluvium, as required by the Geotechnical Engineer.

6.8.3 Fill Placement

Laboratory Testing: Representative samples of materials to be utilized as compacted fill should be analyzed in a laboratory to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material should be conducted.

On-Site Fill Material: The on-site soils, in our opinion, are adequate for re-use in controlled fills provided the soils do not contain any organic matter, debris,

and that over-sized rocks are buried in accordance with the recommendations under *Rock Fragments*.

Rock Fragments: The alluvium on the site should be free of oversized rocks. Any rock fragments over 6 inches should be kept below a depth of 5 feet below proposed grade. Rocks greater than 6 inches in diameter should be taken off site or placed in accordance with the recommendations of the Geotechnical Engineer. Rocks greater than 6 inches in diameter shall be kept out of all street areas to a depth below the deepest proposed utility line. Rocks shall not be placed in concentrated pockets, shall be surrounded with fine grained material, and the distribution of the rocks shall be supervised by the Geotechnical Engineer. A sufficient amount of fine-grained material shall be placed around the rocks to prevent nesting and to fill all void space. An adequate amount of water will be required to force fines into any open voids.

Fill Placement: Approved on-site material shall be evenly placed, watered, processed, and compacted in controlled horizontal layers not exceeding eight inches in loose thickness, and each layer should be thoroughly compacted with approved equipment. The fill should be placed and compacted in horizontal layers, unless otherwise recommended by the Geotechnical Engineer.

Compaction Criteria - Shallow Fills: For fills less than 40 feet in vertical thickness, each layer shall be compacted to at least 90 percent of the maximum laboratory density for material used as determined by ASTM D-1557-12. The field density shall be determined by the ASTM D-1556-07 method or equivalent. Where moisture content of the fill or density testing yields compaction results less than 90 percent, additional compaction effort and/or moisture conditioning, as necessary, shall be performed, until the fill material is in accordance with the requirements of the Geotechnical Engineer.

Fill Material - Moisture Content: All fill material placed must be moisture conditioned, as required to obtain at least optimum moisture, but not greater

than 120 percent. If excessive moisture in the fill results in failing results or an unacceptable “pumping” condition, then the fill should be allowed to dry until the moisture content is within the necessary range to meet the required compaction requirements or reworked until acceptable conditions are obtained.

Keying and Benching: All fills should be keyed and benched through all topsoil, slopewash, alluvium or colluvium or creep material into firm material where the slope receiving fill is steeper than 5:1 (Horizontal: Vertical) or as determined by Geotechnical Engineer. The standard acceptable bench height is four feet into suitable material. The key for side hill fills should be a minimum of 15 feet within compacted fill or firm materials, with a minimum toe embankment of 2 feet into compacted fill, unless otherwise specified by the Geotechnical Engineer.

Slope Face - Compaction Criteria: The Contractor should be required to obtain a minimum relative compaction of 90 percent out to the finish slope face of fill slopes. This may be achieved by either overbuilding the slope a minimum of five feet, and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment, or by any other procedure which produces the required compaction. If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor should rework or rebuild such slopes until the required degree of compaction is obtained, at no additional cost to the Owner or Geotechnical Engineer. Slope testing will include testing the outer 6 inches to 3 feet of the slope face during and after placement of the fill. In addition, during grading, density tests will be taken periodically on the flat surface of the fill three to five feet horizontally from the face of the slope.

Slope Face - Contractor’s Responsibility: The Contractor should prepare a written detailed description of the method or methods he would employ to obtain the required slope compaction. Such documents should be submitted

to the Geotechnical Engineer for review and comments prior to the start of grading.

Slope Face - Vegetation: All fill slopes should be planted or protected from erosion by methods specified in the geotechnical report or required by the controlling governmental agency.

Density Testing Intervals: In general, density tests should be conducted at minimum intervals of 2 feet of fill height or every 500 to 1,000 cubic yards. Due to the variability that can occur in fill placement and different fill material characteristics, a higher number of density tests may be warranted to verify that the required compaction is being achieved.

Grading Control: Earthwork monitoring and field density testing shall be performed by the Geotechnical Engineer during grading to provide a basis for opinions concerning the degree of soil compaction attained. The Contractor should receive a copy of the Geotechnical Engineer's *Daily Field Engineering Report* which will indicate the results of field density tests for that day. Where failing tests occur or other field problems arise, the Contractor shall be notified of such conditions by written communication from the Geotechnical Engineer in the form of a conference memorandum, to avoid any misunderstanding arising from oral communication.

Drainage Devices: Drainage terraces should be constructed in compliance with the ordinances of controlling governmental agencies, or with the recommendations of the Geotechnical Engineer or Engineering Geologist.

6.8.4 Construction Considerations

Erosion Control: Erosion control measures, when necessary, should be provided by the Contractor during grading and prior to the completion and construction of permanent drainage controls.

Compaction Equipment: It is also the Contractor's responsibility to have suitable and sufficient compaction equipment on the project site to handle the amount of fill being placed and the type of fill material to be compacted. If necessary, excavation equipment should be shut down to permit completion of compaction in accordance with the recommendations contained herein. Sufficient watering devices/equipment should also be provided by the Contractor to achieve optimum moisture content in the fill material.

Final Grading Considerations: Care should be taken by the Contractor during final grading to preserve any berms, drainage terraces, interceptor swales, or other devices of a permanent nature on or adjacent to the property.

6.8.5 Temporary Excavation

Where the necessary space is available, temporary unsurcharged embankments may be sloped back without shoring. The slope should not be cut steeper than the following gradient:

TABLE 6 TEMPORARY EXCAVATION SLOPE	
Height	Temporary Gradient (Horizontal:Vertical)
0 - 5'	Near Vertical
above 5'	1:1

In areas where soils with little or no binder are encountered, shoring or flatter excavation slopes shall be made. These recommended temporary excavation slopes do not preclude local ravelling or sloughing.

All applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act, and the Construction Safety Act should be met.

Where sloped embankments are used, the top of the slope should be barricaded to prevent equipment and heavy storage loads within five feet of the

top of the slope. If the temporary construction embankments are to be maintained for long periods, berms should be constructed along the top of the slope to prevent runoff water from eroding the slope faces. The soils exposed in the temporary backcut slopes during excavation should be observed by our personnel so that modifications of the slopes can be made if variations in the soil conditions occur. The temporary excavation slopes should be supported within three weeks.

6.8.6 Excavation Observation

All footing and other excavations should be observed by an Engineering Geologist or Geotechnical Engineering prior to placement of any steel to verify that the proper foundation material has been encountered. The City Inspector should also observe the excavation.

6.8.7 Utility Trenching and Backfill

Utility Trenching: Open excavations and excavations that are shored shall conform to all applicable Federal, State, and local regulations.

Backfill Placement: Approved on-site or imported fill material shall be evenly placed, watered, processed, and compacted in controlled horizontal layers not exceeding eight inches in loose thickness, and each layer should be thoroughly compacted with approved equipment. All fill material should be moisture conditioned, as required to obtain at least optimum moisture, but not greater than 120 percent of optimum moisture content. The fill should be placed and compacted on a horizontal plane, unless otherwise recommended by the Geotechnical Engineer.

As an alternative to on-site or imported fill material, for shallow trenches where pipe or utility lines may be damaged by mechanical compaction equipment, such as under building floor slabs, imported clean sand having a sand equivalent (SE) value of 30 or greater may be utilized. The sand backfill

materials should be watered to achieve near optimum moisture conditions and then tamped into place. No specific relative compaction will be required; however, observation, probing, and if deemed necessary, testing should be performed by a representative of the project geotechnical consultant to verify an adequate degree of compaction.

Backfill Compaction Criteria: Each layer of utility trench backfill shall be compacted to at least 90 percent of the maximum laboratory density determined by ASTM D-1557-12. The field density shall be determined by the ASTM D-1556-07 method or equivalent. Where moisture content of the fill or density testing yields compaction results less than 90 percent, additional compaction effort and/or moisture conditioning, as necessary, shall be performed, until the compaction criteria is reached.

Exterior Trenches Adjacent to Footings: Exterior trenches, paralleling a footing and extending below a 1H:1V plane projected from the outside bottom edge of the footing, should be compacted to 90 percent of the laboratory standard. Sand backfill, unless it is similar to the in-place fill, should not be allowed in trench backfill areas. Density testing, along with probing, should be accomplished to verify the desired results.

Pipe Bedding: We recommend that a minimum of 6 inches of bedding material should be placed in the bottom of the utility trench. All bedding materials shall extend at least 4 inches above the top of utilities which require protection during subsequent trench backfilling. All trenches shall be wide enough to allow for compaction around the haunches of the pipe.

Groundwater Migration: Backfilled utility trenches may act as French drains to some extent, and considerable groundwater flow along utility bedding and backfill should be expected. Wherever buried utilities, or structures which they may intersect, could be adversely affected by such drainage, provisions shall be made to collect groundwater migrating along the trench lines. These

situations include where buried utilities enter buildings, particularly where they enter below grade mechanical rooms, and where buried utilities enter junction boxes or switching stations that are intended to remain dry. Mitigation measures include, but are not limited to, placement of perforated drainpipes below and continuous with bedding materials, and placement of seepage barriers such as lean mix concrete or controlled density fill (CDF).

7.0 CLOSURE

We appreciate this opportunity to be of continued service to you. If you have any questions regarding the content of this report or any other aspects of the project, please do not hesitate to contact us.

April 29, 2024
W.O. 7907

REFERENCES

ACI 302.1R-15, Guide to Concrete Floor and Slab Construction.

ASCE/SEI 7-22, Minimum Design Loads and Associated Criteria For Buildings and Other Structures, American Society of Civil Engineers

California Building Code (CBC), 2022, California Code of Regulations, Title 24, Part 2, Volume I and II.

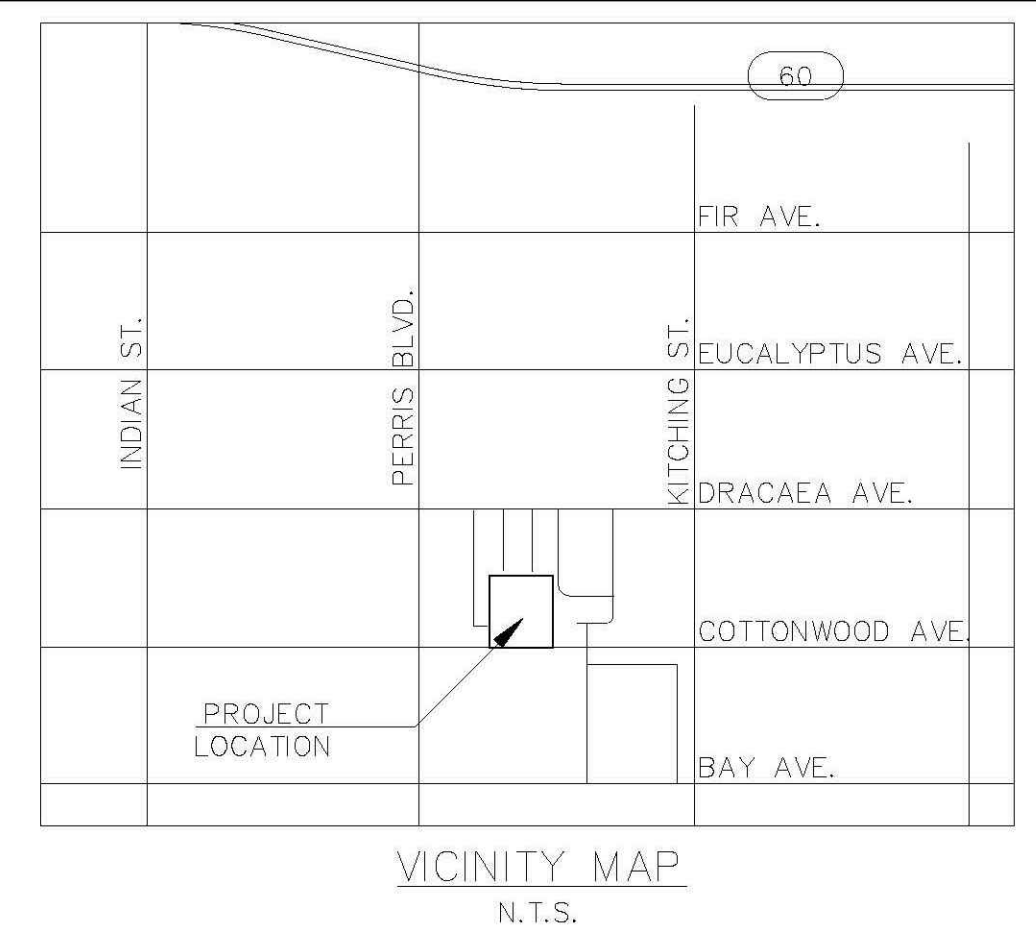
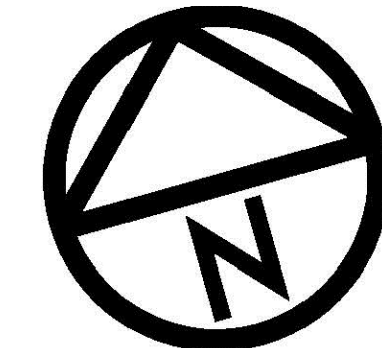
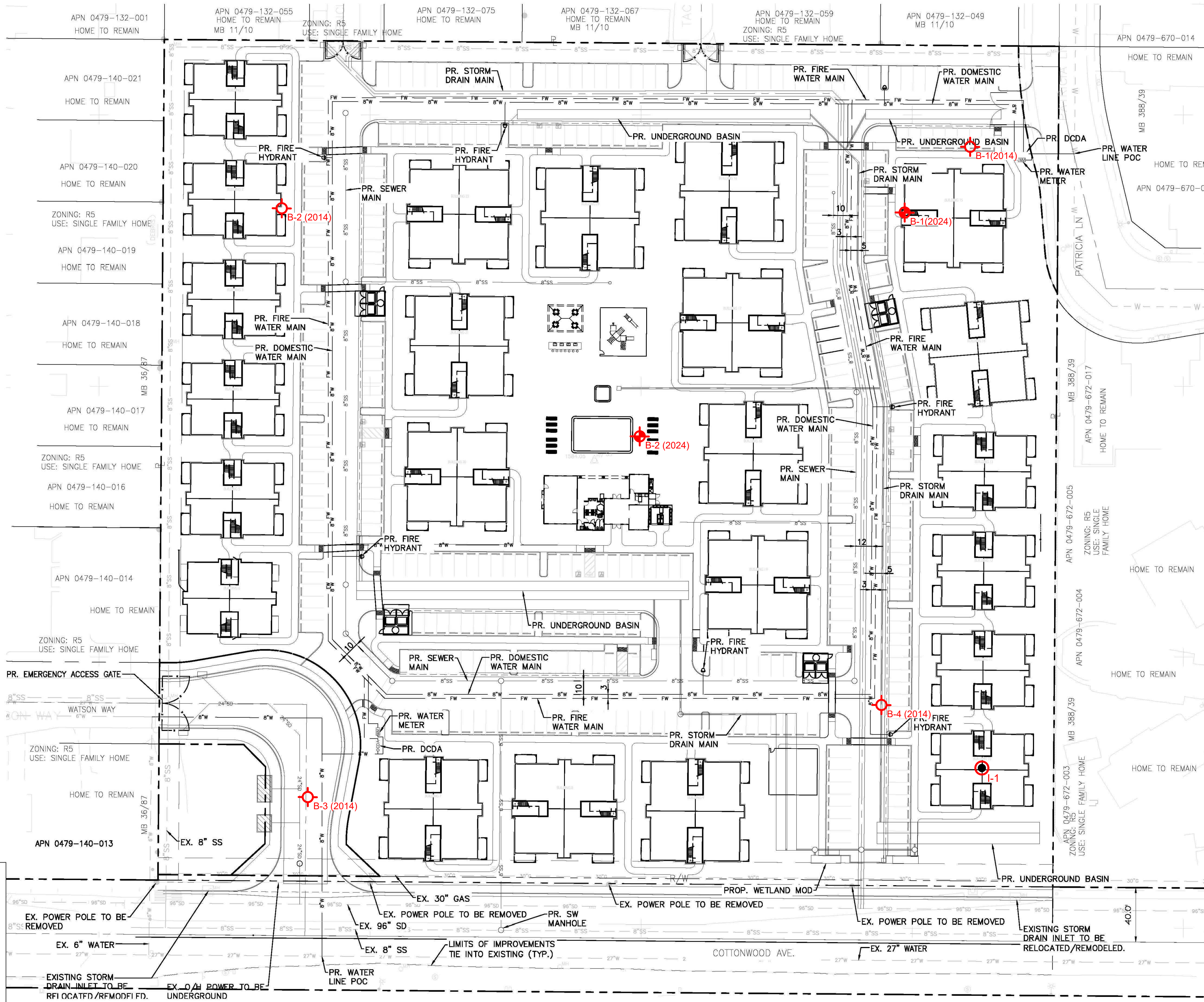
Hannigan, P. J., G. G. Goble, G. Thendean, G. E. Likins, and F. Rausche. Design and Construction of driven pile Foundation, FHWA-NHI-05-042 and NHI-05-043, Federal Highway Administration, U.S. Department of Transportation, Washington, DC, 2006. Vols. I and II.

Geotek, Inc. dated June 24, 2021, "Geotechnical Evaluation Update, Tract No. 34544, City of Moreno Valley, Riverside County, California."

Geotek, Inc. dated June 30, 2014, "Infiltration Evaluation, Proposed Residential Development, Tentative Tract Map No. 34544, City of Moreno Valley, Riverside County, California."

Geotek, Inc. dated April 10, 2014, "Geotechnical Evaluation, Proposed Single-Family Residential Development, APN 479-140-022, City of Moreno Valley, Riverside County, California."

MDN 24161



- EXPLANATION**
- B-1 APPROXIMATE LOCATION OF BORING (GEOTEK, INC. 2014)
 - B-1 APPROXIMATE LOCATION OF BORING (GEOISOILS 2024)
 - I-1 APPROXIMATE LOCATION OF INFILTRATION TEST (GEOTEK)

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

DIGALERT

CALL 811 or 1-800-422-4133 2 Working Days Before You Dig WWW.CALL811.COM

GSC GeoSoils Consultants Inc. 6634 Valjean Avenue Van Nuys, CA 91406

BORING LOCATION MAP
COTTONWOOD AVENUE
MORENO VALLEY, CALIFORNIA
WJK DEVELOPMENT CO.

WORK ORDER 7907	DATE 4/2024	SCALE AS NOTED
REVISED		PLATE 1

MDN 24161

REVIEW BY CITY STAFF

BENCHMARK

BASIS OF BEARING
THE BEARING OF N 89°33'40" W FOR THE CENTERLINE OF DRAECA AVENUE AS SHOWN ON TRACT NO. 7735-1 FILED IN BOOK 96 PAGES 15-17 OF RIVERSIDE COUNTY RECORDS, WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR/DATE
		E.O.R.	REVISION		

CITY OF MORENO VALLEY
ACCEPTED BY:

ENGINEER OF RECORD'S SEAL

BLUE
ENGINEERING & CONSULTING, INC.
9320 BAYVIEW RD. STE. 210 MARLBOROUGH, MA 01923
909-970-5654 info@blueengineering.com

UNDER THE SUPERVISION OF:

ANGEL CESAR RCE 87222 DATE

CITY OF MORENO VALLEY

CONCEPTUAL UTILITY PLAN
COTTONWOOD APARTMENTS DEVELOPMENT

SHEET 6 OF 9
CITY ID No

April 29, 2024
W.O. 7907

APPENDIX A
EXPLORATION DATA

MDN 24161

GEOTECHNICAL BORING LOG

PROJECT NAME	WJK Development	W.O.	7907
DRILLING COMPANY	Choice	DATE STARTED	3/18/2024
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	RM
DRILLING METHOD	Hollow Stem	HAMMER WT (lbs)	140
DIAMETER OF HOLE (IN)	8	DROP (IN)	30
		BORING NO.	B-1
		SHEET	
		GROUND ELEV.	
		GW ELEV.	

Boring Location:

Depth (ft)	Sample Type	Blows / 6"	GEOTECHNICAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Other Tests
0			0-50', ALLUVIUM (Qa) 0-5', Brown sandy, silty CLAY, very moist, soft			
5	[California Ring]	31/50	5', Reddish brown to brown, silty fine to coarse SAND, with some clay, dry, very dense			
	[California Ring]	24/50	7.5', Reddish grey brown, silty coarse SAND, dry, very dense			
10	[California Ring]	36/39/ 50 for 5"	10', Reddish brown, silty fine to coarse SAND, with some clay, slightly moist, very dense			
15	[Standard Penetration Test]	11/9/11	15', Reddish brown, sandy SILT to silty fine SAND, slightly moist, firm/dense			
20	[Standard Penetration Test]	12/18/9	20', Light brown to reddish brown, silty fine to coarse SAND, slightly moist, very dense			
25	[California Ring]	45/50 for 4"	25', Reddish brown, silty coarse SAND, wet, very dense			
30	[Standard Penetration Test]	9/13/15	30', Reddish brown, silty coarse SAND, wet, very dense			

<p style="text-align: center;">LEGEND</p> <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; border: 1px solid black; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px);"></div> Standard Penetration Test </div> <div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; border: 1px solid black; background: repeating-linear-gradient(-45deg, transparent, transparent 2px, black 2px, black 4px);"></div> California Ring </div> <div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; border: 1px solid black; background: radial-gradient(circle, black 1px, transparent 1px); background-size: 4px 4px;"></div> Rock Core </div> <div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; background-color: black;"></div> Bulk Sample </div> </div>	<p>SIEVE: Grain Size Analysis #200: Washed Sieve #200 MAX: Maximum Dry Density DS: Direct Shear C/S: Collapse/Swell CONS: Consolidation HYDR: Hydrometer Analysis EXPAN: Expansion Index CHEM: Chemical Tests R-V: R-Value PI: Atterberge Limits Tests</p>	<p>PLATE A-1</p> <div style="text-align: center;"> <p>GeoSoils Consultants Inc. GEOTECHNICAL · GEOLOGIC · ENVIRONMENTAL</p> </div>
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GEOTECHNICAL BORING LOG

PROJECT NAME	WJK Development	W.O.	7907
DRILLING COMPANY	Choice	DATE STARTED	3/18/2024
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	RM
DRILLING METHOD	Hollow Stem	HAMMER WT (lbs)	140
DIAMETER OF HOLE (IN)	8	DROP (IN)	30
		BORING NO.	B-1
		SHEET	
		GROUND ELEV.	
		GW ELEV.	

Boring Location:

Depth (ft)	Sample Type	Blows / 6"	GEOTECHNICAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Other Tests
35	[Cross-hatch]	13/15/21	35', Light brown, silty coarse SAND, wet, very dense			
45	[Cross-hatch]	9/11/15	45', Light brown to brown, silty coarse SAND with some clay, wet, dense			
50	[Cross-hatch]	17/15/18	50', Gray brown, fine to coarse SAND with some gravel, wet, dense, transitions to reddish brown, sandy SLT, fine grained sand, moist, firm			
55			TD=50' Groundwater @ 25' No caving			
60						
65						

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample

- SIEVE: Grain Size Analysis
- #200: Washed Sieve #200
- MAX: Maximum Dry Density
- DS: Direct Shear
- C/S: Collapse/Swell
- CONS: Consolidation
- HYDR: Hydrometer Analysis
- EXPAN: Expansion Index
- CHEM: Chemical Tests
- R-V: R-Value
- PI: Atterberge Limits Tests

PLATE **A-2**



GEOTECHNICAL BORING LOG

PROJECT NAME	WJK Development	W.O.	7907
DRILLING COMPANY	Choice	DATE STARTED	3/18/2024
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	RM
DRILLING METHOD	Hollow Stem	HAMMER WT (lbs)	140
DIAMETER OF HOLE (IN)	8	DROP (IN)	30
		BORING NO.	B-1
		SHEET	
		GROUND ELEV.	
		GW ELEV.	

Boring Location:

Depth (ft)	Sample Type	Blows / 6"	GEOTECHNICAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Other Tests
0			0-20', ALLUVIUM (Qa)			
		3/4/7	2.5', Brown, silty, clayey, fine to coarse SAND, moist, soft/loose with minor roots			
5		6/9/12	5', Brown, clayey, silty fine to coarse SAND, moist, dense			
		5/8/10	7.5', Reddish gray brown, silty fine to coarse SAND, moderately moist, dense			
10		43/40/50 for 4"	10', Reddish brown, silty fine to coarse SAND, slightly moist, very dense			
15		17/20/34	15', Reddish brown, silty coarse SAND with caliche, moderately moist, very dense			
20		19/34/50 for 2"	20', Reddish brown, silty coarse SAND, moist to very moist, very dense			
			TD=20' Groundwater @ 19' No caving			
25						
30						

<p style="text-align: center;">LEGEND</p> <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; border: 1px solid black; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px);"></div> <div>Standard Penetration Test</div> </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; border: 1px solid black; background: repeating-linear-gradient(-45deg, transparent, transparent 2px, black 2px, black 4px);"></div> <div>California Ring</div> </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; border: 1px solid black; background: radial-gradient(circle, black 1px, transparent 1px); background-size: 4px 4px;"></div> <div>Rock Core</div> </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; background-color: black;"></div> <div>Bulk Sample</div> </div> </div>	<p>SIEVE: Grain Size Analysis #200: Washed Sieve #200 MAX: Maximum Dry Density DS: Direct Shear C/S: Collapse/Swell CONS: Consolidation HYDR: Hydrometer Analysis EXPAN: Expansion Index CHEM: Chemical Tests R-V: R-Value PI: Atterberge Limits Tests</p>	<p>PLATE A-3</p> <div style="text-align: center; margin-top: 20px;"> <p>GeoSoils Consultants Inc. GEOTECHNICAL · GEOLOGIC · ENVIRONMENTAL</p> </div>
--	--	---

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT: Frontier Enterprises
PROJECT NAME: APN 479-140-022
PROJECT NO.: 1165-CR3
LOCATION: See Boring Location Map

DRILLER: 2R Drilling
DRILL METHOD: 8" Hollow Stem
HAMMER: Auto 140#/30"

LOGGED BY: AMS
OPERATOR: Jerry
RIG TYPE: CME 75
DATE: 3/24/2014

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: B-1	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
MATERIAL DESCRIPTION AND COMMENTS								
0				SM	Alluvium: 0': Silty f-m SAND with some clay, red brown, slightly moist, loose to medium dense			SH, EI, MD, SR
5	35	50-4.5"	BI-1		5': Silty f-m SAND with some clay, red brown, slightly moist, dense	5.0	130.9	HC
10	50		BI-2		10': SAME	6.8	112.1	
15	11 19 22		BI-3		15': SAME	18.1	109.4	
20	50		BI-4		20': SAME	8.7	119.7	
25	43	50-5.5"	BI-5		25': Silty f-c SAND, gray brown to red brown, slightly moist, dense			
30	40	50-4.5"	BI-6	SP	30': m-c SAND with gravel, gray brown, wet, dense			

LEGEND	Sample type:	---Ring	---SPT	---Small Bulk	---Large Bulk	---No Recovery	---Water Table
	Lab testing:	AL = Atterberg Limits	SR = Sulfate/Resistivity Test	EI = Expansion Index	SH = Shear Test	SA = Sieve Analysis	RV = R-Value Test

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT: Frontier Enterprises
PROJECT NAME: APN 479-140-022
PROJECT NO.: 1165-CR3
LOCATION: See Boring Location Map

DRILLER: 2R Drilling
DRILL METHOD: 8" Hollow Stem
HAMMER: Auto 140#/30"

LOGGED BY: AMS
OPERATOR: Jerry
RIG TYPE: CME 75
DATE: 3/24/2014

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: B-1 (continued)	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
MATERIAL DESCRIPTION AND COMMENTS								
					Alluvium (continued)			
35								
40		18 50-5.5"	B1-7	SM	40': Silty f-c SAND, gray brown to red brown, wet, dense			
45		36 50-5"	B1-8		45': SAME			
50		18 50-2.5"	B1-9		50': Silty f-c SAND with trace gravel, red brown to gray brown, wet, dense			
					BORING TERMINATED AT 50 FEET			
					No groundwater encountered Boring backfilled with cuttings			
55								
60								

LEGEND	Sample type:		---Ring		---SPT		---Small Bulk		---Large Bulk		---No Recovery		---Water Table
	Lab testing:	AL = Atterberg Limits	SR = Sulfate/Resistivity Test	EI = Expansion Index	SH = Shear Test	SA = Sieve Analysis	HC = Consolidation	RV = R-Value Test	MD = Maximum Density				

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT: Frontier Enterprises
PROJECT NAME: APN 479-140-022
PROJECT NO.: 1165-CR3
LOCATION: See Boring Location Map

DRILLER: 2R Drilling
DRILL METHOD: 8" Hollow Stem
HAMMER: Auto 140#/30"

LOGGED BY: AMS
OPERATOR: Jerry
RIG TYPE: CME 75
DATE: 3/24/2014

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: B-2	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
MATERIAL DESCRIPTION AND COMMENTS								
0				SM	Alluvium: 0': Silty f-m SAND with some clay, red brown, slightly moist, loose to medium dense			
5	22 24 18	B2-1			5': Clayey silty f-c SAND, red brown, slightly moist, dense	7.9	130.0	
10	33 46 48	B2-2			10': Silty f-c SAND, gray to red brown, slightly moist, dense	10.7	127.9	
15	13 27 33	B2-3	SC		15': Clayey f-c SAND, red, slightly moist, dense	13.8	122.5	
20	16 22 25	B2-4			20': SAME	9.1	126.1	
BORING TERMINATED AT 21.5 FEET								
25					No groundwater encountered Boring backfilled with cuttings			
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits EI = Expansion Index SA = Sieve Analysis RV = R-Value Test
SR = Sulfate/Resistivity Test SH = Shear Test HC = Consolidation MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT: Frontier Enterprises
PROJECT NAME: APN 479-140-022
PROJECT NO.: 1165-CR3
LOCATION: See Boring Location Map

DRILLER: 2R Drilling
DRILL METHOD: 8" Hollow Stem
HAMMER: Auto 140#/30"

LOGGED BY: AMS
OPERATOR: Jerry
RIG TYPE: CME 75
DATE: 3/24/2014

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: B-3	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
MATERIAL DESCRIPTION AND COMMENTS								
0				SM	Alluvium: 0': Silty f-m SAND with some clay, red brown, slightly moist, loose to medium dense			
5	15 14 16	B3-1			5': Silty fine SAND, medium brown, slightly moist, dense	9.6	109.7	
10	20 50-4.5"	B3-2			10': Silty fine SAND, orange brown mottled, slightly moist, dense	12.5	124.2	HC
15	24 47 50-5"	B3-3	SC		15': Silty clayey f-c SAND, red, slightly moist, dense	14.8	120.2	
20	21 50	B3-4			20': SAME	13.2	122.2	
BORING TERMINATED AT 20 FEET								
25					No groundwater encountered Boring backfilled with cuttings			
30								

LEGEND	Sample type:	---Ring	---SPT	---Small Bulk	---Large Bulk	---No Recovery	---Water Table	
	Lab testing:	AL = Atterberg Limits	SR = Sulfate/Resistivity Test	EI = Expansion Index	SH = Shear Test	SA = Sieve Analysis	HC = Consolidation	RV = R-Value Test

GeoTek, Inc.
LOG OF EXPLORATORY BORING

CLIENT: Frontier Enterprises
PROJECT NAME: APN 479-140-022
PROJECT NO.: 1165-CR3
LOCATION: See Boring Location Map

DRILLER: 2R Drilling
DRILL METHOD: 8" Hollow Stem
HAMMER: Auto 140#/30"

LOGGED BY: AMS
OPERATOR: Jerry
RIG TYPE: CME 75
DATE: 3/24/2014

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: B-4	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
MATERIAL DESCRIPTION AND COMMENTS								
5		18 27 28	B4-1	SM	Alluvium: 0': Silty f-m SAND with some clay, red brown, slightly moist, loose to medium dense			
5		18 27 28	B4-1		5': Silty fine SAND, medium brown, slightly moist, dense	12.1	125.1	
10		24 43 50-5.5"	B4-2	SC	10': Silty clayey f-c SAND, red brown, slightly moist, dense	10.4	128.1	
15		43 50-3"	B4-3		15': SAME	13.1	122.0	
20		12 23 42	B4-4		20': SAME	12.3	124.3	
BORING TERMINATED AT 21.5 FEET								
25					No groundwater encountered Boring backfilled with cuttings			
30								

LEGEND	Sample type:	---Ring	---SPT	---Small Bulk	---Large Bulk	---No Recovery	---Water Table	
	Lab testing:	AL = Atterberg Limits	SR = Sulfate/Resistivity Test	EI = Expansion Index	SH = Shear Test	SA = Sieve Analysis	HC = Consolidation	RV = R-Value Test

FRONTIER ENTERPRISES

DOUBLE RING INFILTROMETER TEST DATA	
Project Name and Test Location: <u>1165-CR3</u>	TTM <u>34544</u> Liquid Used: <u>WATER</u>
Trench No.: _____	Ground Temperature: _____
Tested by: _____	Liquid Level Maintained by Using: <u>HAND MEASUREMENTS</u>
Date of Testing: <u>6/28/14</u>	Penetration of Rings Into Soil (in.): <u>4</u> <u>6</u>
Water Table Depth: <u>> 50</u>	USCS Classification: <u>SM</u>

TRIAL NO.	START/END	TIME	ELAPSED TIME (Min.)	FLOW READINGS			SPACE FLOW (water added in ml)	LIQUID TEMP. (F)	INFILTRATION RATE		REMARKS
				INNER RING (in.)	RING FLOW (water added in ml)	ANNULAR READING (in.)			INNER (in./hr.)	ANNULAR (in./hr.)	
1	S	520	0	10		12		74	0.8	1.5	
	E	530	10	9 7/8	232	11 3/4	1390				
2	S	531	0	10		12			0.8	1.5	
	E	541	10	9 7/8	232	11 3/4	1390				
3	S	542	0	10		12			0.8	1.5	
	E	552	10	9 7/8	232	11 3/4	1390				
4	S	553	0	10		12			0.8	1.5	
	E	603	10	9 7/8	232	11 3/4	1390				
5	S	604	0	10		12			0.4	0.8	
	E	614	10	9 15/16	116	11 7/8	695				
6	S	615	0	10		12			0.4	0.8	
	E	625	10	9 15/16	116	11 7/8	695				
7	S	626	0	10		12			0.4	0.8	
	E	656	30	9 13/16	348	11 5/8	2085				
8	S	658	0	10		12			0.4	0.8	
	E	728	30	9 13/16	348	11 5/8	2085				
9	S	730	0	10		12			0.4	0.8	
	E	800	30	9 13/16	348	11 5/8	2085				
10	S	802	0	10		12			0.4	0.8	
	E	832	30	9 13/16	348	11 5/8	2085				
11	S	834	0	10		12			0.3	0.6	
	E	904	30	9 7/8	232	11 11/16	1043				
12	S	906	0	10		12			0.3	0.6	
	E	936	30	9 7/8	232	11 11/16	1043				
13	S	938	0	10		12			0.3	0.6	
	E	1008	30	9 7/8	232	11 11/16	1043				
14	S	1010	0	10		12			0.3	0.6	
	E	1040	30	9 7/8	232	11 11/16	1043				
15	S	1042	0	10		12			0.3	0.6	
	E	1112	30	9 7/8	232	11 11/16	1043				
16	S	1114	0	10		12			0.3	0.6	
	E	1144	30	9 7/8	232	11 11/16	1043				
17	S	1146	0	10		12		74	0.3	0.6	
	E	1216	30	9 7/8	232	11 11/16	1043				
18	S										
	E										
19	S										
	E										

April 29, 2024
W.O. 7907

APPENDIX B

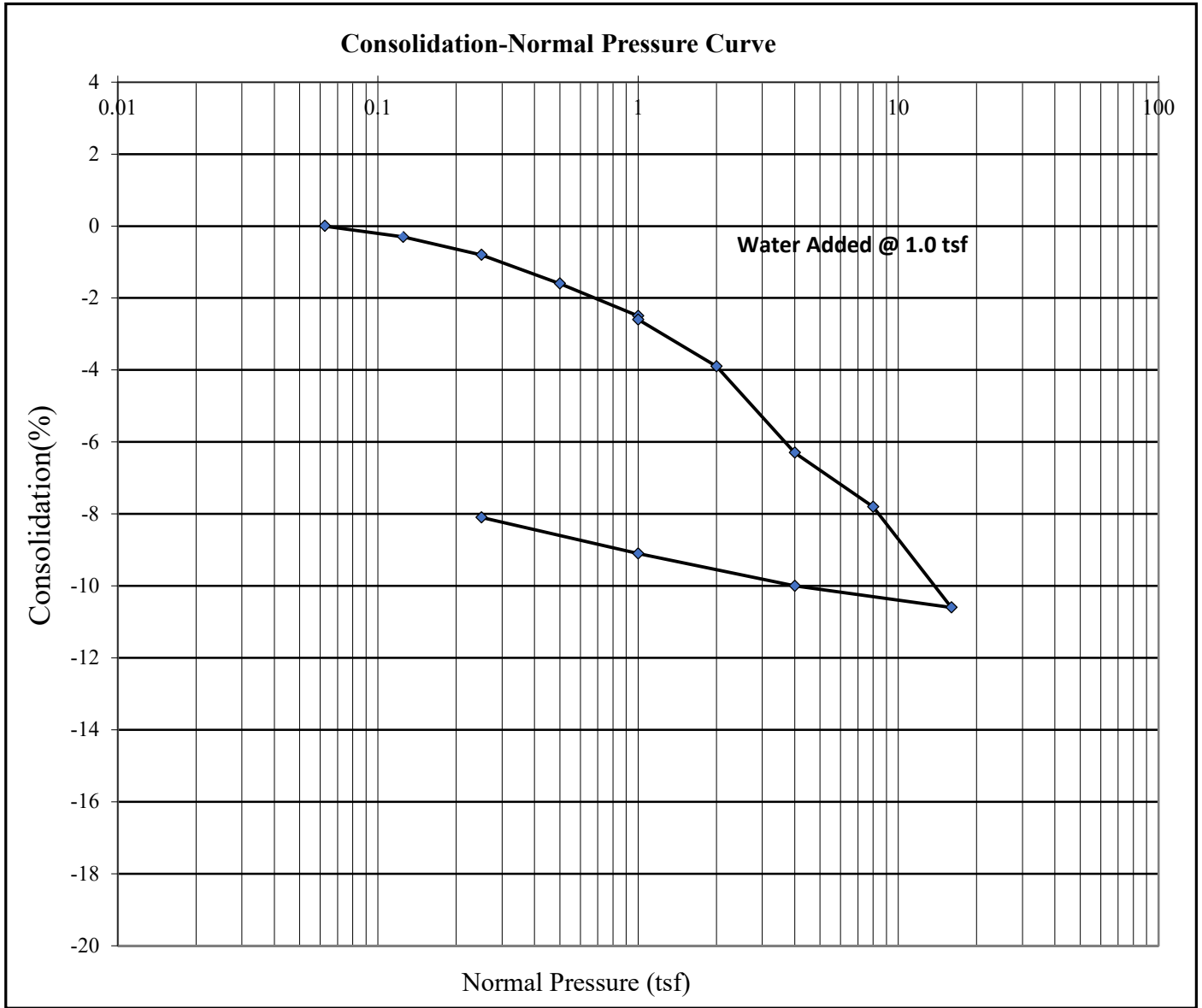
LAB DATA

MDN 24161



Client:
Work Order:
Test Date:
Sample:
Soil Classification:
Test Procedure:
Lab and QC By:

WJK
 7907
 4/19/2024
 B-2 @ 5.0'
 Brown slightly clayey sandy SILT.
 ASTM D 2435-04
 RA



Final Moisture Content (%)	13.69
Init. Dry Density (PCF)	119.2
Init. Void Ratio	0.42

% Hydroconsolidation:	-0.1
Total Consolidation @ 16 tsf	-10.6

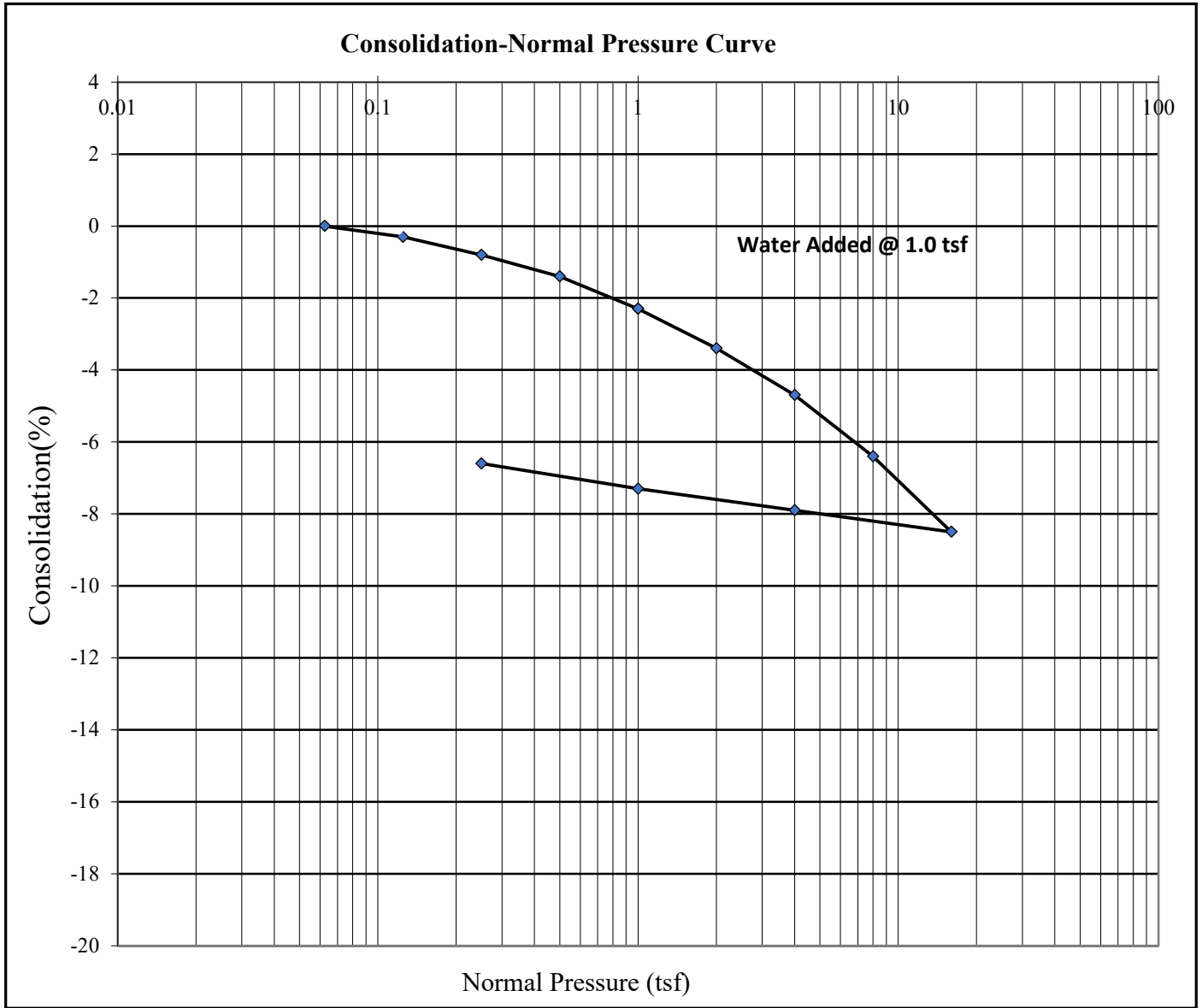
CONSOLIDATION TEST DIAGRAM

Plate: C-1



Client:
Work Order:
Test Date:
Sample:
Soil Classification:
Test Procedure:
Lab and QC By:

WJK
 7907
 4/19/2024
 B-2 @ 7.5'
 Brown clayey very fine to coarse SAND.
 ASTM D 2435-04
 RA



Final Moisture Content (%)	14.81
Init. Dry Density (PCF)	120.6
Init. Void Ratio	0.45

% Hydroconsolidation:	0.0
Total Consolidation @ 16 tsf	-8.5

CONSOLIDATION TEST DIAGRAM

Plate: C-2

EXPANSION INDEX TEST

ASTM D-4829

WJK

7907

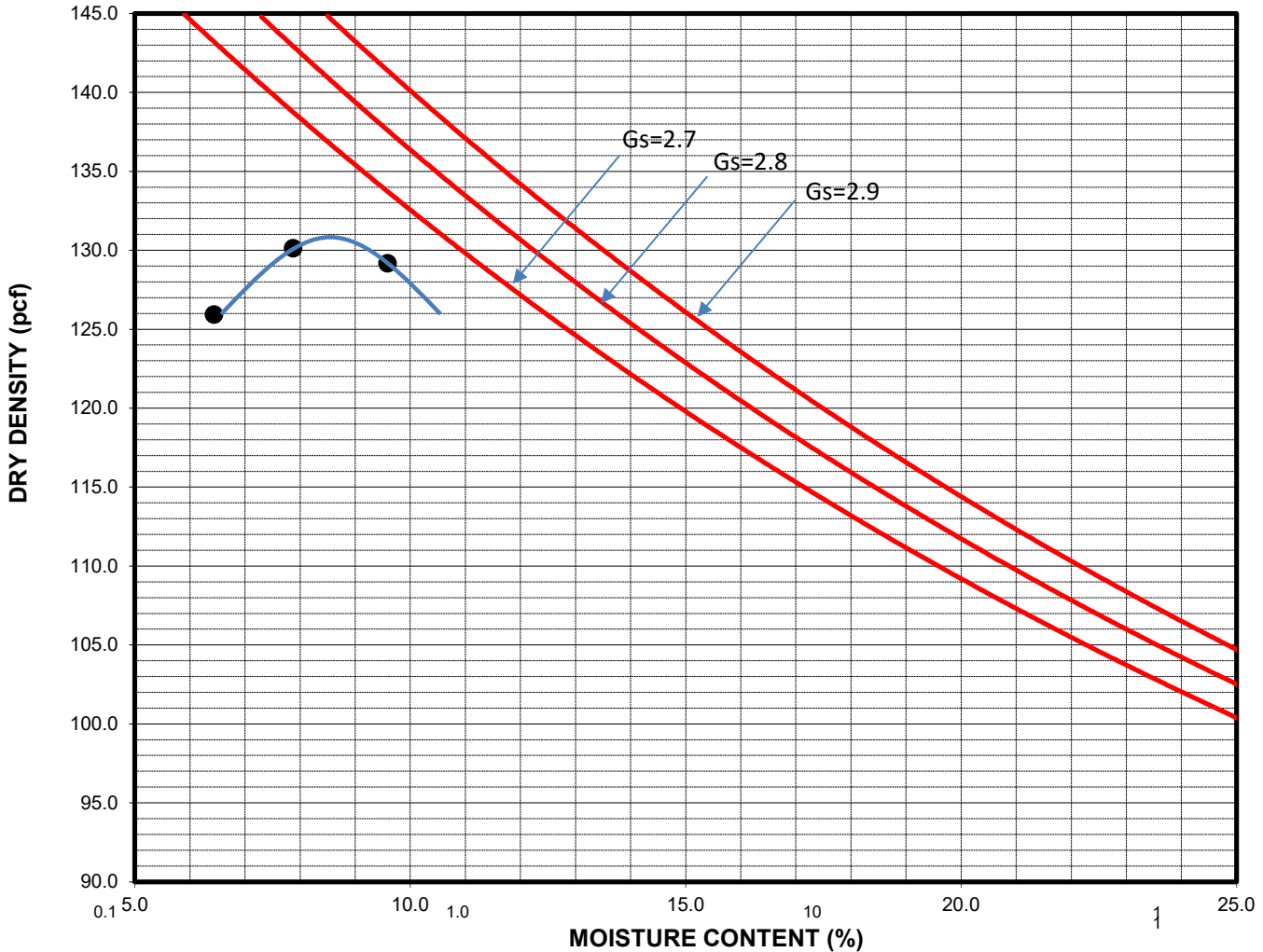
Project Information	
Project Name:	WJK
Work Order No.:	7907
Date of Test:	15-Apr-24
Tract Number:	

Calculations		Constants	
		Vol. wet soil (cf):	0.0073
		Specific Gravity:	2.70
Boring/Lot #:	B-2		
Depth of Test (ft):	0 - 5.0'		
Soil Classification:	Brown silty very fine to fine SAND.		
Wet Weight + Ring (lbs):	1.3650		
Ring Weight (lbs):	0.4280		
Wet Weight (lbs):	0.9370		
Wet Density (pcf):	128.4		
Moisture (%):	8.2		
Dry Density (pcf):	118.6		
Saturation (%):	52.7		
Initial Reading:	0.3720		
Final Reading:	0.3820		
Expansion, H, (inches):	0.0100		
Expansion Index:	11		
Expansion Potential:	Very Low		
After Test			
Wet Weight (g):	445.6		
Dry Weight (g):	390.7		
Water Loss (g):	54.9		
Moisture (%):	14.1		

Expansion Index Table: **0 - 20 = Very Low**
21 - 50 = Low
51 - 90 = Medium
91 - 130 = High
130 & Up = Very High

Client:
Work Order:
Test Date:
Sample:
Soil Classification:
Compaction Procedure:
Lab and QC by:

WJK
 7907
 4/15/2024
 B-2 @ 0-5.0'
 Brown silty very fine to fine SAND.
 ASTM D 1557 Method A
 RA



MAXIMUM DRY DENSITY:	131.0
OPTIMUM MOISTURE CONTENT (%):	8.5

A	Mold diameter (in)	4	4	4	4	4
B	Mold height (in)	4.581	4.581	4.581	4.581	4.581
C	Wt. of Mold (g)	4276	4276	4276	4276	4276
D	Moist Soil + Mold (g)	6305	6401	6419	0	0
E	Soil Wt. (g)	2029	2125	2143	-4276	-4276
F	Volume of mold (ft3)	0.0334	0.0334	0.0334	0.0334	0.0334
G	Volume of mold (cm3)	944.99	944.99	944.99	944.99	944.99
H	Moist Density (g/cm3)	2.14711	2.248701	2.267748865	-4.524916	-4.52492
M	Wt. of wet soil (g)	200	200	200	200	200
N	Wt. of dry soiltare (g)	187.9	185.4	182.5	176.1	175
O	Wt. of water (g)	12.1	14.6	17.5	23.9	25
P	Moisture Content (%)	6.4	7.9	9.6	#N/A	#N/A
Q	Dry Density (g/cm3)	2.0	2.1	2.1	#N/A	#N/A
R	Dry Unit Weight (pcf)	125.9	130.1	129.2	#N/A	#N/A

Plate: MDD-1

GeoSoils Consultants Inc.

RELATIVE COMPACTION DETERMINATION WORKSHEET

CLIENT : WJK

WORK ORDER NO : 7907

DATE : 04/17/24

SAMPLE	WET DENSITY (PCF)	MOISTURE %	DRY DENSITY (PCF)	MAXIMUM DENSITY (PCF)	OPTIMUM MOISTURE %	RELATIVE COMPACTION	NOTES
B-1 @ 5.0	133.1	9.6	121.4				
B-1 @ 7.5	125.7	7.9	116.5				
B-1 @ 10.0	142.7	8.5	131.6				
B-1 @ 15.0	-	12.0	-				SPT.
B-1 @ 20.0	-	11.7	-				SPT.
B-1 @ 25.0	137.2	7.2	128.0				
B-1 @ 30.0	-	15.5	-				SPT.
B-1 @ 35.0	-	12.9	-				SPT.
B-1 @ 45.0	-	15.5	-				SPT.
B-1 @ 50.0	-	19.5	-				SPT.
B-2 @ 2.5	134.9	13.1	119.3				
B-2 @ 5.0	135.2	13.4	119.2				
B-2 @ 7.5	137.3	13.9	120.6				
B-2 @ 10.0	142.7	12.5	126.9				
B-2 @ 15.0	139.8	11.5	125.4				
B-2 @ 20.0	139.0	12.7	123.3				

ANAHEIM TEST LAB, INC

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

GEOISOILS CONSULTANTS, INC.
6634 VALJEAN AVE.
VAN NUYS, CA 91406

DATE: 4/23/2024

P.O. NO.: Verbal

LAB NO.: C-7838

SPECIFICATION: CA 301

MATERIAL: Brown, Sandy Clay

Work Order No.: 7907
Client Name: WJK
Sample ID: B-2 @ 0-5'

ANALYTICAL REPORT "R" VALUE

BY EXUDATION

BY EXPANSION

28

N/A

RESPECTFULLY SUBMITTED



WES BRIDGER LAB MANAGER

"R" VALUE CA 301

Client: GeoSoils Consultanys, Inc.

ATL No.: C 7838

Date: 4/23/2024

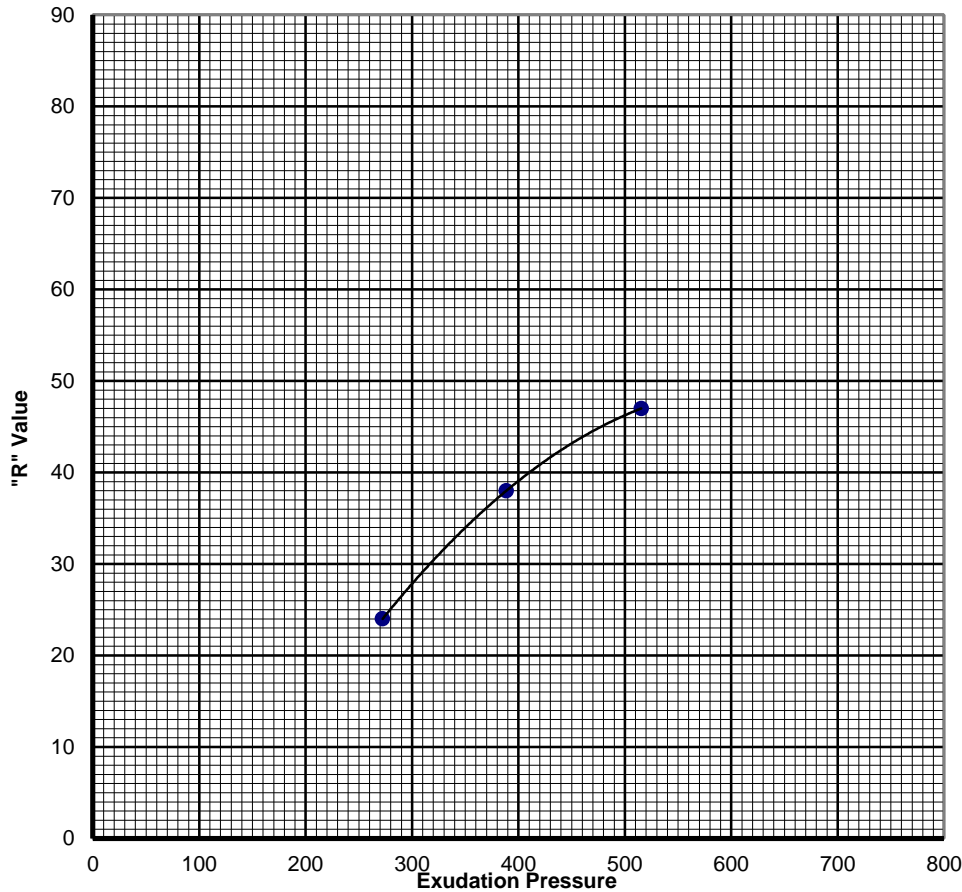
Client Reference No.: 7907

Soil Type: Brown, Sandy Clay

Sample: B-2 @ 0-5'

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	80	200	150	
Initial Moisture Content	%	8.2	8.2	8.2	
Moisture at Compaction	%	10.0	9.1	9.5	
Briquette Height	in.	2.53	2.44	2.48	
Dry Density	pcf	128.2	130.2	129.1	
EXUDATION PRESSURE	psi	272	516	389	
EXPANSION PRESSURE	psf	0	95	43	
Ph at 1000 pounds	psi	46	38	43	
Ph at 2000 pounds	psi	102	68	81	
Displacement	turns	4.43	3.86	4.05	
"R" Value		24	47	38	
CORRECTED "R" VALUE		24	47	38	

Final "R" Value	
BY EXUDATION: @ 300 psi	28
BY EXPANSION: TI = 5.0	N/A



Appendix 4: Historical Site Conditions

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

The site consists of an almost square shaped parcel, approximately 9.4 acres in size. The site is currently undeveloped and appears to have been graded in the past. Ground surface cover consists of exposed soil.

The site topography appears to have a low spot at the southeast corner of the property. There is an estimated 6 foot of elevation differential across the site. The existing flows drains into an existing inlet that is in the public right of way just north of Cottonwood Avenue. This inlet is the ultimate outfall of the site and is connected into the Riverside County Flood Control District Sunnymead Line P.

The site will be developed into attached multi-family homes. The site will contain twenty-three residential building a multi-purpose building and pool, and two recreational areas. Each residential building will contain 8 dwelling units. 10 building's (80 units) will have approximately 730 sq ft footprint. 13 buildings (104 units) will have approximately 1,090 sq ft footprint.

The project site has been vacant in its recent history. Below is an image from Esri 2002.

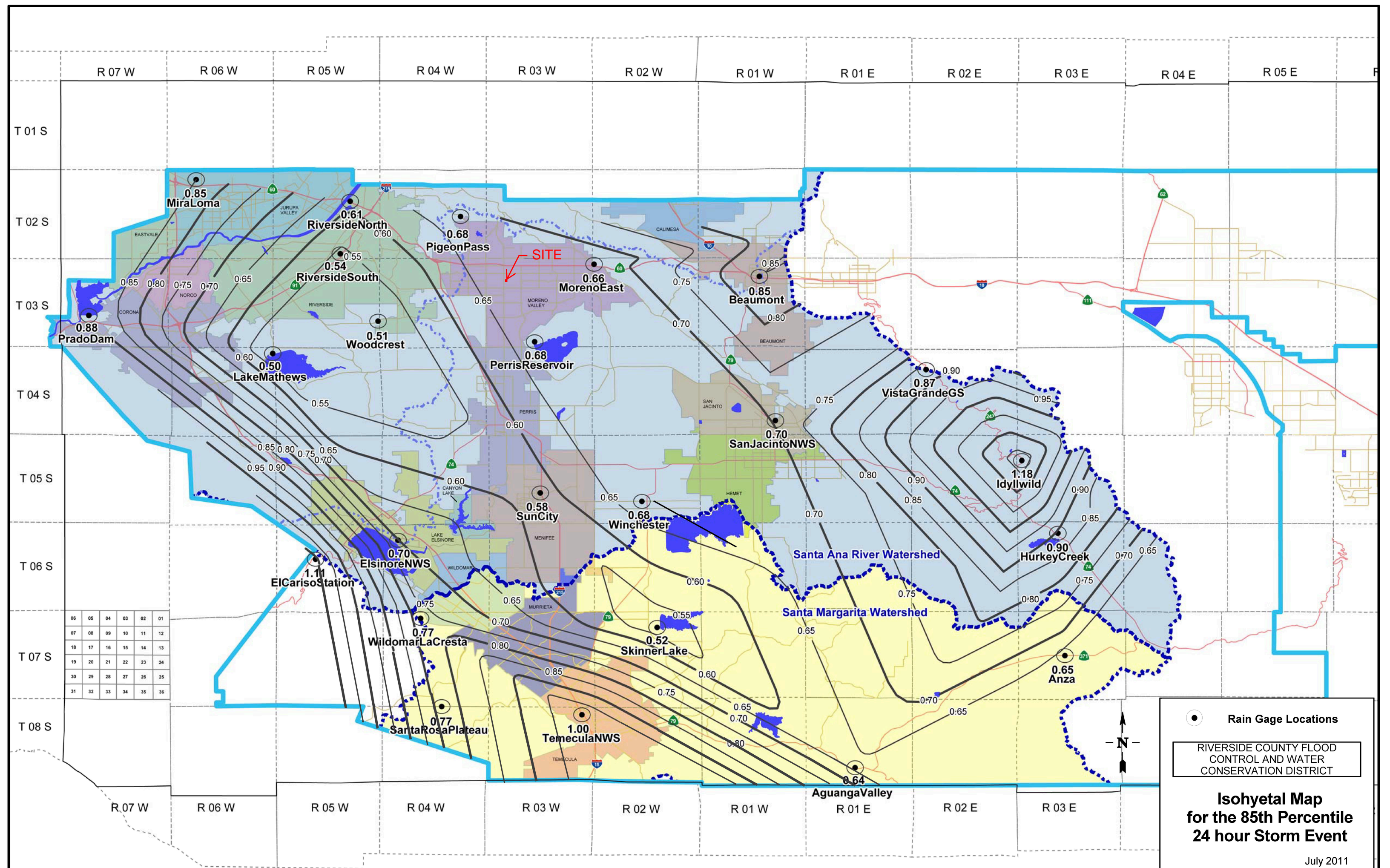


Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation



06	05	04	03	02	01
07	08	09	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

● Rain Gage Locations

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Isohyetal Map for the 85th Percentile 24 hour Storm Event

July 2011

Effective Impervious Fraction

Developed Cover Types	Effective Impervious Fraction
Roofs	1.00
Concrete or Asphalt	1.00
Grouted or Gapless Paving Blocks	1.00
Compacted Soil (e.g. unpaved parking)	0.40
Decomposed Granite	0.40
Permeable Paving Blocks w/ Sand Filled Gap	0.25
Class 2 Base	0.30
Gravel or Class 2 Permeable Base	0.10
Pervious Concrete / Porous Asphalt	0.10
Open and Porous Pavers	0.10
Turf block	0.10
Ornamental Landscaping	0.10
Natural (A Soil)	0.03
Natural (B Soil)	0.15
Natural (C Soil)	0.30
Natural (D Soil)	0.40

Mixed Surface Types

Use this table to determine the effective impervious fraction for the V_{BMP} and Q_{BMP} calculation sheets

Cottonwood Multifamily Residential

Calculations of storage system drain in 72 hours

	Storage	OUTLET	OUTLET SIZE	Drain Time
	Volume (cf)	(cfs)	(in)	(hr)
BMP 1	1,728	0.573*	6	0.84
BMP 2	3,259	0.573*	6	1.58
BMP 3	4,437	0.573*	6	2.15
BMP 4	3,554	0.573*	6	1.72
BMP 5	488	0.128**	3	1.06

*6" PVC @0.5% MIN 0.573 cfs full

**3" PVC @1% MIN 0.128 cfs full

$$\begin{aligned}\text{Drain time} &= (\text{volume(cf)}/\text{outlet(cfs)})/3600\text{s} \\ &= \text{hr}\end{aligned}$$

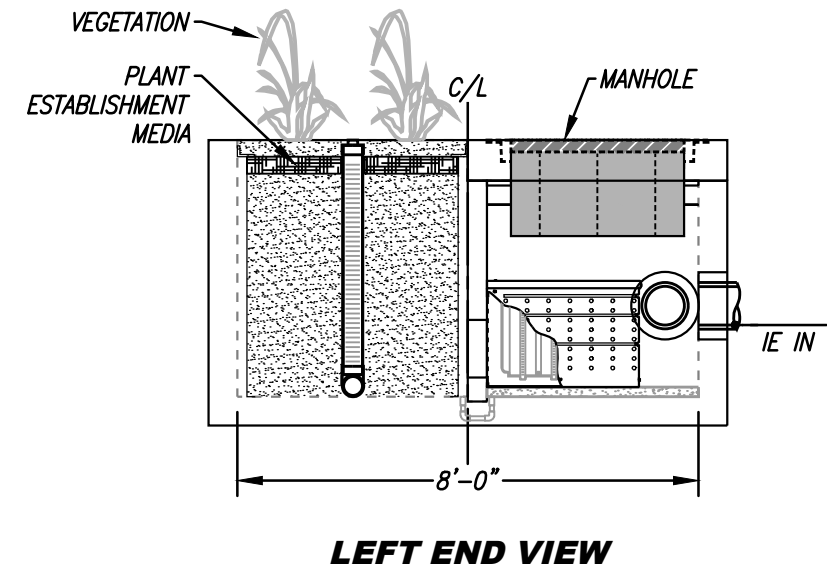
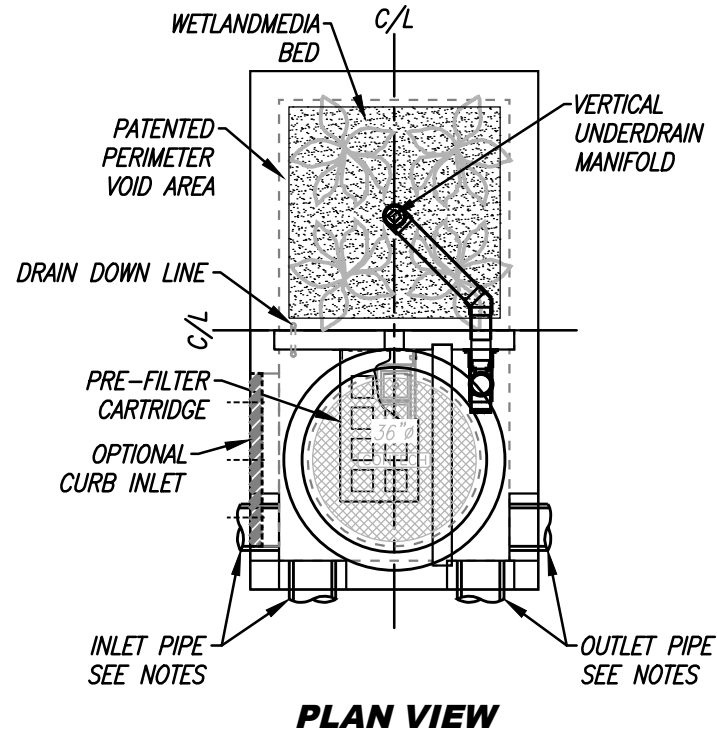
DMA	DCV	DRAW DOWN	FLOW (cfs)	DESIGN FLOW	STANDARD FLOW	
	1	1728	48	0.0100	0.038462 MWS-L-4-8	0.115
	2	3259	48	0.0189	0.072538 MWS-L-4-8	0.115
	3	4437	48	0.0257	0.098758 MWS-L-4-8	0.115
	4	3554	48	0.0206	0.079104 MWS-L-4-8	0.115
	5	488	48	0.0028	0.010862 MWS-L-4-8	0.115

$$\text{FLOW} = \text{DCV}/(\text{DRAW DOWN TIME} * 60 * 60)$$

SITE SPECIFIC DATA

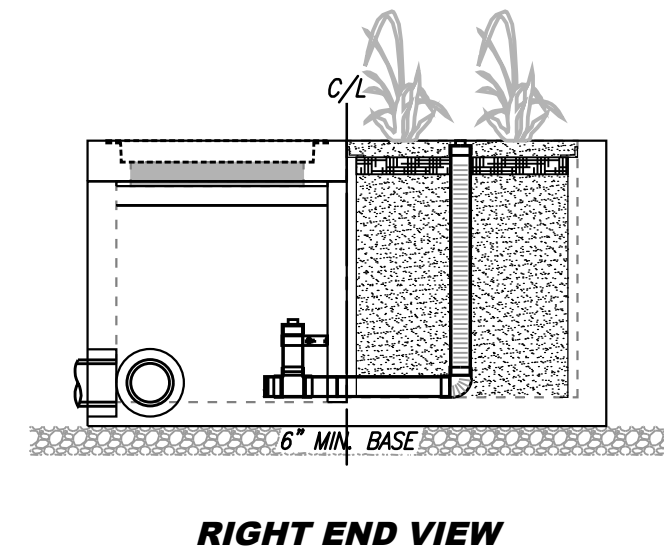
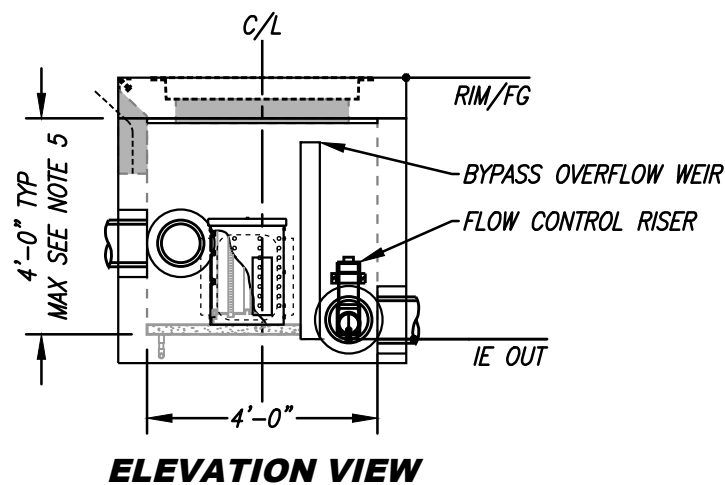
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			
PRETREATMENT LOADING RATE (GPM/SF)		2.1 GPM/SF	
WETLAND MEDIA LOADING RATE (GPM/SF)		1.0	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE		____ (CFS)	
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION

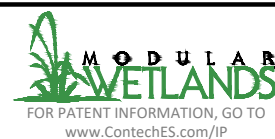


INSTALLATION NOTES

1. 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.
2. 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.
3. 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.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.



8/15/23 SCOTT SERICH



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MWS-L-4-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

Channel Report

3inch PVC at 1%

Circular

Diameter (ft) = 0.25

Invert Elev (ft) = 100.00

Slope (%) = 1.00

N-Value = 0.009

Calculations

Compute by: Q vs Depth

No. Increments = 2

Highlighted

Depth (ft) = 0.25

Q (cfs) = 0.128

Area (sqft) = 0.05

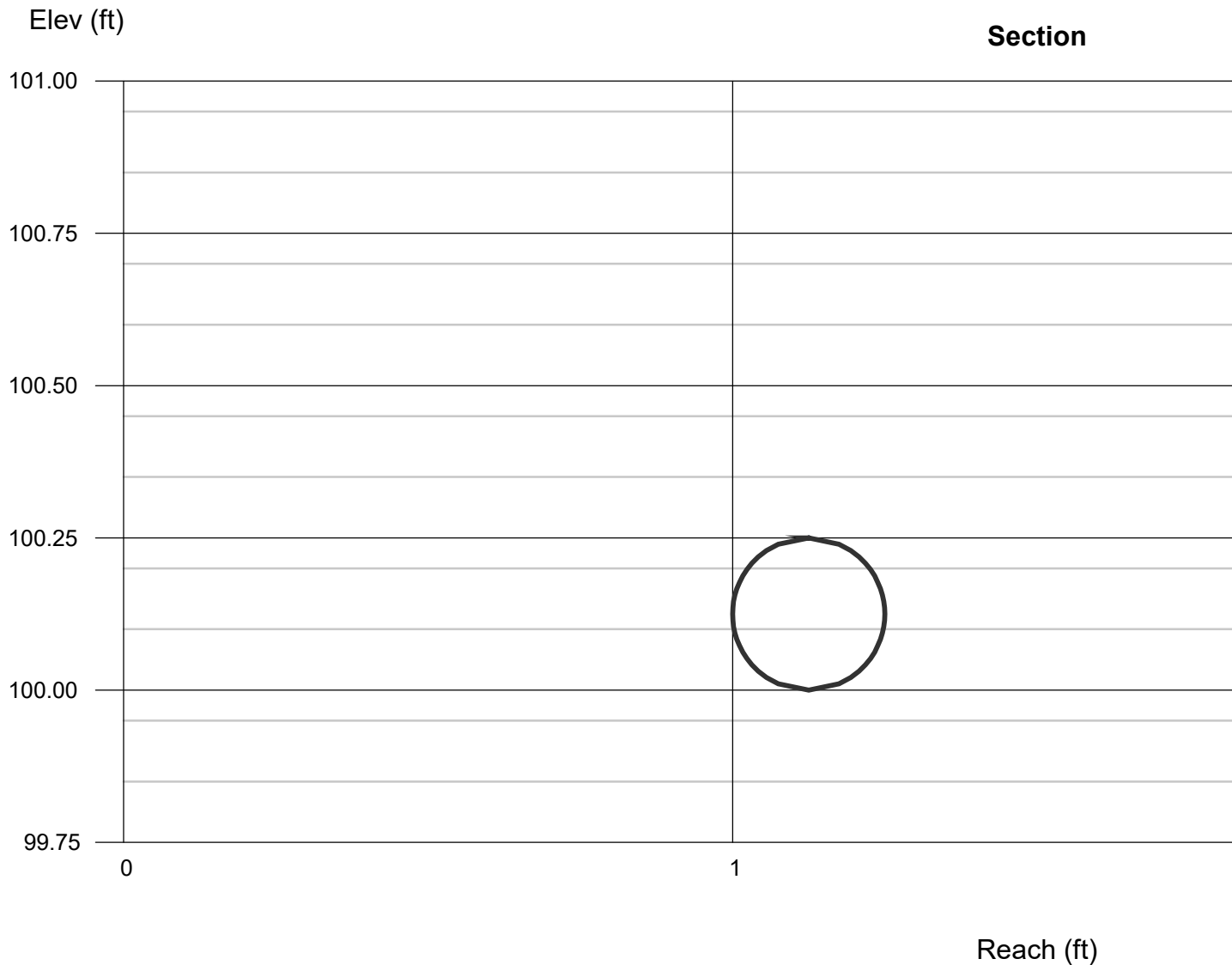
Velocity (ft/s) = 2.60

Wetted Perim (ft) = 0.79

Crit Depth, Yc (ft) = 0.22

Top Width (ft) = 0.00

EGL (ft) = 0.35



Channel Report

6inch PVC at 0.5%

Circular

Diameter (ft) = 0.50

Invert Elev (ft) = 100.00

Slope (%) = 0.50

N-Value = 0.009

Calculations

Compute by: Q vs Depth

No. Increments = 2

Highlighted

Depth (ft) = 0.50

Q (cfs) = 0.573

Area (sqft) = 0.20

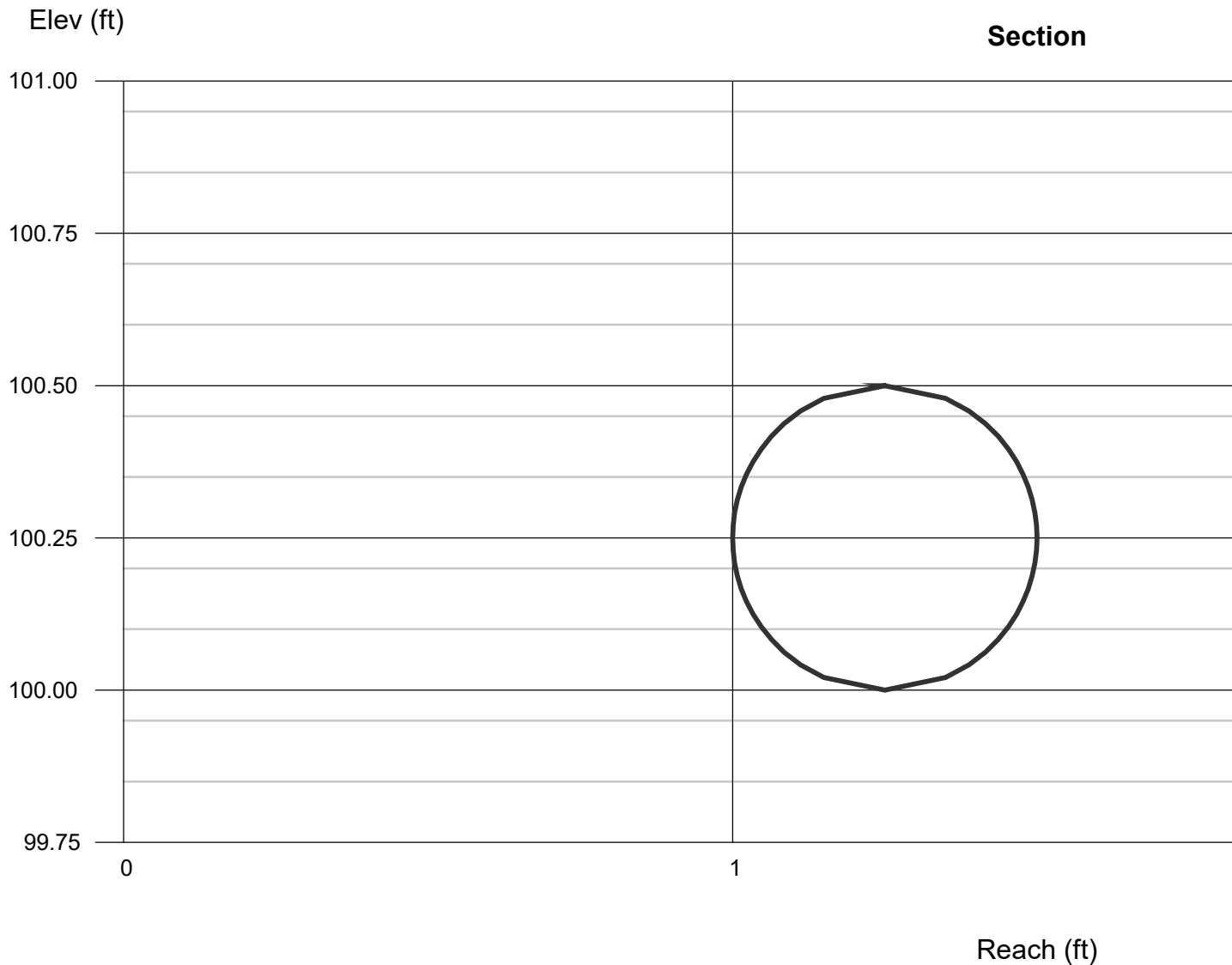
Velocity (ft/s) = 2.92

Wetted Perim (ft) = 1.57

Crit Depth, Yc (ft) = 0.39

Top Width (ft) = 0.00

EGL (ft) = 0.63



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 Blue Engineering and Consulting, Inc

Date 1/28/2025

Designed by Angel Cesar, P.E.

Case No

Company Project Number/Name 2023249

BMP Identification

BMP NAME / ID 1 - Modular Wetland with upstream detention

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} = 0.66 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)
1	51877	Mixed Surface Types	0.8	0.60	31089.7			
	51877				31089.7	0.66	1709.9	1728
		Total						

Notes:

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 **Blue Engineering and Consulting, Inc**

Date **1/28/2025**

Designed by **Angel Cesar, P.E.**

Case No

Company Project Number/Name **2023249**

BMP Identification

BMP NAME / ID **2 - Modular Wetland with upstream detention**

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

$D_{85} =$ **0.66** 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)
2	97870	Mixed Surface Types	0.8	0.60	58653.1			
	97870				58653.1	0.66	3225.9	3259

Notes:

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 **Blue Engineering and Consulting, Inc.**

Date **9/11/2024**

Designed by **Angel Cesar, P.E.**

Case No

Company Project Number/Name **2023249**

BMP Identification

BMP NAME / ID **3-Modular Wetland with upstream detention**

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} = **0.66** 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)
3	133,429	Mixed Surface Types	0.8	0.60	79963.5			
	133429				79963.5	0.66	4398	6683.5

Notes:

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 **Blue Engineering and Consulting, Inc**

Date **1/28/2025**

Designed by **Angel Cesar, P.E.**

Case No

Company Project Number/Name **2023249**

BMP Identification

BMP NAME / ID **4 - Modular Wetland with upstream detention**

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} = **0.66** 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)
4	106147	Mixed Surface Types	0.8	0.60	63613.5			
	106147				63613.5	0.66	3498.7	3554

Notes:

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 **Blue Engineering and Consulting, Inc**

Date **1/28/2025**

Designed by **Angel Cesar, P.E.**

Case No

Company Project Number/Name **2023249**

BMP Identification

BMP NAME / ID **5 - Modular Wetland with upstream detention**

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} = **0.66** 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)
5	14367	Mixed Surface Types	0.8	0.60	8610.1			
	14367				8610.1	0.66	473.6	488

Notes:

PROJECT SUMMARY

CALCULATION DETAILS

- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 243 LF

STORAGE SUMMARY

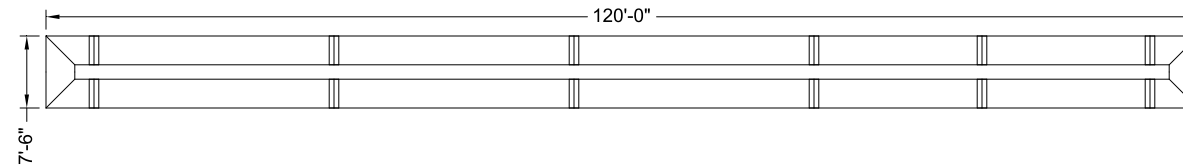
- STORAGE VOLUME REQUIRED = 1,710 CF
- PIPE STORAGE VOLUME = 1,718 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 1,718 CF

PIPE DETAILS

- DIAMETER = 36"
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 18"

BACKFILL DETAILS

- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2 2/3" x 1/2" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 20'

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DATE	REVISION DESCRIPTION	BY

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ENGINEERED SOLUTIONS LLC
www.ContechES.com

9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH
CMP DETENTION SYSTEMS

CONTECH
DYODS
DRAWING

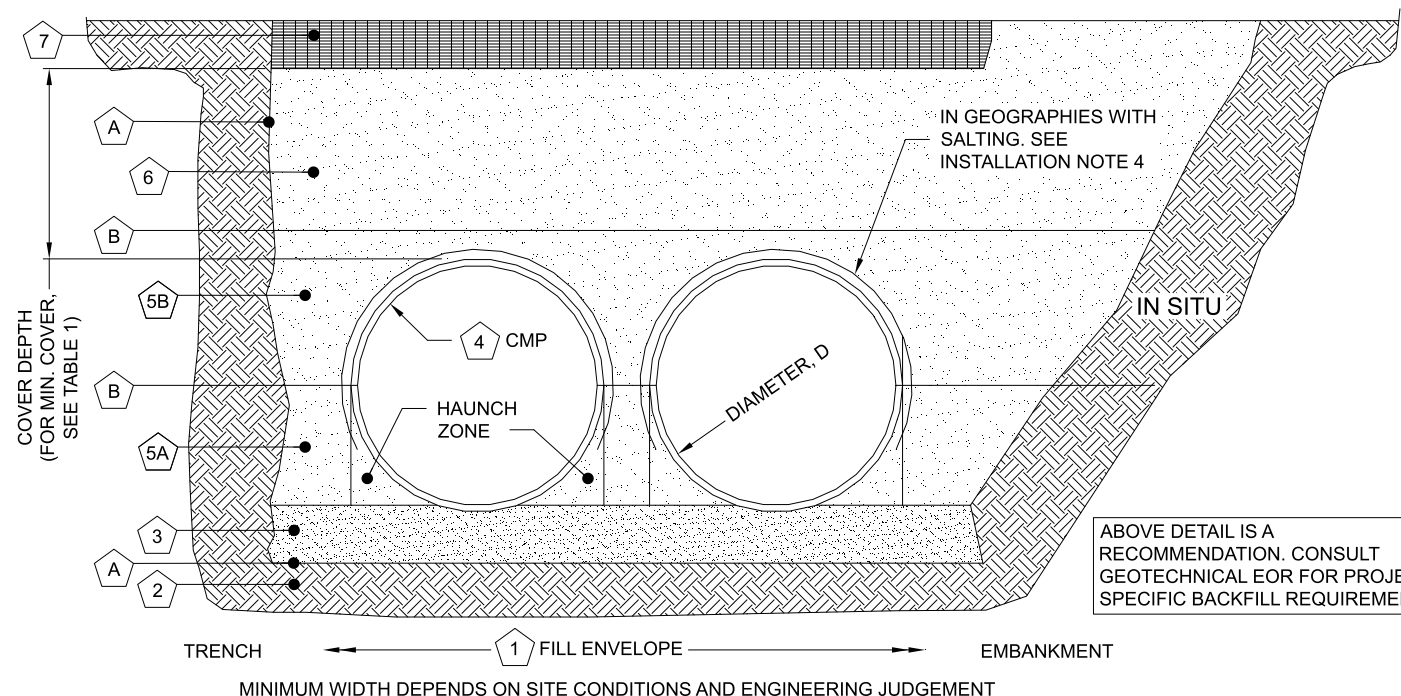
DYO49899 Cottonwood
DMA1
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 49899	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS			
MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12" MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	AASHTO 26.5.2 OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.
3	BEDDING	AASHTO M 43: 3, 357, 4, 467, 5, 56, 57 (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1
4			CORRUGATED METAL PIPE
5A	CRITICAL BACKFILL	AASHTO M 145: A-1, A-2, A-3 *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).
5B	BACKFILL	AASHTO M 145: A-1, A-2, A-3	
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.

NOTES:

- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.
- * APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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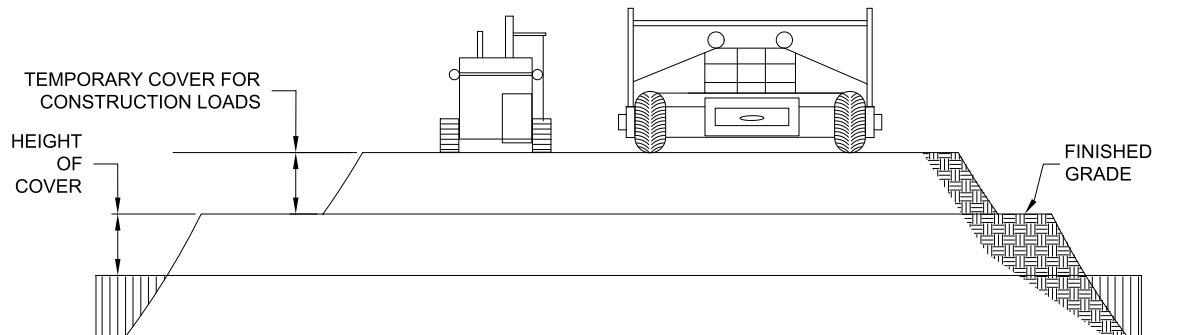
DATE	REVISION DESCRIPTION	BY

CONTECH
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9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH
CMP DETENTION SYSTEMS
CONTECH
DYODS
DRAWING

DYO49899 Cottonwood
DMA1
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 49899	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1



CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL

THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS

CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSIPA GUIDELINES.

PIPE

THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

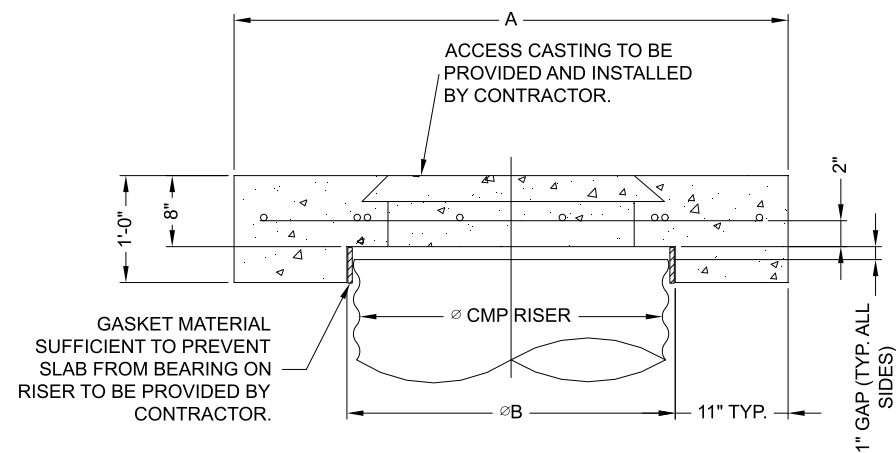
APPLICABLE HANDLING AND ASSEMBLY

SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

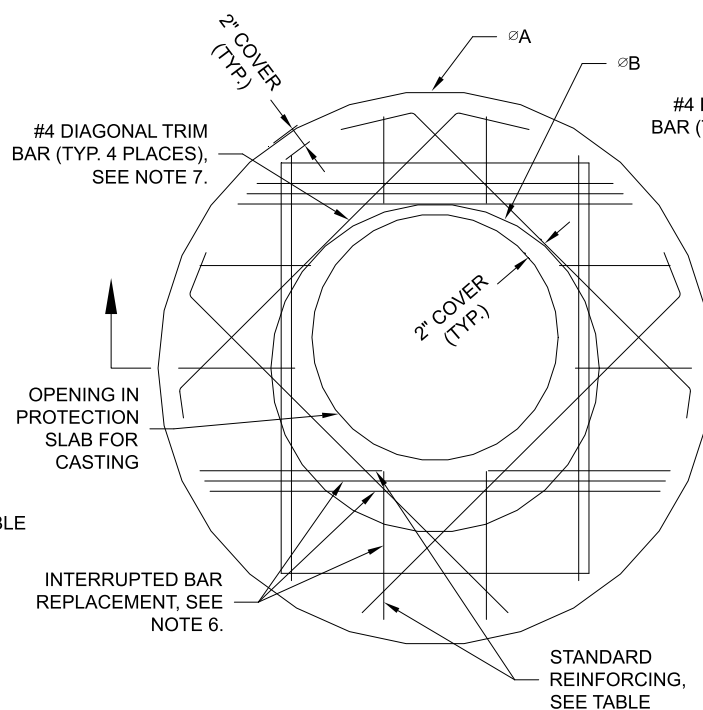
INSTALLATION

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

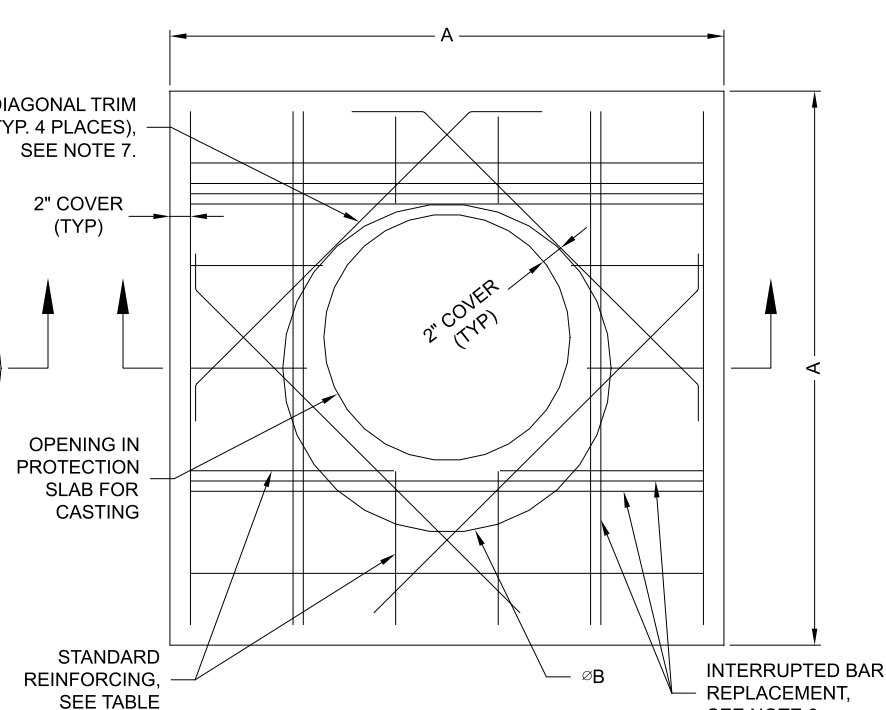
IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.



SECTION VIEW



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

- DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
- DESIGN LOAD HS25.
- EARTH COVER = 1' MAX.
- CONCRETE STRENGTH = 3,500 psi
- REINFORCING STEEL = ASTM A615, GRADE 60.
- PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
- TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
- PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
- DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY

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NOTE:
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CONTECH
CMP DETENTION SYSTEMS
CONTECH
DYODS
DRAWING

DYO49899 Cottonwood
DMA1
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 49899	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

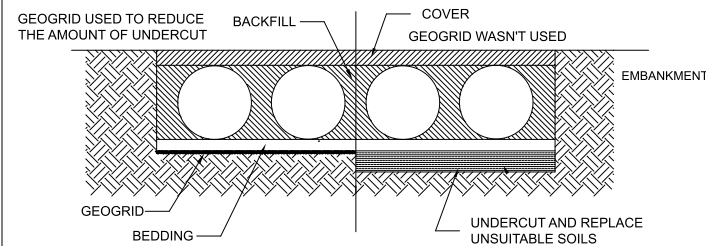
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

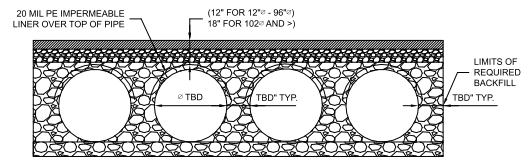
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

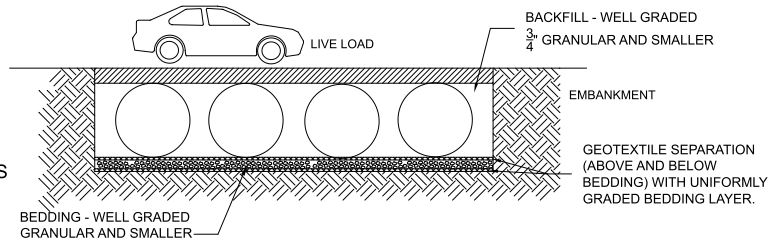
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

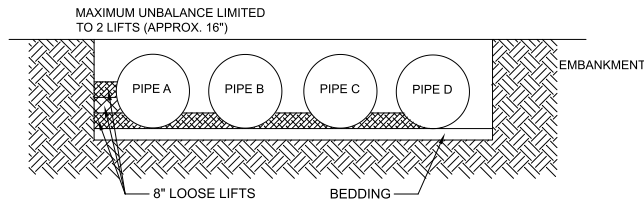
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



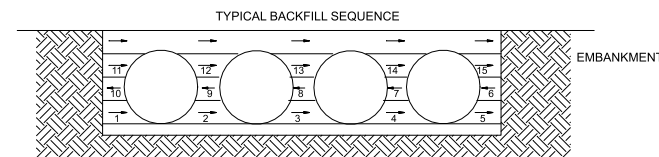
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

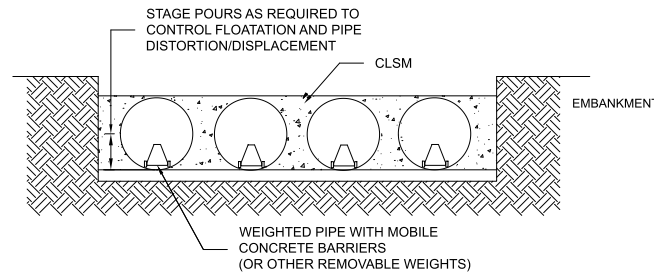


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10- FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

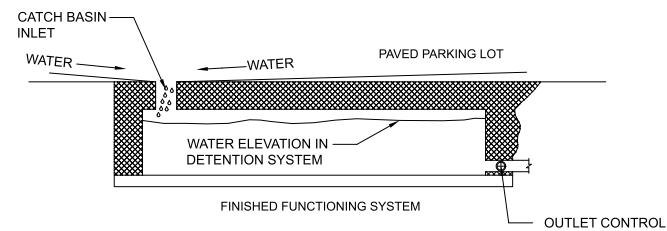


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CMP DETENTION SYSTEMS
 CONTECH
DYODS
 DRAWING

DY049899 Cottonwood
 DMA1
 Rancho Cucamonga, CA
 DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 49899	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

PROJECT SUMMARY

CALCULATION DETAILS

- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 166 LF

STORAGE SUMMARY

- STORAGE VOLUME REQUIRED = 3,226 CF
- PIPE STORAGE VOLUME = 3,259 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 3,259 CF

PIPE DETAILS

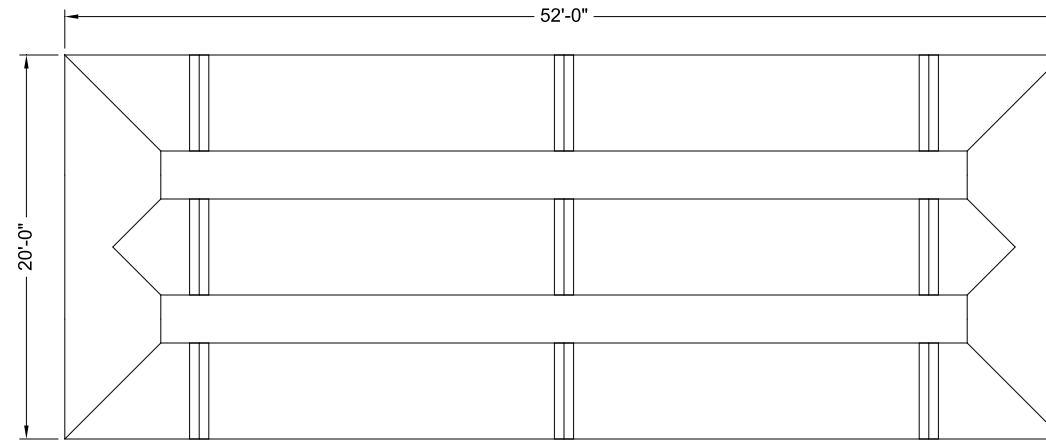
- DIAMETER = 60"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 30"

BACKFILL DETAILS

- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2²/₃" x 1¹/₂" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
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ASSEMBLY
SCALE: 1" = 10'

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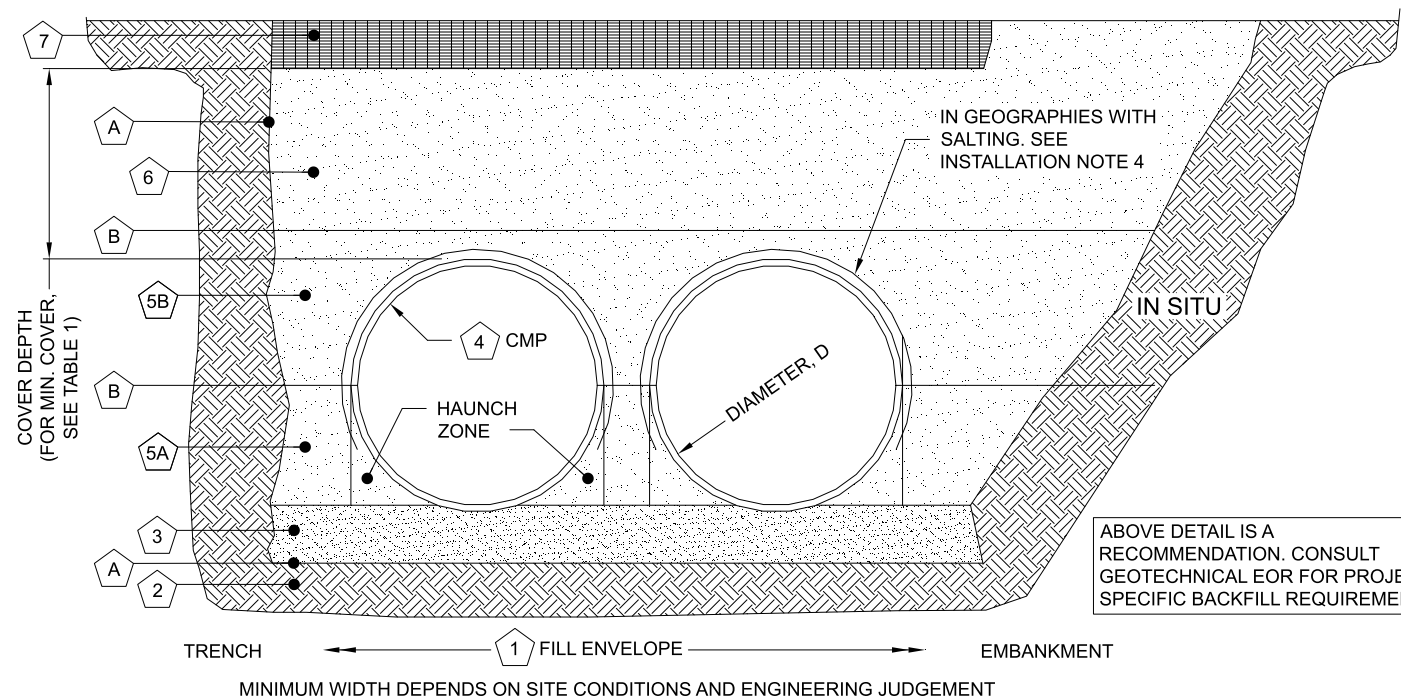
DYO67371 Cottonwood
DMA2
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 67371	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS			
MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12" MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	AASHTO 26.5.2 OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.
3	BEDDING	AASHTO M 43: 3, 357, 4, 467, 5, 56, 57 (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1
4	CORRUGATED METAL PIPE		
5A	CRITICAL BACKFILL	AASHTO M 145: A-1, A-2, A-3 *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).
5B	BACKFILL	AASHTO M 145: A-1, A-2, A-3	
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.

NOTES:

- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.
- * APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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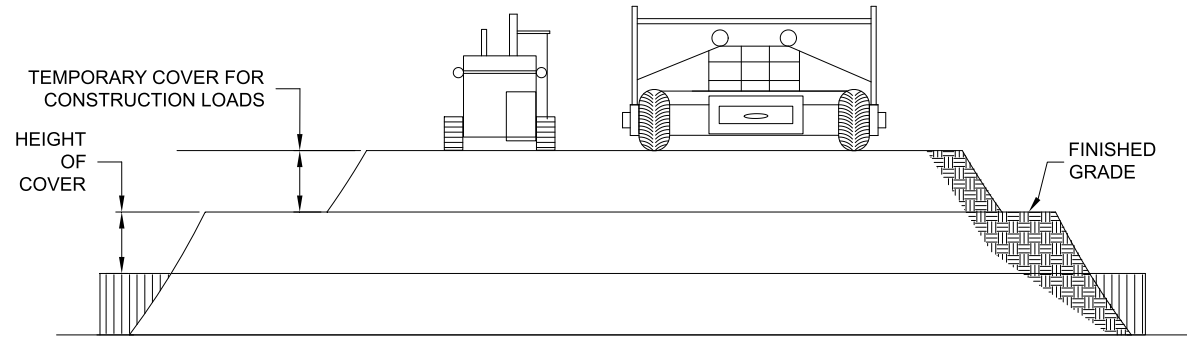
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CONTECH
CMP DETENTION SYSTEMS
CONTECH
DYODS
DRAWING

DY067371 Cottonwood
DMA2
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 67371	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1



CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL

THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS

CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSIPA GUIDELINES.

PIPE

THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

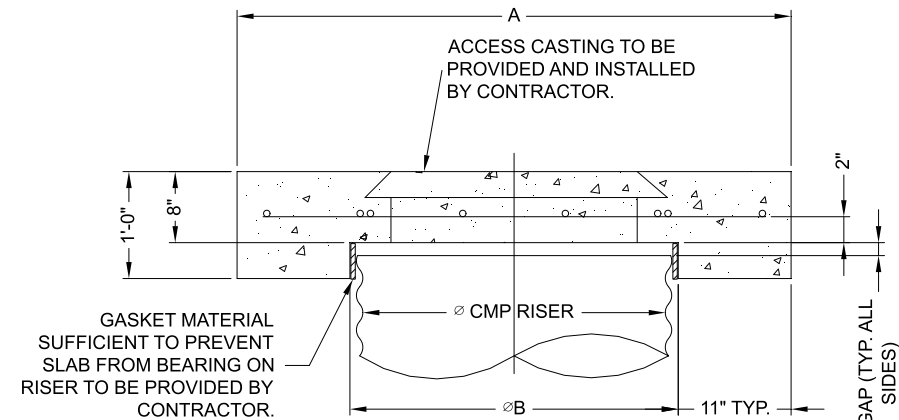
HANDLING AND ASSEMBLY

SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

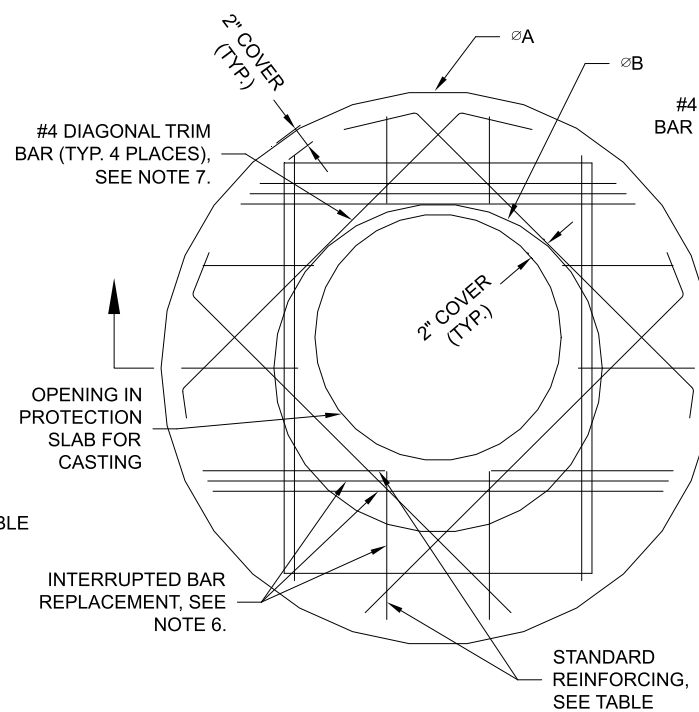
INSTALLATION

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

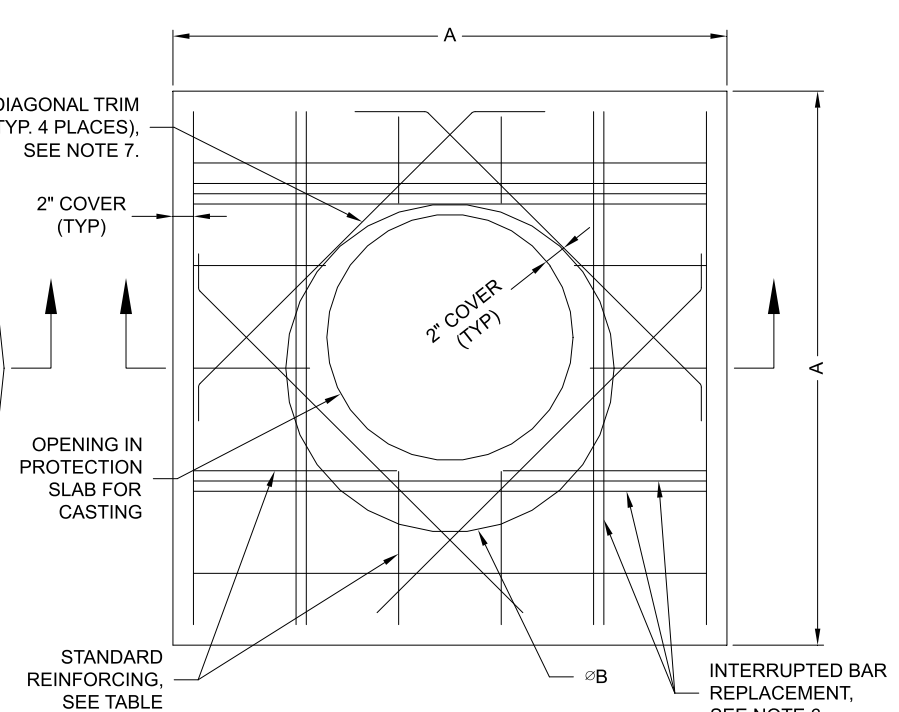
IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.



SECTION VIEW



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

- DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
- DESIGN LOAD HS25.
- EARTH COVER = 1' MAX.
- CONCRETE STRENGTH = 3,500 psi
- REINFORCING STEEL = ASTM A615, GRADE 60.
- PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
- TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
- PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
- DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY

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NOTE:
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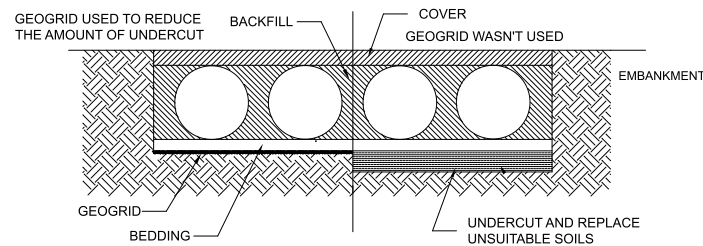
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

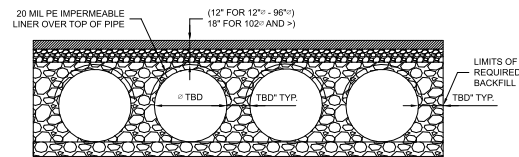
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

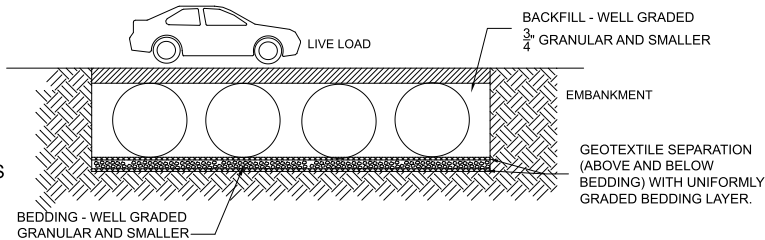
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

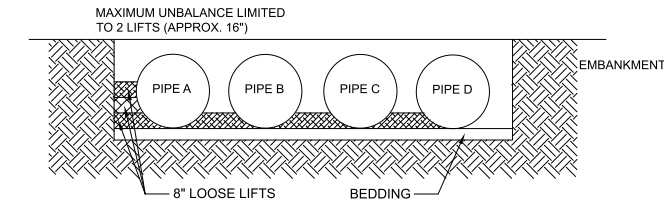
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



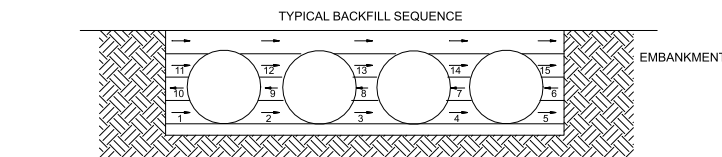
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

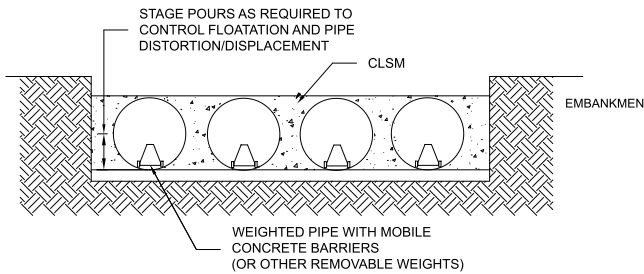


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10- FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

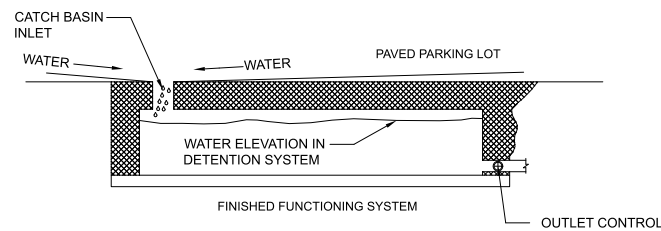


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CMP DETENTION SYSTEMS

CONTECH
DYODS
DRAWING

DYO67371 Cottonwood
DMA2
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 67371	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

PROJECT SUMMARY

CALCULATION DETAILS

- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 226 LF

STORAGE SUMMARY

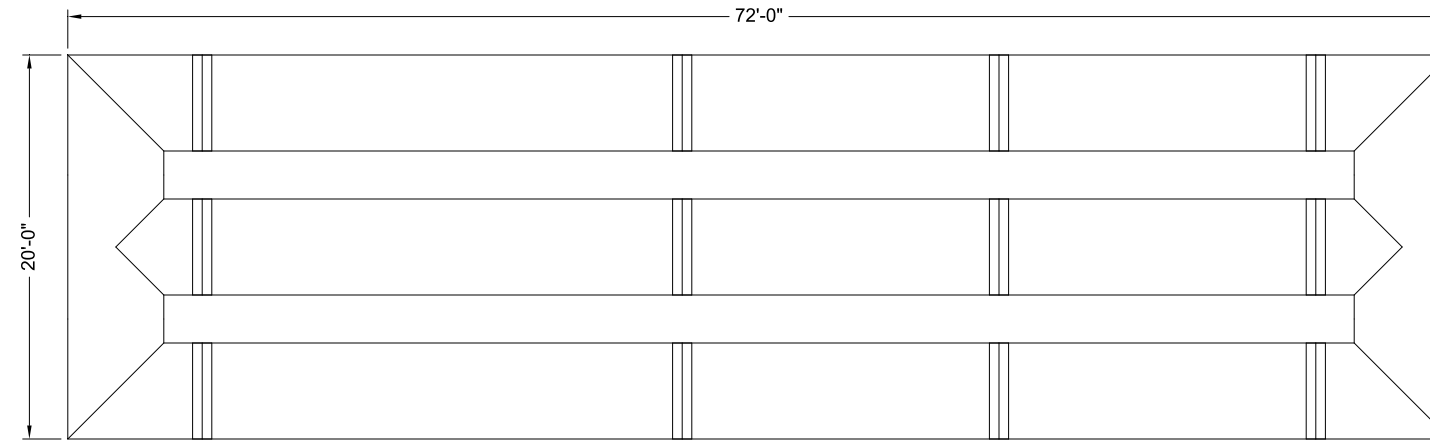
- STORAGE VOLUME REQUIRED = 4,398 CF
- PIPE STORAGE VOLUME = 4,437 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 4,437 CF

PIPE DETAILS

- DIAMETER = 60"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 30"

BACKFILL DETAILS

- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2²/₃" x 1¹/₂" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
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ASSEMBLY
SCALE: 1" = 10'

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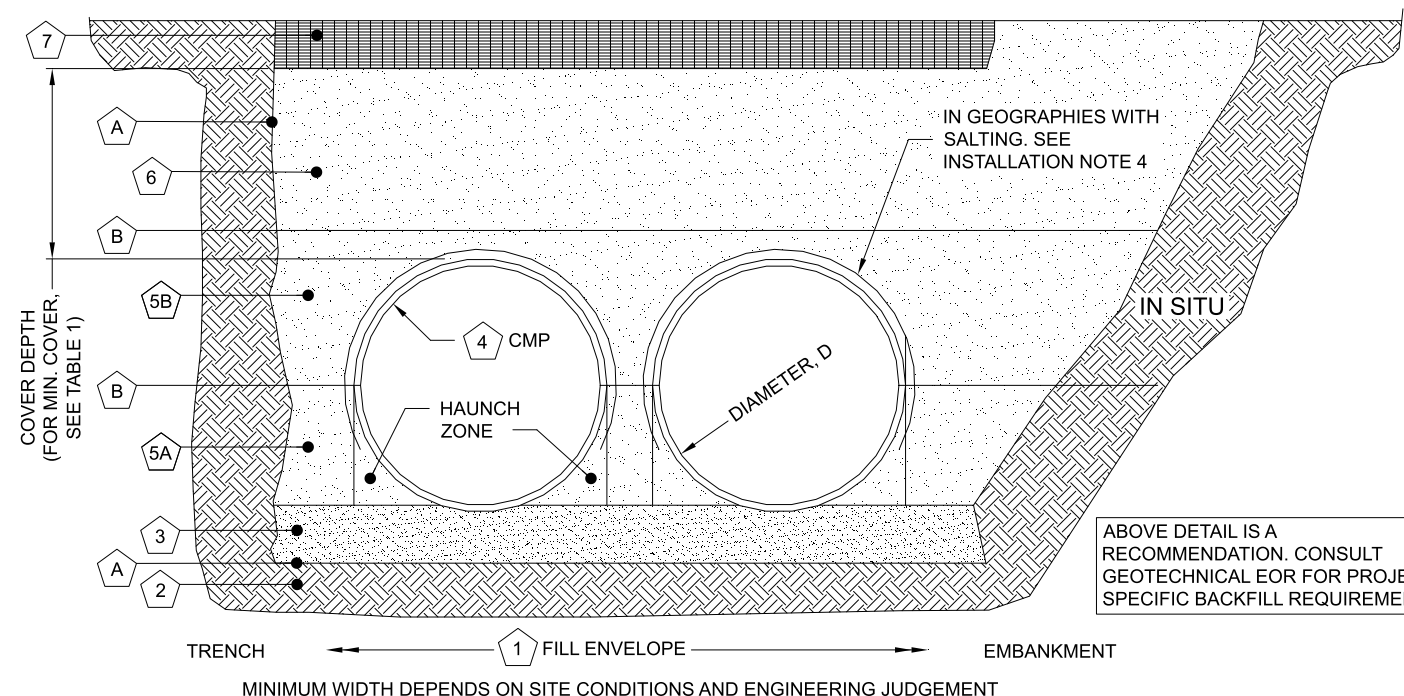
DYO67373 Cottonwood
DMA3
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 67373	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS			
MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12" MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	AASHTO 26.5.2 OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.
3	BEDDING	AASHTO M 43: 3, 357, 4, 467, 5, 56, 57 (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1
4	CORRUGATED METAL PIPE		
5A	CRITICAL BACKFILL	AASHTO M 145: A-1, A-2, A-3 *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).
5B	BACKFILL	AASHTO M 145: A-1, A-2, A-3	
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.

NOTES:

- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.
- * APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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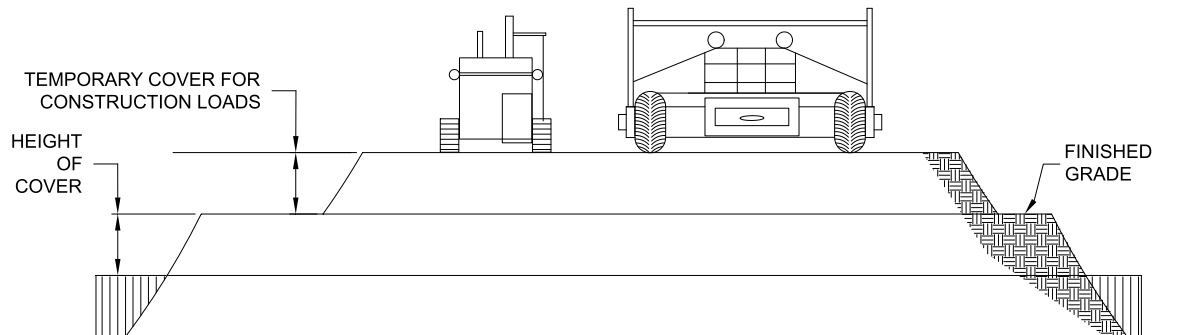
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CONTECH
CMP DETENTION SYSTEMS
CONTECH
DYODS
DRAWING

DYO67373 Cottonwood
DMA3
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 67373	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1



CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL

THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS

CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPE GUIDELINES.

PIPE

THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

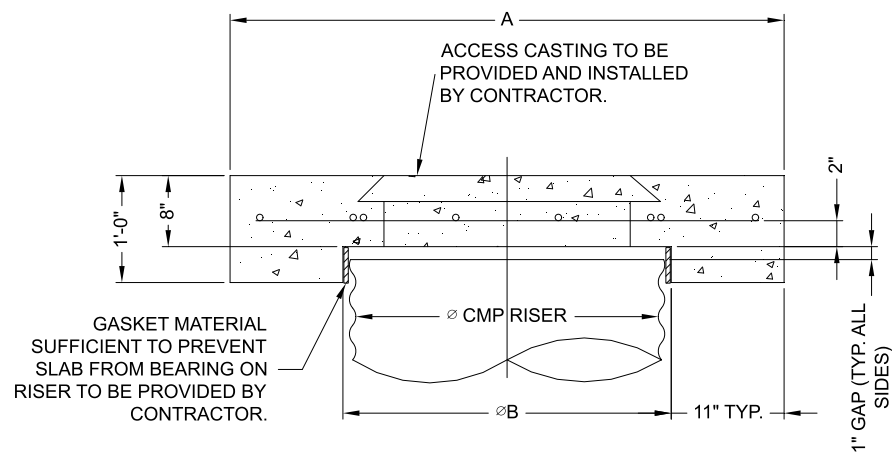
APPLICABLE HANDLING AND ASSEMBLY

SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

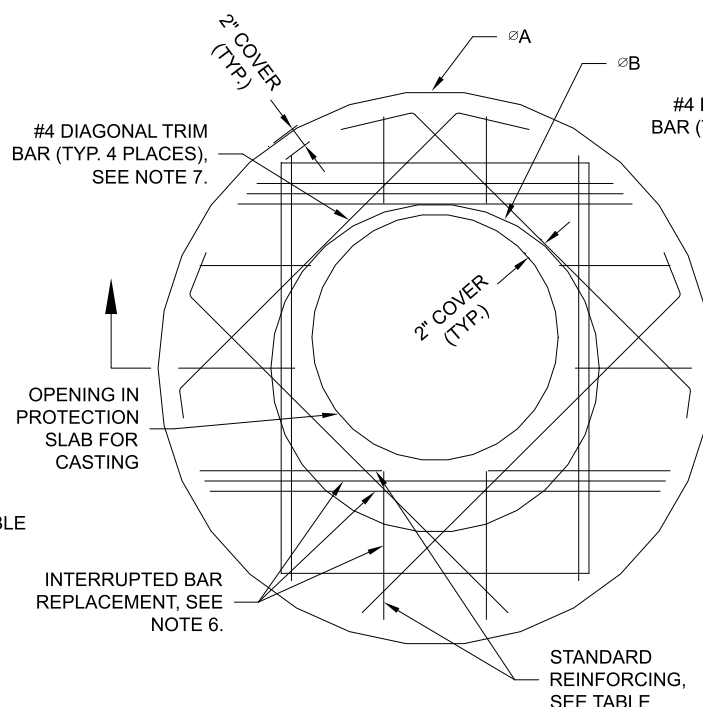
INSTALLATION

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

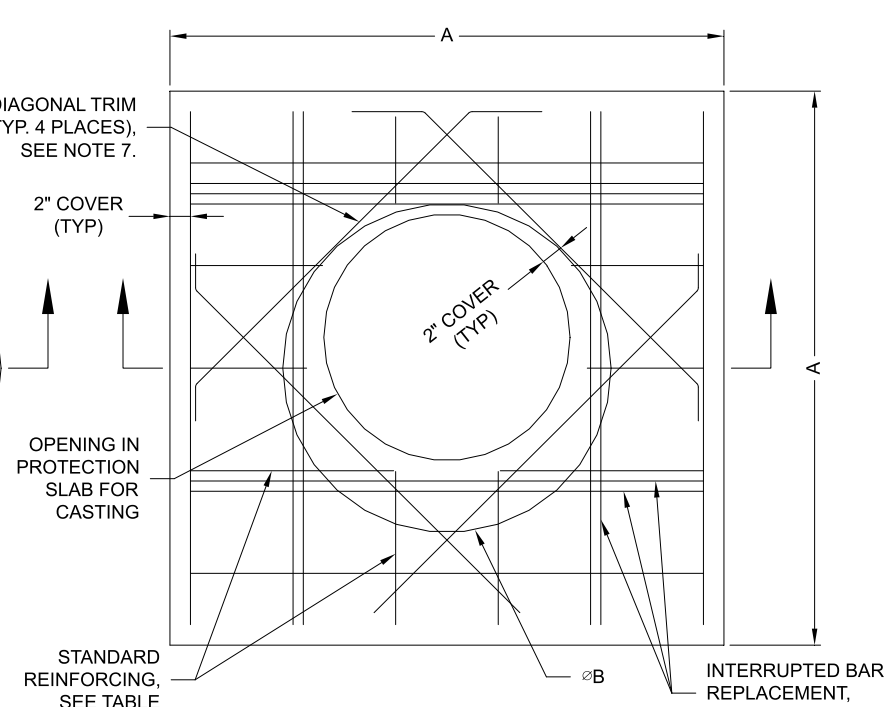
IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.



SECTION VIEW



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

- DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
- DESIGN LOAD HS25.
- EARTH COVER = 1' MAX.
- CONCRETE STRENGTH = 3,500 psi
- REINFORCING STEEL = ASTM A615, GRADE 60.
- PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
- TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
- PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
- DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY

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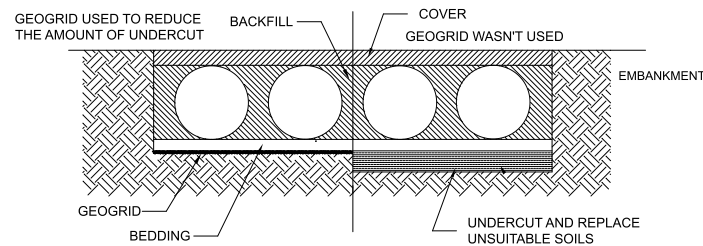
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

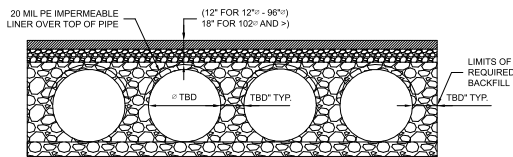
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

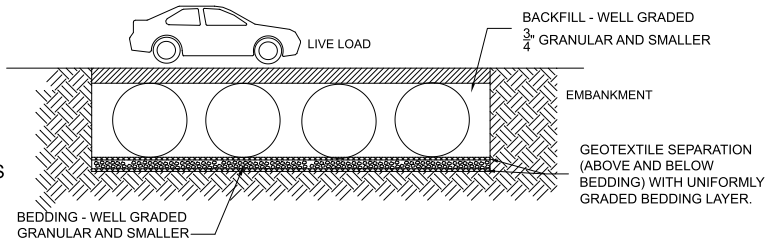
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

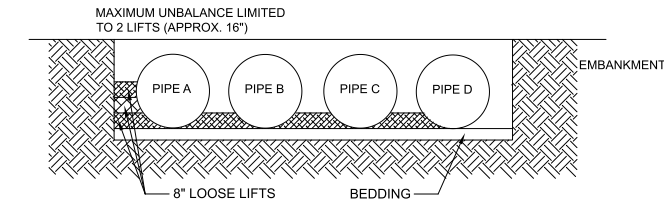
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



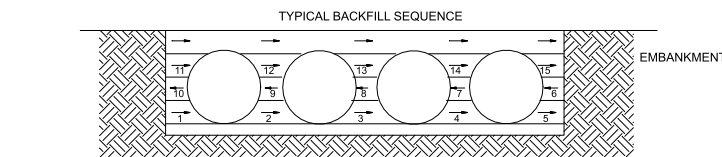
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

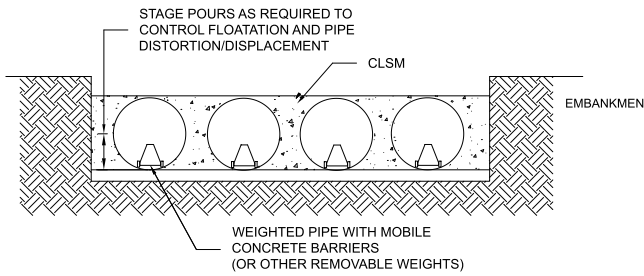


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10- FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

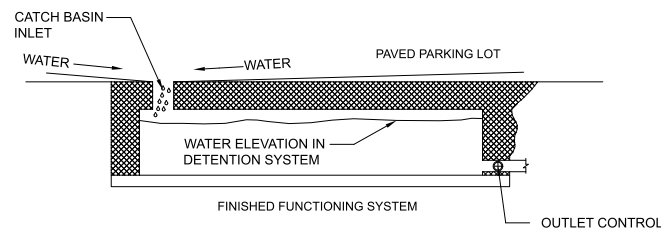


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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PROJECT SUMMARY

CALCULATION DETAILS

- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 181 LF

STORAGE SUMMARY

- STORAGE VOLUME REQUIRED = 3,499 CF
- PIPE STORAGE VOLUME = 3,554 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 3,554 CF

PIPE DETAILS

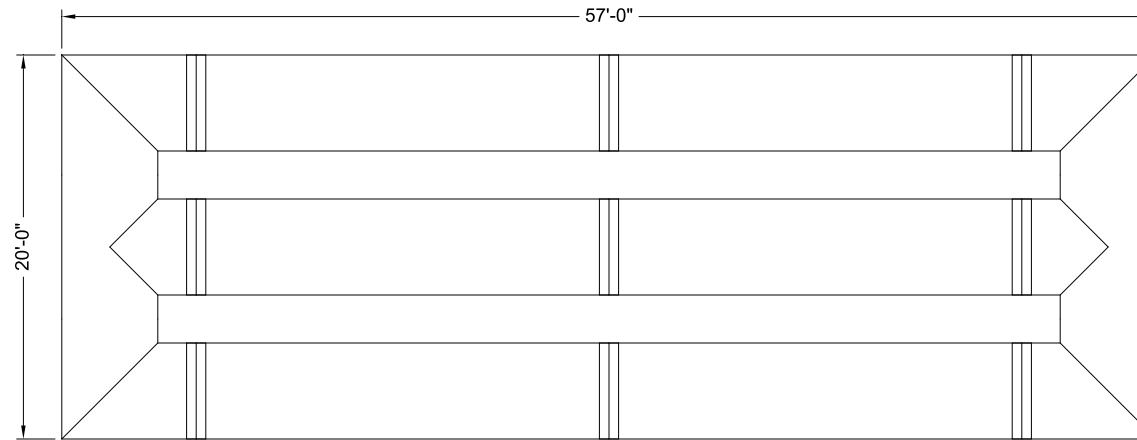
- DIAMETER = 60"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 30"

BACKFILL DETAILS

- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2²/₃" x 1¹/₂" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



ASSEMBLY
SCALE: 1" = 10'

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CONTECH
CMP DETENTION SYSTEMS

CONTECH
DYODS
DRAWING

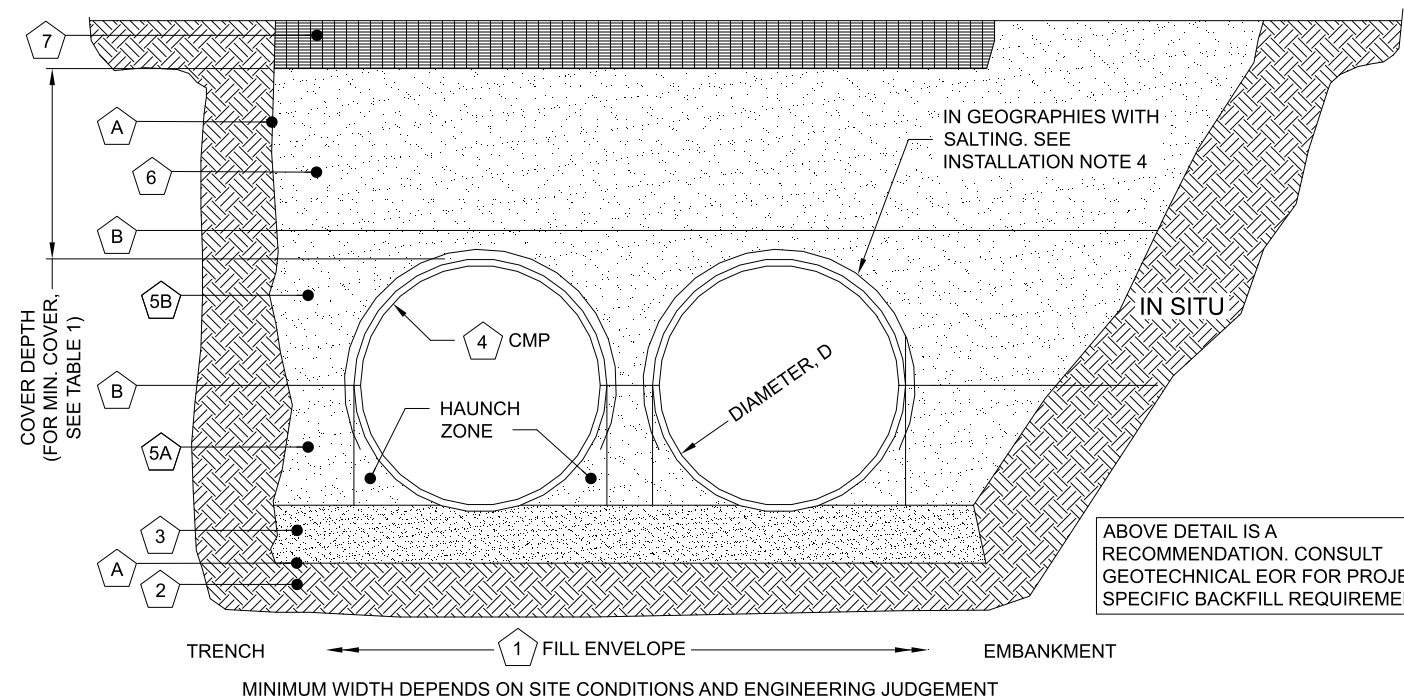
DYO67374 Cottonwood
DMA4
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 67374	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS			
MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12" MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	AASHTO 26.5.2 OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.
3	BEDDING	AASHTO M 43: 3, 357, 4, 467, 5, 56, 57 (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1
4	CORRUGATED METAL PIPE		
5A	CRITICAL BACKFILL	AASHTO M 145: A-1, A-2, A-3 *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).
5B	BACKFILL	AASHTO M 145: A-1, A-2, A-3	
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.

NOTES:

- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.
- * APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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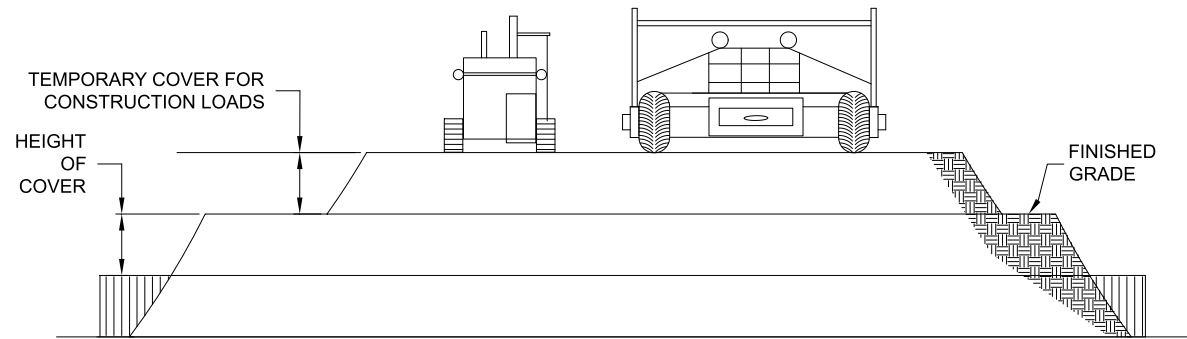
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CMP DETENTION SYSTEMS
CONTECH
DYODS
DRAWING

DYO67374 Cottonwood
DMA4
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 67374	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1



CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL

THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS

CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSA GUIDELINES.

PIPE

THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

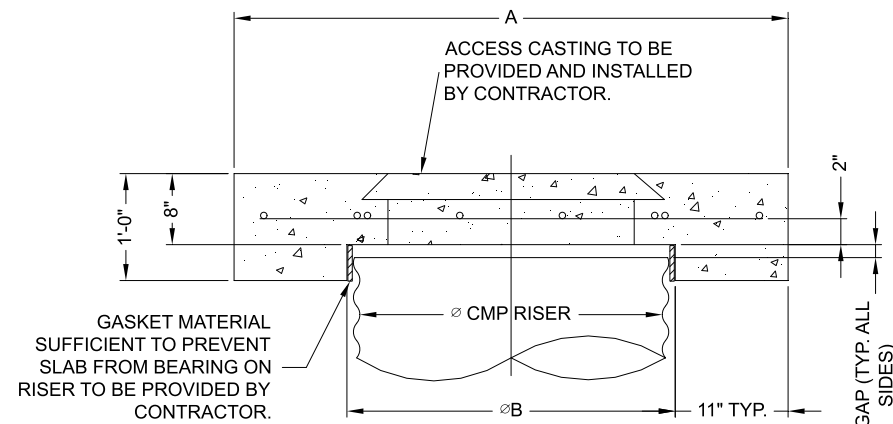
HANDLING AND ASSEMBLY

SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

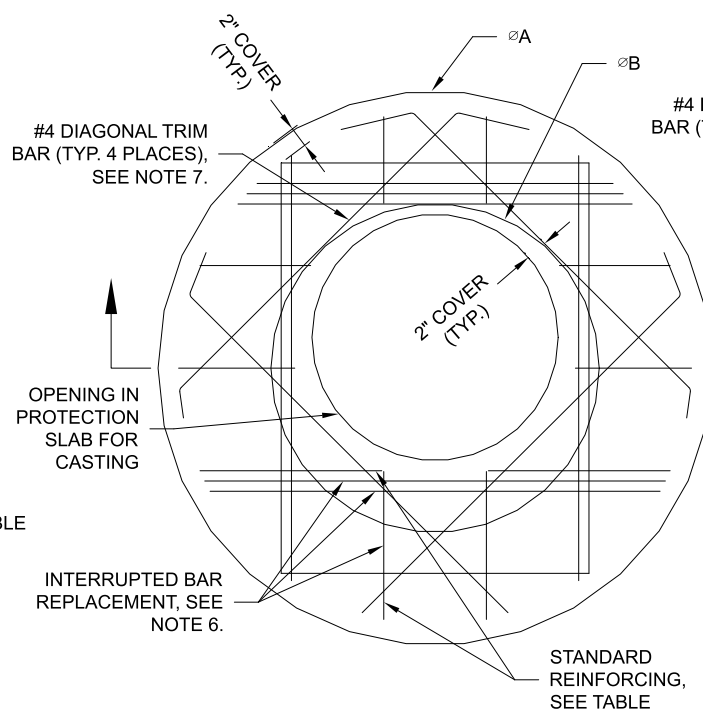
INSTALLATION

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

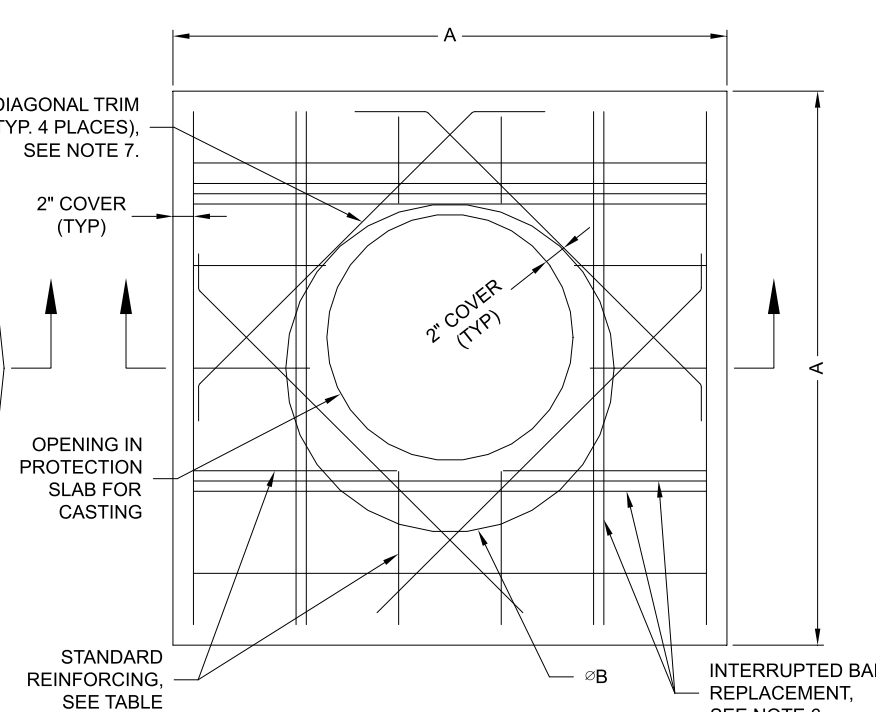
IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.



SECTION VIEW



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

- DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
- DESIGN LOAD HS25.
- EARTH COVER = 1' MAX.
- CONCRETE STRENGTH = 3,500 psi
- REINFORCING STEEL = ASTM A615, GRADE 60.
- PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
- TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
- PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
- DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY

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CONTECH
CMP DETENTION SYSTEMS
CONTECH
DYODS
DRAWING

DYO67374 Cottonwood
DMA4
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 67374	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
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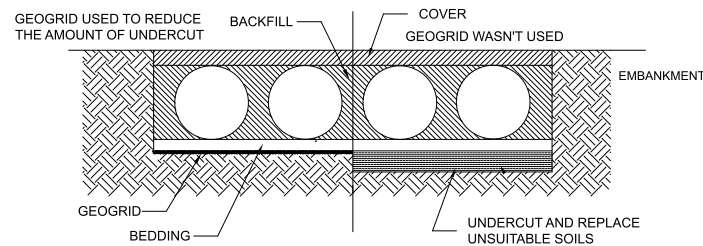
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

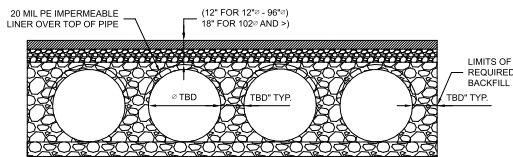
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

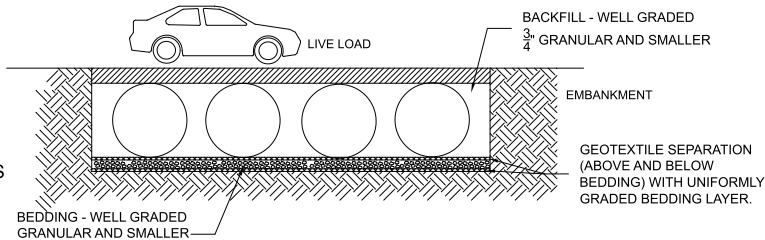
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

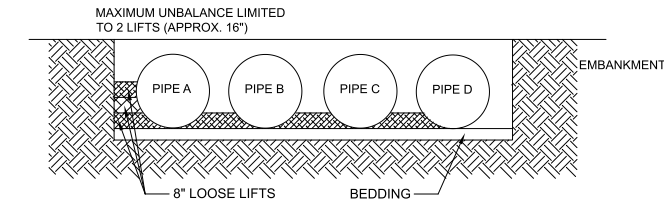
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



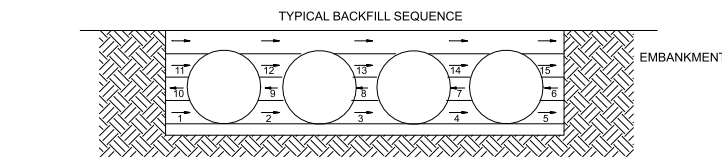
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

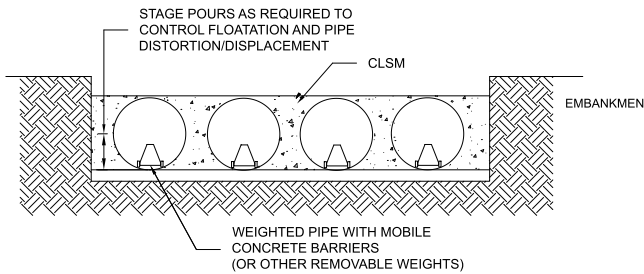


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10- FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

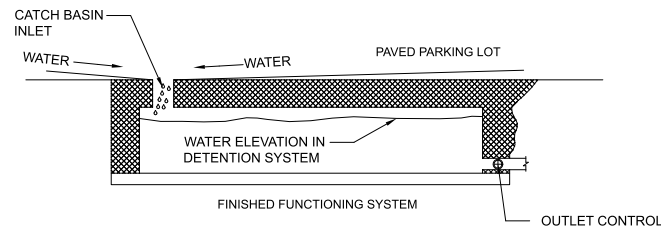


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CONTECH
CMP DETENTION SYSTEMS

CONTECH
DYODS
DRAWING

DYO67374 Cottonwood
DMA4
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 67374	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

PROJECT SUMMARY

CALCULATION DETAILS

- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 69 LF

STORAGE SUMMARY

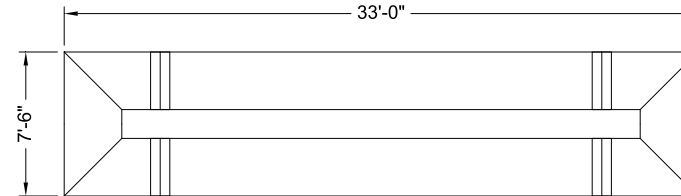
- STORAGE VOLUME REQUIRED = 474 CF
- PIPE STORAGE VOLUME = 488 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 488 CF

PIPE DETAILS

- DIAMETER = 36"
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 18"

BACKFILL DETAILS

- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2 2/3" x 1/2" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 10'

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CONTECH
CMP DETENTION SYSTEMS

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DRAWING

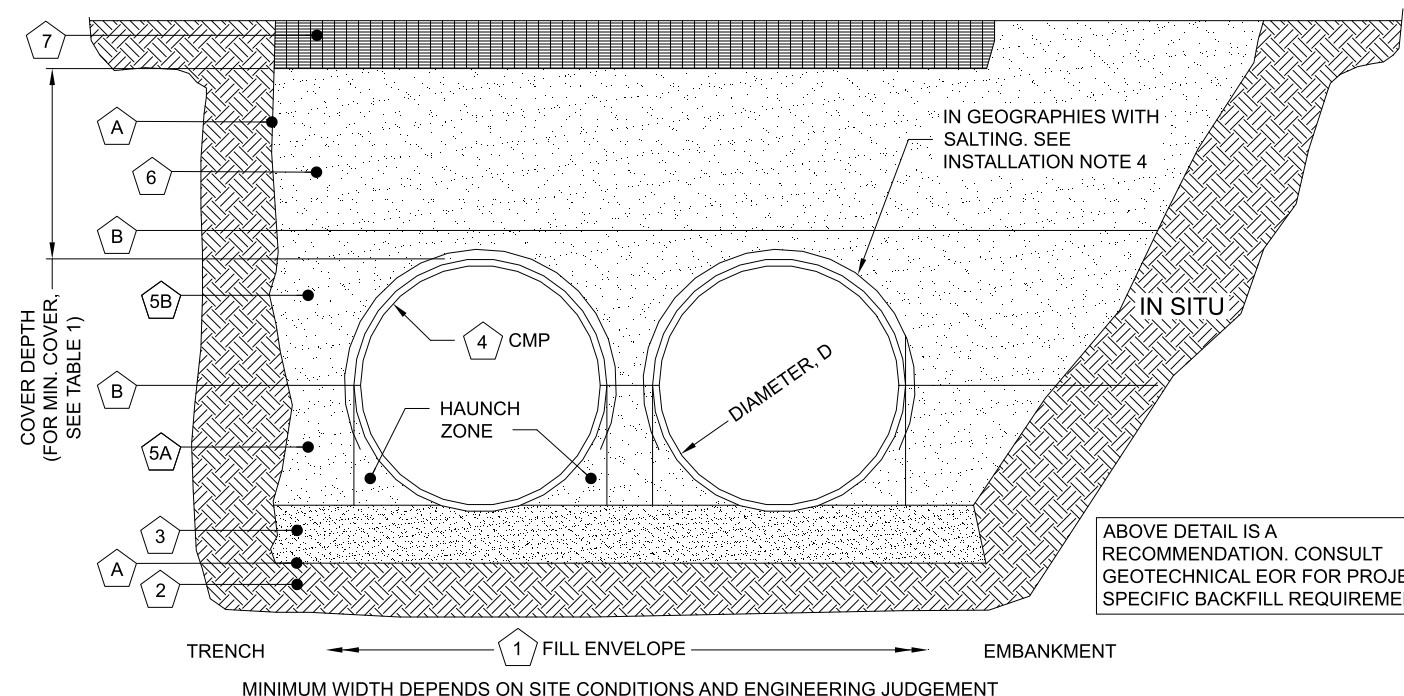
DY049899 Cottonwood
DMA1
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 49899	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS			
MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12" MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	AASHTO 26.5.2 OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.
3	BEDDING	AASHTO M 43: 3, 357, 4, 467, 5, 56, 57 (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1
4	CORRUGATED METAL PIPE		
5A	CRITICAL BACKFILL	AASHTO M 145: A-1, A-2, A-3 *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).
5B	BACKFILL	AASHTO M 145: A-1, A-2, A-3	
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.

NOTES:

- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.
- * APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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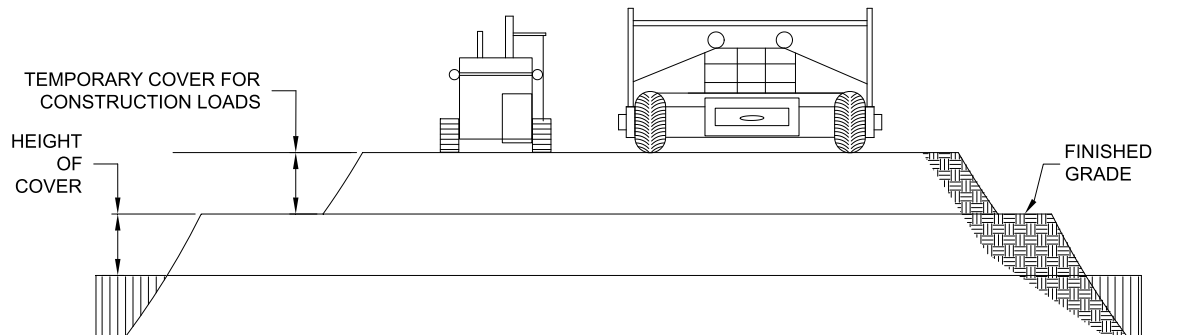
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DYODS
DRAWING

DYO49899 Cottonwood
DMA1
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 49899	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1



CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL

THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS

CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSIPA GUIDELINES.

PIPE

THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

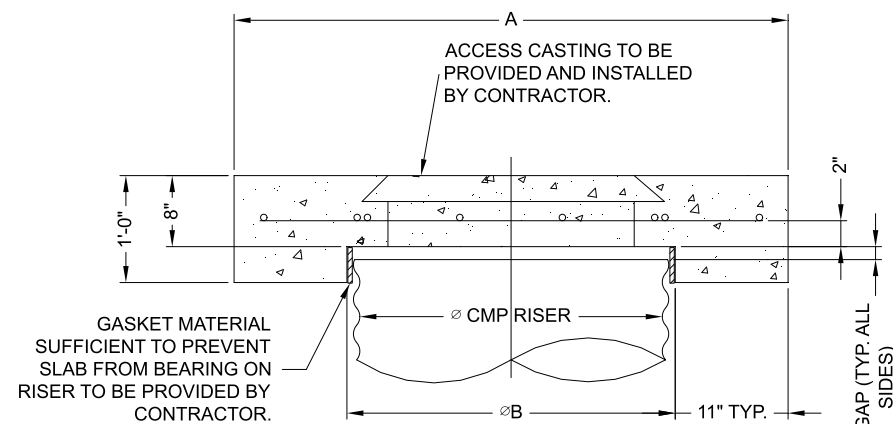
HANDLING AND ASSEMBLY

SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

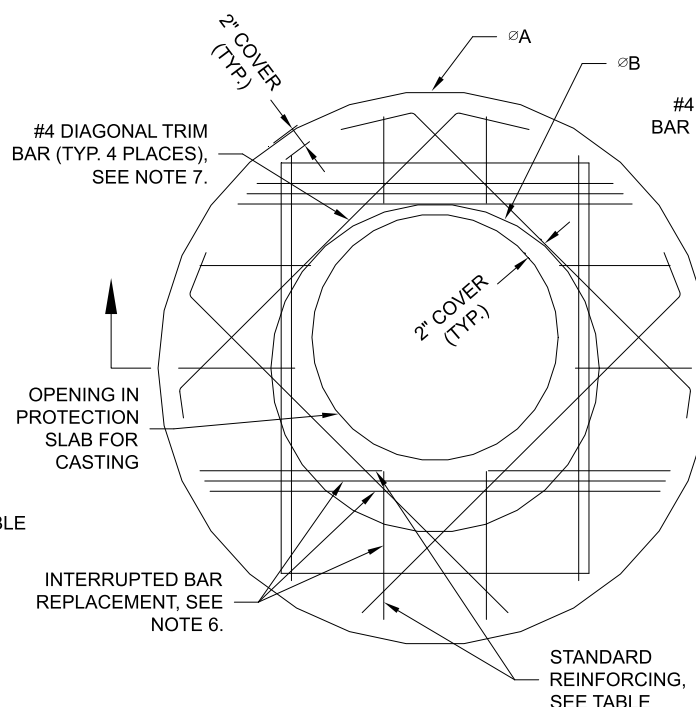
INSTALLATION

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

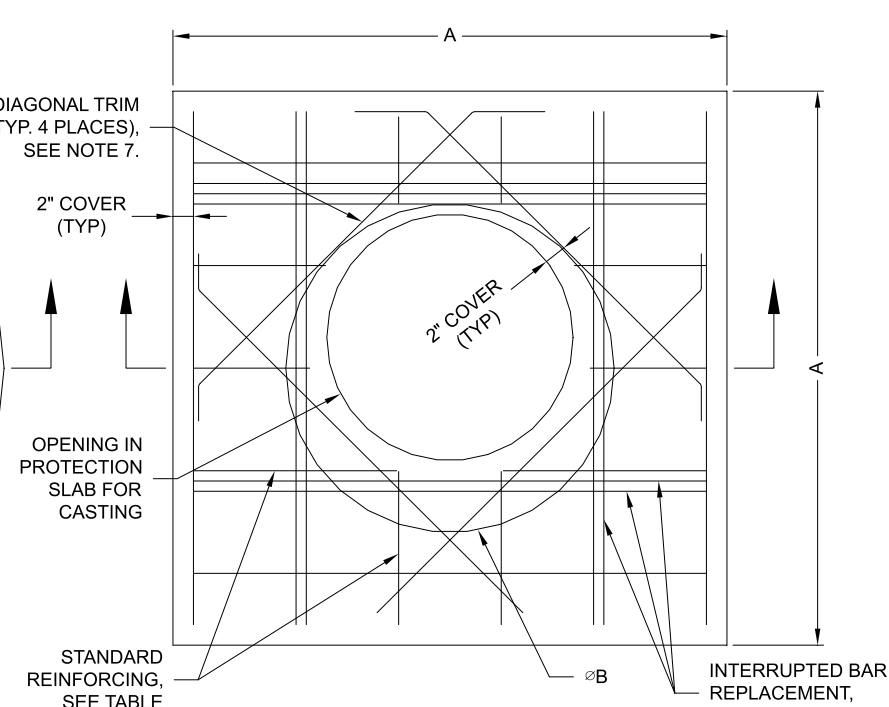
IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.



SECTION VIEW



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

- DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
- DESIGN LOAD HS25.
- EARTH COVER = 1' MAX.
- CONCRETE STRENGTH = 3,500 psi
- REINFORCING STEEL = ASTM A615, GRADE 60.
- PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
- TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
- PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
- DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY

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DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 49899	DATE: 1/28/2025
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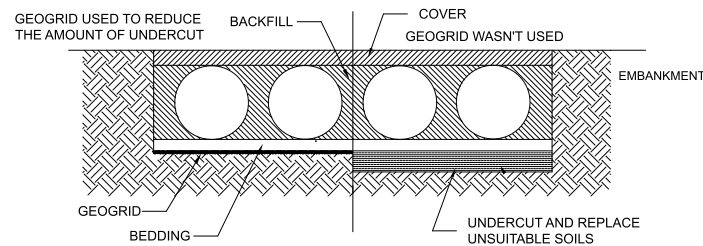
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

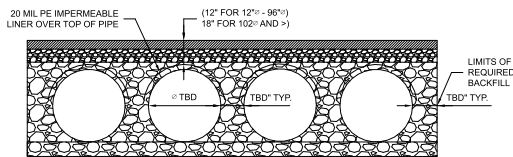
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

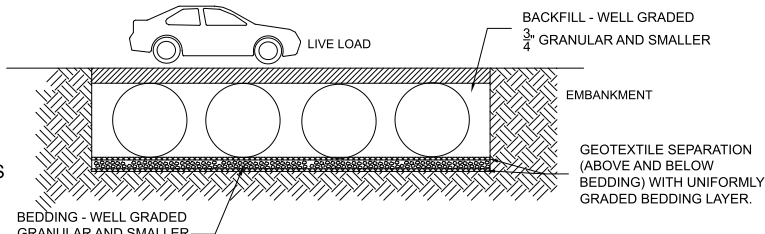
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

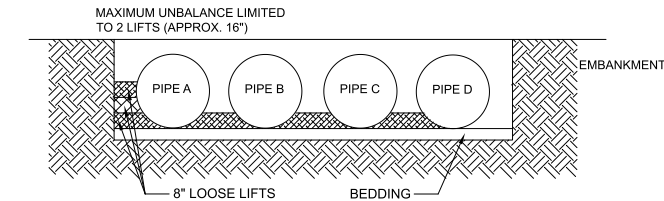
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



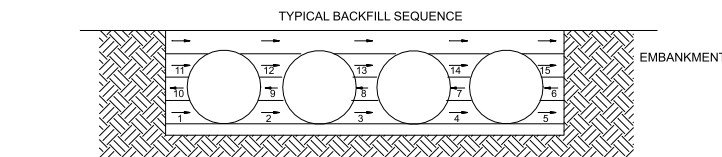
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

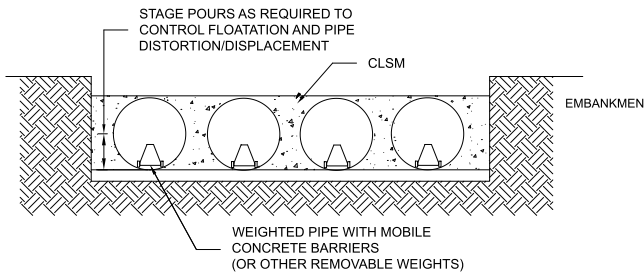


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10- FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

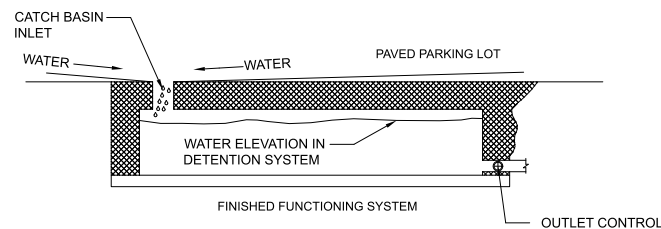


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CONTECH
CMP DETENTION SYSTEMS

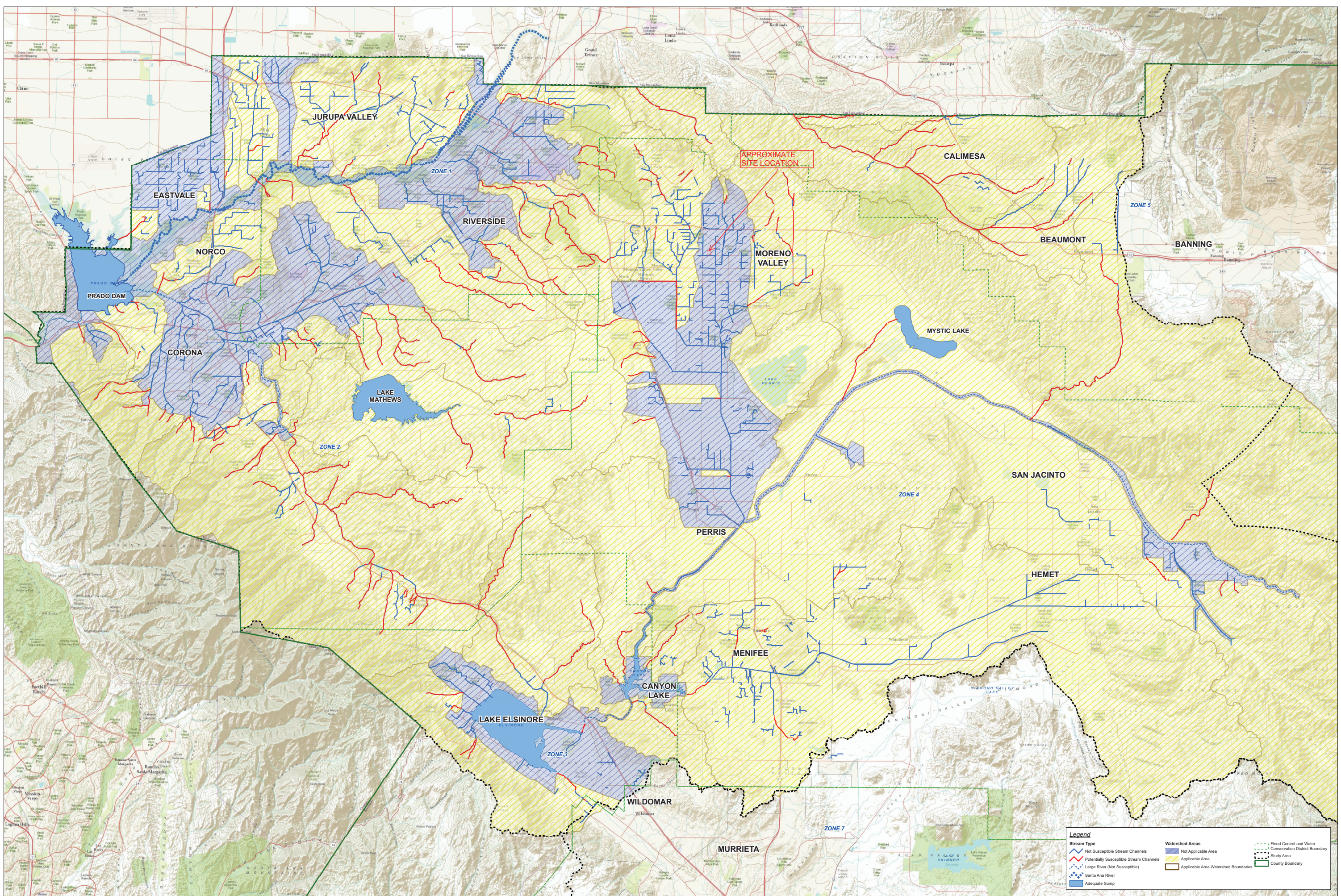
CONTECH
DYODS
DRAWING

DYO49899 Cottonwood
DMA1
Rancho Cucamonga, CA
DETENTION SYSTEM

PROJECT No.: 34641	SEQ. No.: 49899	DATE: 1/28/2025
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern



Legend

Stream Type	Watershed Areas	Flood Control and Water Conservation District Boundary
Not Susceptible Stream Channels	Not Applicable Area	Study Area
Potentially Susceptible Stream Channels	Applicable Area	County Boundary
Large River (Not Susceptible)	Applicable Area Watershed Boundaries	
Santa Ana River		
Adequate Sump		

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 www.cabmphandbooks.com <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 type="checkbox"/> B. Interior floor drains and elevator shaft sump pumps		<input type="checkbox"/> State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	<input type="checkbox"/> Inspect and maintain drains to prevent blockages and overflow.
<input checked="" type="checkbox"/> C. Interior parking garages		<input checked="" type="checkbox"/> State that parking garage floor drains will be plumbed to the sanitary sewer.	<input checked="" 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	<ul style="list-style-type: none"> <input checked="" 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 checked="" 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> <ul style="list-style-type: none"> <input checked="" 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 checked="" 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>	<ul style="list-style-type: none"> <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 http://rcflood.org/stormwater/Error! <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
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> E. Pools, spas, ponds, decorative fountains, and other water features. 	<ul style="list-style-type: none"> <input checked="" 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.) 	<p>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.</p>	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> See applicable operational BMPs in “Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain” at http://rcflood.org/stormwater/
<ul style="list-style-type: none"> <input type="checkbox"/> F. Food service 	<ul style="list-style-type: none"> <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. 	<ul style="list-style-type: none"> <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. 	<ul style="list-style-type: none"> <input type="checkbox"/> See the brochure, “The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries” at http://rcflood.org/stormwater/ Provide this brochure to new site owners, lessees, and operators.
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> G. Refuse areas 	<ul style="list-style-type: none"> <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 checked="" type="checkbox"/> Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer. 	<ul style="list-style-type: none"> <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. 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post “no hazardous materials” signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, “Waste Handling and Disposal” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

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

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"/> 1. 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"> ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank <p>www.cchealth.org/groups/hazmat/</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 www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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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"/> J. Vehicle and Equipment Cleaning	<input type="checkbox"/> Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use). (3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	<input type="checkbox"/> If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): <input type="checkbox"/> Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Refer to “Outdoor Cleaning Activities and Professional Mobile Service Providers” for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ <input type="checkbox"/> Car dealerships and similar may rinse cars with water only.

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		
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<ul style="list-style-type: none"> ■ K. Vehicle/Equipment Repair and Maintenance 	<ul style="list-style-type: none"> □ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. □ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. □ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained. 	<ul style="list-style-type: none"> ■ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. □ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency’s requirements. □ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency’s requirements. 	<p>In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:</p> <ul style="list-style-type: none"> □ No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. □ No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. □ No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment. <p>Refer to “Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations”. Brochure can be found at http://rcflood.org/stormwater/</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 http://rcflood.org/stormwater/</p>

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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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 ⁶ shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable. <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 ¹ .] 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 www.cabmphandbooks.com

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

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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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"/> M. Loading Docks	<input 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 type="checkbox"/> Move loaded and unloaded items indoors as soon as possible. <input type="checkbox"/> See Fact Sheet SC-30, “Outdoor Loading and Unloading,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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<ul style="list-style-type: none"> <input checked="" type="checkbox"/> N. Fire Sprinkler Test Water 		<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Provide a means to drain fire sprinkler test water to the sanitary sewer. 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> See the note in Fact Sheet SC-41, “Building and Grounds Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
<p>O. Miscellaneous Drain or Wash Water or Other Sources</p> <ul style="list-style-type: none"> <input type="checkbox"/> Boiler drain lines <input checked="" type="checkbox"/> Condensate drain lines <input type="checkbox"/> Rooftop equipment <input type="checkbox"/> Drainage sumps <input checked="" type="checkbox"/> Roofing, gutters, and trim. <input type="checkbox"/> Other sources 		<ul style="list-style-type: none"> <input checked="" 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 checked="" 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. <input checked="" type="checkbox"/> 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. <p>Include controls for other sources as specified by local reviewer.</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
<ul style="list-style-type: none"> ■ P. Plazas, sidewalks, and parking lots. 			<ul style="list-style-type: none"> ■ 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

Appendix 10: Educational Materials

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

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.

California Experience

The number of installations is unknown but likely exceeds a thousand. Some users have reported that these systems require considerable maintenance to prevent plugging and bypass.

Advantages

- Does not require additional space as inserts as the drain inlets are already a component of the standard drainage systems.
- Easy access for inspection and maintenance.
- As there is no standing water, there is little concern for mosquito breeding.
- A relatively inexpensive retrofit option.

Limitations

Performance is likely significantly less than treatment systems that are located at the end of the drainage system such as ponds and vaults. Usually not suitable for large areas or areas with trash or leaves than can plug the insert.

Design and Sizing Guidelines

Refer to manufacturer’s guidelines. Drain inserts come any many configurations but can be placed into three general 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

Design Considerations

- Use with other BMPs
- Fit and Seal Capacity within Inlet

Targeted Constituents

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

Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.



one box; that is, the setting area and filtration through media occurs in the same box. One manufacturer has a double-box. Stormwater enters the first box where setting occurs. The stormwater flows into the second box where the filter media is located. Some products consist of one or more trays or mesh grates. The trays can hold different types of media. Filtration media vary with the manufacturer: types include polypropylene, porous polymer, treated cellulose, and activated carbon.

Construction/Inspection Considerations

Be certain that installation is done in a manner that makes certain that the stormwater enters the unit and does not leak around the perimeter. Leakage between the frame of the insert and the frame of the drain inlet can easily occur with vertical (drop) inlets.

Performance

Few products have performance data collected under field conditions.

Siting Criteria

It is recommended that inserts be used only for retrofit situations or as pretreatment where other treatment BMPs presented in this section area used.

Additional Design Guidelines

Follow guidelines provided by individual manufacturers.

Maintenance

Likely require frequent maintenance, on the order of several times per year.

Cost

- The initial cost of individual inserts ranges from less than \$100 to about \$2,000. The cost of using multiple units in curb inlet drains varies with the size of the inlet.
- The low cost of inserts may tend to favor the use of these systems over other, more effective treatment BMPs. However, the low cost of each unit may be offset by the number of units that are required, more frequent maintenance, and the shorter structural life (and therefore replacement).

References and Sources of Additional Information

Hrachovec, R., and G. Minton, 2001, Field testing of a sock-type catch basin insert, Planet CPR, Seattle, Washington

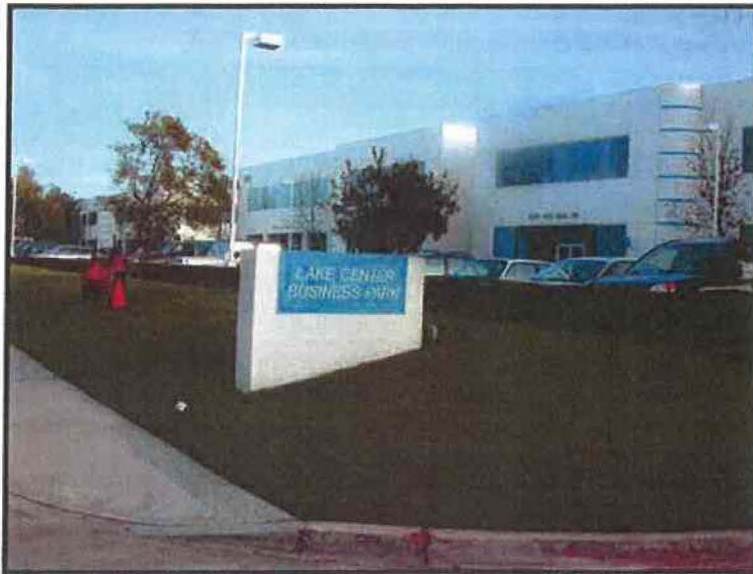
Interagency Catch Basin Insert Committee, Evaluation of Commercially-Available Catch Basin Inserts for the Treatment of Stormwater Runoff from Developed Sites, 1995

Larry Walker Associates, June 1998, NDMP Inlet/In-Line Control Measure Study Report

Manufacturers literature

Santa Monica (City), Santa Monica Bay Municipal Stormwater/Urban Runoff Project - Evaluation of Potential Catch basin Retrofits, Woodward Clyde, September 24, 1998

Woodward Clyde, June 11, 1996, Parking Lot Monitoring Report, Santa Clara Valley Nonpoint Source Pollution Control Program.



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

- 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

- 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, polyphosphates 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/>

Site Design & Landscape Planning SD-10



Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.



SD-10 Site Design & Landscape Planning

Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

Site Design & Landscape Planning SD-10

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of "redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

SD-10 Site Design & Landscape Planning

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.



Rain Garden

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain



barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Supplemental Information

Examples

- City of Ottawa’s Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, “Low-Impact Development”, January/February 2003.
www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD.
www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition



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

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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.

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.

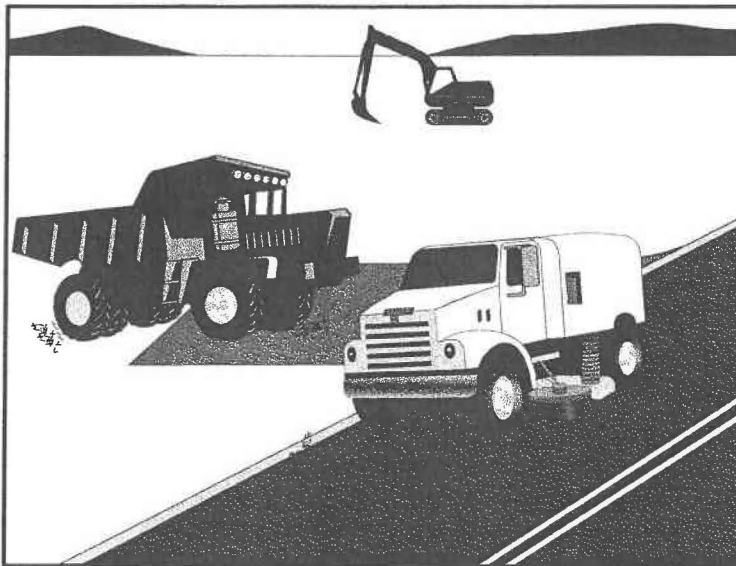
Other Resources

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.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.



Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

Categories

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	<input checked="" type="checkbox"/>
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Objective
- Secondary Objective

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

Potential Alternatives

None



- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from \$58/hour (3 yd³ hopper) to \$88/hour (9 yd³ hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

General Description

A manufactured wetland is similar to public domain stormwater wetlands. In a manufactured wetland, gravel substrate and subsurface flow of the stormwater through the root systems force the vegetation to remove nutrients and dissolved pollutants from the stormwater.

Only one company currently manufactures a pre-engineered wetland: It consists of a standard module, about 9.5 feet in diameter and 4 feet in height. The module is constructed of recycled polyethylene. The number of units is varied to meet the design volume of the site.

Inspection/Maintenance Considerations

To maximize wetland removal of pollutants, the vegetation must be harvested frequently. Harvesting is particularly important with respect to the removal of phosphorus and metals, less so nitrogen. Harvesting should occur by mid-summer before the plants begin to transfer phosphorus from the aboveground foliage to subsurface roots, or begin to lose metals that desorb during plant die off. While not stated by the manufacturer, it is also desirable that every few years the entire plant mass including roots be harvested. This is because the belowground biomass constitutes a significant reservoir (possibly half) of the nutrients and metals that are removed from the stormwater by plants (Minton, 2002).

If pretreatment is provided then maintenance consideration must be given to the build up of debris and floatables.

Inspection Activities	Suggested Frequency
<ul style="list-style-type: none"> Inspect during the dry season to determine if irrigation of plants is necessary. 	As needed
<ul style="list-style-type: none"> Inspect to verify that invasive species of wetland plants is not occurring. 	Annual
Maintenance Activities	Suggested Frequency
<ul style="list-style-type: none"> Clean the center well. 	As needed
<ul style="list-style-type: none"> Remove vegetation near end of each growth season to capture the nutrients and pollutants removed by the wetland vegetation. 	Annual

Maintenance Concerns, Objectives, and Goals

- Vegetation/Landscape Maintenance
- Endangered Species Habitat Creation
- Pollutant Removal Efficiency
- Clogging of the Outlet
- Invasive/exotic Plant Species
- Vector Control

Targeted Constituents

- Sediment
- Nutrients
- Trash
- Metals
- Bacteria
- Oil and Grease
- Organics
- Oxygen Demanding

Removal Effectiveness

See New Development and Redevelopment BMP Handbook- Section 5.



References Used to Develop this Fact Sheet

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Camp Dresser and McKee Inc.; Larry Walker Associates. California Stormwater Best Management Practice Handbook for New Development and Redevelopment. California Stormwater Quality Association (CASQA), 2004.

Contra Costa Clean Water Program. Stormwater Quality Requirements for Development Applications. 3rd Edition. Contra Costa, 2006.

County of Los Angeles Public Works. Stormwater Best Management Practice Design and Maintenance Manual. Los Angeles, 2009.

Kim, Hunho, Eric A. Seagren and Allen P. Davis. "Engineered Bioretention for Removal of Nitrate from Stormwater Runoff." Water Environment Research 75.4 (2003): 355-366.

LA Team Effort. LA Team Effort: FREE Planter Boxes for Businesses. 2 November 2009. May 2010 <<http://lateameffort.blogspot.com/2009/11/free-planter-boxes-for-businesses-est.html>>.

Montgomery County Maryland Department of Permitting Services Water Resources Section. Biofiltration (BF). Montgomery County, 2005.

Program, Ventura Countywide Stormwater Quality Management. Technical Guidance Manual for Stormwater Quality Control Measures. Ventura, 2002.

United States Environmental Protection Agency. Storm Water Technology Fact Sheet Bioretention. Washington D.C, 1999.

Urban Drainage and Flood Control District. Urban Storm Drainage Criteria Manual Volume 3 - Best Management Practices. Vol. 3. Denver, 2008. 3 vols.

Urbonas, Ben R. Stormwater Sand Filter Sizing and Design: A Unit Operations Approach. Denver: Urban Drainage and Flood Control District, 2002.

Pollution Prevention STORMWATER

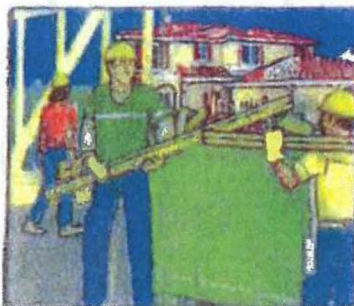
CONSTRUCTION

Cement wash, sediment, vehicle fluids, dust and hazardous debris from construction sites often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



Store Materials Safely

Keep construction materials and debris away from the street, gutter and storm drains. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.



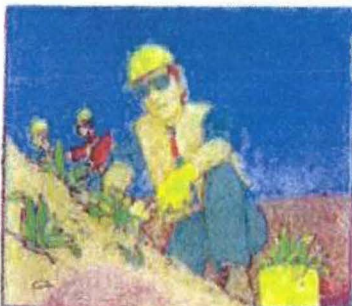
Ordering Materials & Recycling Waste

Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. You can recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call (909) 386-6401.



Cleaning & Preventing Spills

Use a drip pan and funnel when draining or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. To report serious spills, call 611.



Preventing Erosion

Avoid excavation or grading during wet weather. Plant temporary vegetation or add hydromulch on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff to a detention basin and around the construction site. Channels can be lined with grass or roughened pavement to reduce runoff velocity.



Maintaining Vehicles & Equipment

Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutter and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks, and prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids.

To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

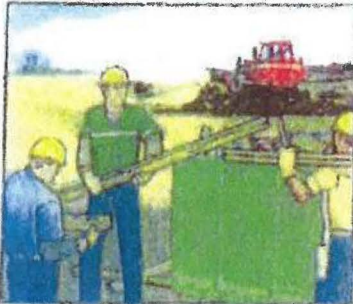
www.1800cleanup.org



STORMWATER Pollution Prevention

EXCAVATION AND GRADING

Sediment, cement wash, asphalt and vehicle fluids from soil excavation and grading often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



Recycling Waste

Recycle broken asphalt, concrete, wood, and cleared vegetation whenever possible. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call (909) 388-8497.



Maintaining Vehicles & Equipment

Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutters and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks. Use gravel approaches where truck traffic is heavy to reduce soil compaction and limit the tracking of sediment into the street.



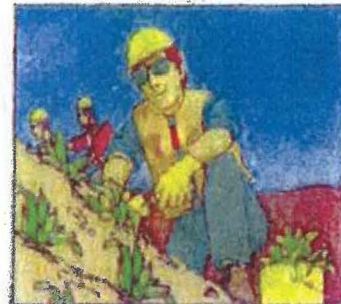
Cleaning & Preventing Spills

Use a drip pan and funnel when draining or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. Prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids. To report serious spills, call 811.



Storing Materials

Keep construction materials and debris away from the street, gutter and storm drains. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.



Preventing Erosion

Avoid excavation or grading during wet weather. Plant temporary vegetation on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff. Channels can be lined with grass or reinforced pavement to reduce runoff velocity.

To report illegal dumping or for more information
on stormwater pollution prevention, call

1 (800) CLEANUP

www.1800cleanup.org

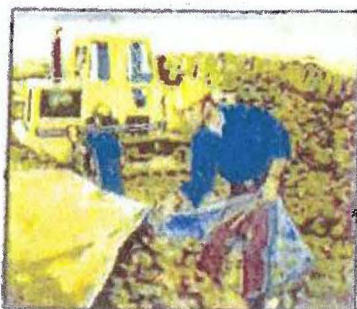


POLLUTION PREVENTION

STORMWATER

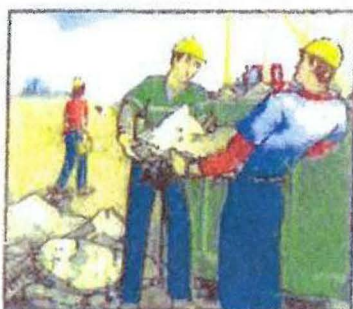
FRESH CONCRETE & MORTAR APPLICATION

Cement wash, sediment, vehicle fluids, dust and hazardous debris from construction sites often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



Storing Materials

Keep construction materials and debris away from the street, gutter and storm drains. Secure open bags of cement and cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.



Ordering Materials & Recycling Waste

Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. When breaking up paving, recycle the pieces at a crushing company. You can also recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. Call (909) 396-9401 for recycling and disposal information.

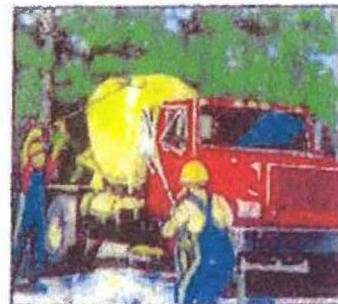


During Construction

Schedule excavation and grading during dry weather. Prevent mortar and cement from entering the street and storm drains by placing erosion controls. Setup small mixers on tarps or drop cloths, for easy cleanup of debris. Never bury waste material. Recycle or dispose of it as hazardous waste.

Cleaning Up

Wash concrete dust onto designated dirt areas, not down driveways or into the street or storm drains. Wash out concrete mixers and equipment in specified washout areas, where water can flow into a containment pond. Cement washwater can be recycled by pumping it back into cement mixers for reuse. Never dispose of cement washout into driveways, streets, gutters, storm drains or drainage ditches.



To report illegal dumping or for more information on stormwater pollution prevention, call:

(800) CLEANUP

www.1800cleanup.org



STORMWATER Pollution Prevention

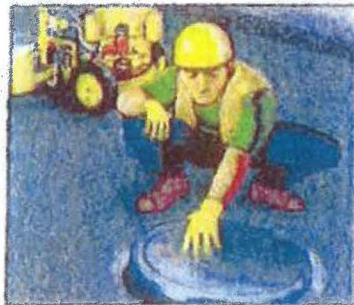
ROADWORK AND PAVING

Asphalt, saw-cut slurry and excavated materials from road paving, surfacing and pavement removal often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



Preventing Erosion

Schedule excavation and grading work during dry weather. Develop and implement erosion and sediment control plans for excavated embankments. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.



During Construction

Cover catch basins and maintenance holes when applying seal coat, slurry seal or fog seal. Use check dams, ditches or berms around excavations, and avoid over applying water for dust control. Never wash excess materials from exposed aggregate or concrete into the street, gutter or a storm drain.



Maintaining Vehicles & Equipment

Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutter and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks, and prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids.

Asphalt & Concrete Removal

Barriade storm drain openings during saw-cutting, and recycle broken up pavement at a recycling company. For recycling information, call (909) 388-0401.



Cleaning & Preventing Spills

Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. Sweep up dry spills, instead of hosing. Prevent spills from paver machines by using drip pans, or by placing absorbent materials like cloths or rags under the machines when not in use. To report serious spills, call 311.

To report illegal dumping or for more information
on stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org



POLLUTION STORMWATER Prevention

PAINTING

Paints, solvents, adhesives and other toxic chemicals used in painting often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these simple tips to prevent pollution and protect our health.



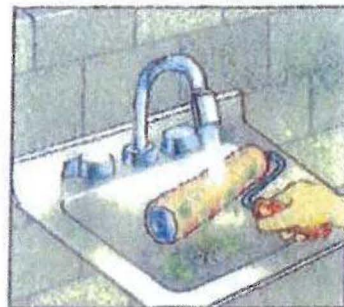
Water-Based Paints

Use water-based paints whenever possible. They are less toxic than oil-based paints and easier to clean up. Look for products labeled "latex" or "cleans with water."



Paint Removal

Sweep up paint stripping residue, chips and dust instead of hosing into the street and dispose of them safely at a household hazardous waste collection facility. Call (800) CLEANUP for the facility in your area.

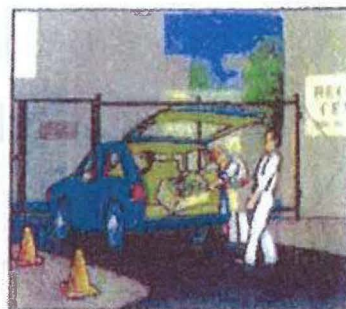


Painting Cleanup

Never clean brushes or rinse paint containers in the street, gutter or near a storm drain. Clean water-based paints in the sink. Clean oil-based paints with thinner, which can be reused by putting it in a jar to settle out the paint particles and then pouring off the clear liquid for future use. Wrap dried paint residue in newspaper and dispose of it in the trash.

Exterior Paint Removal

When stripping or cleaning building exteriors with high-pressure water, block nearby storm drains and divert washwater onto a designated dirt area. Ask your local wastewater treatment authority if you can collect building cleaning water and discharge it to the sewer.



Recycling Paint

Recycle leftover paint at a household hazardous waste collection facility, save it for touch ups or give it to someone who can use it, like a theatre group, school, city or community organization.

To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org



POLLUTION STORMWATER Prevention

HOME & GARDEN

Yard waste and household toxics like paints and pesticides often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these simple tips to prevent pollution and protect your health.



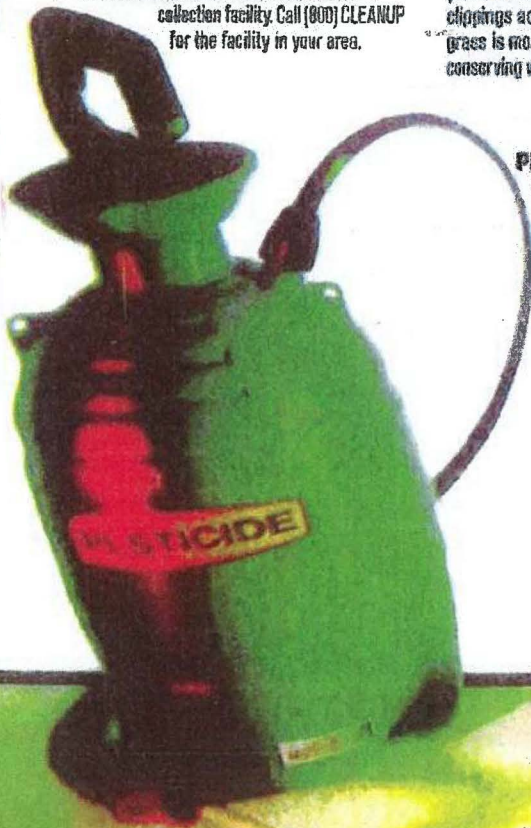
Recycle Household Hazardous Waste
Household products like paint, pesticides, solvents and cleaners are too dangerous to dump and too toxic to trash. Take them to be recycled at a convenient household hazardous waste collection facility. Call (800) CLEANUP for the facility in your area.



Disposing of Yard Waste
Recycle leaves, grass clippings and other yard waste, instead of blowing, sweeping or hosing into the street. Try grasscycling, leaving grass clippings on your lawn instead of using a grass catcher. The clippings act as a natural fertilizer, and because grass is mostly water, it also irrigates your lawn, conserving water.

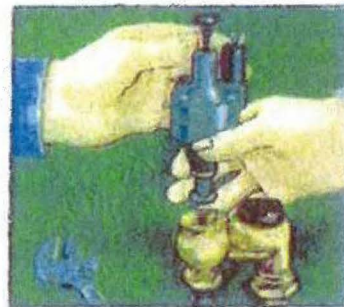


Use Fertilizers & Pesticides Safely
Fertilizers and pesticides are often carried into the storm drain system by sprinkler runoff. Try using organic or non-toxic alternatives. If you use chemical fertilizers or pesticides, avoid applying near curbs and driveways and never apply before a rain.



Planting in the Yard

Produce less yard waste and save water by planting low maintenance, drought-tolerant trees and shrubs. Using drip irrigation, soaker hoses or micro-spray systems for flower beds and vegetation can also help reduce your water bill and prevent runoff.



Use Water Wisely

Cut your water costs and prevent runoff by controlling the amount of water and direction of sprinklers. The average lawn needs about an inch of water a week, including rainfall, or 10 to 20 minutes of watering. A half-inch per week is enough for fall and spring. Sprinklers should be on long enough to allow water to soak into the ground but not so long as to cause runoff.

To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org



Prevención de Contaminación del Desagüe

TRABAJO DE CARRETERAS & PAVIMENTO

Asfalto, mezcla y materiales de excavaciones del pavimento acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Río de Santa Ana. Esto contamina el agua que tomamos, haciéndola peligrosa para la gente y la vida salvaje. Sigue estas prácticas para prevenir la contaminación y proteger la salud pública.



Previniendo Erosiones

Planea las excavaciones trabajo de jardinería durante el clima seco. Desarrolla e implementa planes de embarramientos de control de sedimento y excavaciones. Cubre montones de tierra, grava y otros materiales con un plástico para protegerlos de la lluvia, aire y desagüe.



Durante Construcción

Cubre los lavados y de mantenimiento a los hoyos al aplicar selladura o mezcla. Revisa las áreas de excavaciones, y evita pasarle de agua para prevenir polvareda. Nunca laves los materiales limos de concreto en la calle, drenajes o en el desagüe.



Mantenimiento de Vehículos & Herramientas

Has el mantenimiento y carga de vehículos en el mismo lugar, lejos de la calle, las alcantarillas y los drenajes. Inspecciona los vehículos y el equipo de cualquier goteadura y evita goteaduras de autos que no se usan vaciando la gasolina, aceite de transmisión, frenos y líquidos del radiador.

Removiendo Asfalto & Concreto

Bloquea alrededor de los drenajes cuando estas usando las maquinas de sierra, también recicle todo el pavimento roto en la compañía demolidora. Para más información llama al (909) 386-8401.



Limpiando & Previniendo Derrames

Mientras siempre preparado para cualquier derrame, usa siempre los herramientas de seguridad al igual que materiales como, tierra para desechos de gato o aserrín. Barra los derrames en vez de lavarlos con la manguera. Previene los derrames de las maquinas usando anillos o colocando garros para absorber cualquier líquido. Para reportar derrames llama al 911.

Para reportar actividades ilegales u obtener más información de la prevención de contaminación llamar al:

1 (800) CLEANUP

www.1800cleanup.org



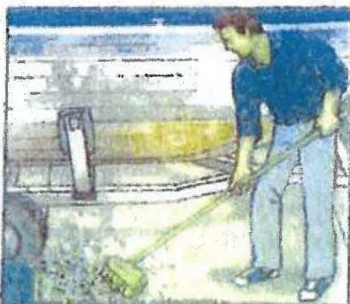
Prevención de Contaminación del Desagüe

PINTURA Pintura, solventes y otros químicos peligrosos que se usan al pintar acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Río de Santa Ana. Esto contamina el agua que tomamos, haciéndolo peligroso para la gente y la vida salvaje. Sigue estas prácticas para prevenir la contaminación y proteger la salud pública.



Pinturas de Agua

Usa pinturas de agua cuando sea posible. Son menos tóxicas que las pinturas de aceite y más fáciles para limpiar. Busca los productos "latex" or "cleans with water".



Removiendo Pintura

Residuos de pintura, polvo de pintura y pinturas que contienen plomo son peligrosas. Barridos en ves de lavarlos con la manguera y deséchalos en un lugar de colección de desechos peligrosos. Llama al (800) CLEANUP para un lugar en tu área.

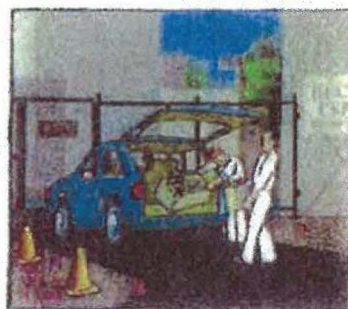


Limpiando Pintura

Nunca laves las brochas ni los contenedores de pintura en la celda, coladeras o desagües. Las de pintura de agua límpialas en el lavabo y las de pintura de aceite con thinner, y vuévelas a guardar en un frasco, para un uso futuro. Envuelve los residuos de pintura en un periódico y tíralos a la basura.

Removiendo Pintura en Exteriores

Al despintar o lavar exteriores de los edificios con agua de alta presión bloquea los drenajes cercanos y desvía el desagüe. Pregúnta las autoridades si puedes desecharla en las alcantarillas.



Reciclado Pintura

Recicla la pintura que sobra en un lugar de colección de materiales peligrosos, guárdalo para retoques or regálalo a alguien que lo usa, como a un teatro, a la escuela, una organización de la ciudad o de la comunidad.

Para reportar actividades ilegales u obtener información de la prevención de contaminación llamar al

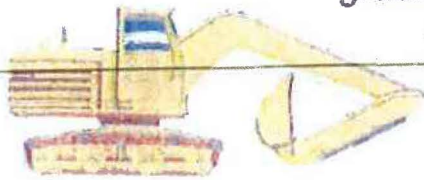
1 (800) CLEANUP

www.1800cleanup.org



EXCAVATION & GRADING OPERATIONS

Sediment, cement wash, asphalt, and motor oil from soil excavation and grading operations often make their way into the San Bernardino County storm drain system and DO



NOT GET TREATED before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

Erosion Prevention...

Reduce erosion by avoiding excavation or grading activities during wet weather, and by planting temporary vegetation on slopes where construction is not immediately planned. Plant permanent vegetation as soon as possible, once excavation and grading activities are complete. Diversion dikes can be constructed to channel runoff around the site; channels can be lined with grass or roughened pavement to reduce runoff velocity. For information on erosion control, call 799-7407.



General Business Practices...

Cover exposed piles of soil and other construction materials with plastic sheeting to prevent contact with rain water.

Recycling...



Recycle broken asphalt, concrete, wood, and cleared vegetation whenever possible. Unrecyclable materials must be taken to an appropriate landfill or disposed of as hazardous waste. For recycling or disposal information, call 386-8401.

Equipment Maintenance...

Maintain all vehicles and equipment by inspecting them frequently for leaks. Also, conduct maintenance and refueling at one location -- away from storm drains, and perform major equipment repairs and washings off site. Finally, use gravel approaches where truck traffic is frequent to reduce soil compaction and limit the tracking of sediment into the streets.



Spills...

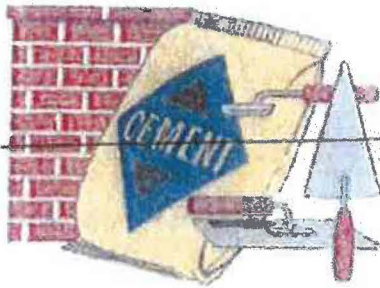
Avoid accidental spills by using a drip pan and funnel when draining or pouring fluids. Be ready for unexpected spills by preparing and using easy to find spill containment and cleanup kits. Kits should include safety equipment and cleanup materials such as kitty litter, sawdust or cornmeal. Furthermore, prevent leaks from stored vehicles by draining gas, hydraulic oil, and transmission, brake & radiator fluid. **REMEMBER:** Never hose down dirty surfaces. To report serious spills, call 1-800-33-TOXIC.



For more information, call your city's stormwater representative



FRESH CONCRETE & MORTAR APPLICATION



Cement, cement wash, gravel, asphalt, solvents, and motor oil from fresh concrete and mortar activities often make their way into the San Bernardino County storm drain system and **DO NOT GET TREATED** before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

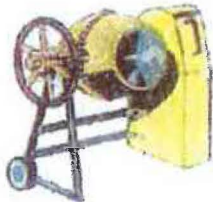
General Business Practices...

Schedule excavation and grading work during dry weather, and in case it rains, prevent materials from contacting stormwater by storing them under cover. Also, secure open bags of cement to keep wind-blown cement powder away from streets, gutters and storm drains.



During Construction...

Prevent mortar and cement from entering the storm drains by placing erosion controls (i.e., berms or temporary vegetation) down-slope to capture runoff.



When breaking up paving, be sure to pick up all pieces and recycle them at a crushing company;

small amounts of excess dry concrete, grout and mortar can be disposed of in the trash. Setup small mixers on tarps or heavy drop cloths to allow for easy cleanup of debris. **REMEMBER:** Never bury waste material -- recycle or dispose of it as hazardous waste. Call 386-8401 for recycling and disposal information.

Handling Materials & Wastes...

Minimize wastes when ordering materials by ordering only the amounts needed to complete the job. Whenever possible, use recycled or recyclable materials. Recycle broken asphalt, concrete, wood, and cleared vegetation. Unrecyclable materials must be taken to an appropriate landfill or disposed of as hazardous waste. For recycling and disposal information, call 386-8401.



Cleaning up...

When cleaning up after driveway or sidewalk construction, wash concrete dust onto designated dirt areas, not down the driveway or into the street or storm drain. Also, wash out concrete mixers and equipment only in specified wash-out areas, where the water flows into containment ponds. Cement washwater can be recycled by pumping it back into cement mixers



for reuse. **REMEMBER:** Never dispose of cement washout into driveways, streets, gutters, storm drains or drainage ditches.



For more information, call your city's stormwater representative



GENERAL CONSTRUCTION



Soil, cement wash, asphalt and motor oil from construction sites often make their way into the San Bernardino County storm drain system and **DO NOT GET TREATED** before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

General Business Practices...

Cover exposed piles of soil and other construction materials with plastic sheeting to prevent contact with rain water.

Erosion Prevention...

Reduce erosion by avoiding excavation or grading activities during wet weather, and by planting temporary vegetation on slopes where construction is not immediately planned.

Plant permanent vegetation as soon as possible, once excavation and grading activities are complete. Diversion dikes can be constructed to channel runoff around the site; channels can be lined with grass or roughened pavement to reduce runoff velocity. For information on erosion control, call 799-7407.

Equipment Maintenance...

Maintain all vehicles and equipment by inspecting them frequently for leaks. Also, conduct maintenance and refueling at one location – away from storm drains, and perform major equipment repairs and washings off site.

Handling Materials & Waste...

Minimize wastes when ordering materials by ordering only the amounts needed to complete the job. Whenever possible, use recycled or recyclable materials. Recycle broken asphalt, concrete, wood, and cleared vegetation. Unrecyclable materials must be taken to an appropriate landfill or disposed of as hazardous waste. For recycling and disposal information, call 386-8401.

Spills...

Avoid accidental spills by using a drip pan and funnel when draining or pouring fluids. Be ready for unexpected spills by preparing and using easy to find spill containment and cleanup kits. Kits should include safety equipment and cleanup materials such as kitty litter, sawdust or commeal. Furthermore, prevent leaks from stored vehicles by draining gas, hydraulic oil, and transmission, brake & radiator fluid. **REMEMBER:** Never hose down dirty surfaces; instead, sweep regularly. To report serious spills, call 1-800-33-TOXIC.



For more information, call your city's stormwater representative



HOME & GARDEN



Yard waste and household toxics such as paints, solvents, and pesticides often make their way into the San Bernardino County storm drain system and **DO NOT GET TREATED** before reaching the Santa Ana River. These wastes pollute our drinking water and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

In Your Home...

Household products such as paints, paint thinners, drain openers, motor oil, wood polishes, insecticides & herbicides, oven cleaners, and many other general cleaners



frequently get dumped on the ground, or into a gutter, street or storm drain. Instead of polluting our stormwaters, take these items to a household hazardous waste collection facility. Call 1-800-OILY-CAT for a facility in your area.

Fertilizers and Pesticides...

Fertilizers and pesticides are often carried into our storm drains by sprinkler runoff. To minimize stormwater pollution, use organic or non-toxic pesticides and fertilizers as directed, and keep them away from ditches, gutters and storm drains.

Store them in a covered area, off the ground, to prevent contact with water. For additional gardening questions, call the San Bernardino Master Gardeners at 387-2182.



Trimmin' the Garden...

Decaying organic materials that enter our storm drains, such as grass, leaves, yard clippings, and pet waste, will use up oxygen in nearby streams, stressing aquatic life. Prevent stormwater pollution by not blowing, sweeping, raking or hosing yard waste into the street, gutter, or storm drain.

Alternatively, leave grass clippings on your lawn after mowing, or compost your clippings and yard waste.

Pet waste should not be composted, but rather disposed of in the trash to prevent the potential spread of diseases.



Planting In The Yard

Produce less yard waste and save water by planting low maintenance trees and shrubs. Also, conserve water and minimize unwanted runoff by using drip irrigation, soaker hoses, or micro-spray systems to water vegetation.



For more information, call your city's stormwater representative



HOME REPAIR & REMODELING

Paints, solvents, adhesives, dusts, sediments, pesticides and household toxics commonly associated with home repair and remodeling activities often make their way into the San Bernardino County storm drain system and **DO NOT GET TREATED** before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.



Follow these practices to help prevent stormwater pollution...

Household Hazardous Wastes...

Common household cleaners, paint products, and wallpaper & tile adhesives contain toxic substances. Dispose of these products properly. **REMEMBER:** Toxic wastes should never enter the storm drain system. For disposal information, call **1-800-OILY-CAT**.



Construction...

Keep all construction debris away from the street, gutter and storm drain, and if possible, schedule grading and excavation projects for dry weather. Cover excavated material and stockpiles of asphalt, sand, etc. with plastic tarps, and prevent erosion by planting fast-growing annual and perennial grasses, which will shield and bind the soil.

Landscape & Gardening...

Use fertilizers and pesticides as directed. Keep them away from ditches, gutters and storm drains, and store them in a covered area to prevent contact with rain water. Also, minimize runoff and conserve water by using drip irrigation, soaker hoses, or micro-spray systems. **REMEMBER:** Do not deposit leaves into the street, gutter, or storm drain.



Painting...

CLEANUP... Avoid cleaning brushes or rinsing paint containers into a street, gutter, or storm drain. For water-based paints, "brush out" as much paint as possible, and rinse in the sink. For oil-based paints, "brush out" as much paint as possible, clean with thinner, and then filter and reuse thinner or solvent.



REMOVAL... Paint stripping residue, chips & dust from marine paints, and paints containing lead or tributyl tin are hazardous wastes. Sweep them up and call **1-800-OILY-CAT** for disposal information.

RECYCLING... Recycle or reuse leftover paint by using it for touch-ups, or by giving it to someone who can use it, such as a theatre group, school, city or other community organization. If you're unable to give it away, contact **1-800-OILY-CAT** for disposal information.

Concrete & Masonry...

Store bags of cement and plaster away from gutters and storm drains, and under cover, protected from rainfall, runoff and wind. **REMEMBER:** Never dispose of cement washout or concrete dust onto driveways, streets, gutters or storm drains.



For more information, call your city's stormwater representative





PAINTING

Paints, solvents, adhesives, and toxic chemicals from painting operations often make their way into the San Bernardino County storm drain system and **DO NOT GET TREATED** before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

General Business Practices...

Keep all paint products and wastes away from the street, gutter, and storm drains. Reuse paint thinner by setting used thinner aside in a closed, labeled jar to settle out paint particles, and then pouring off the clear liquid for future use. Wrap dried paint residue in newspaper and dispose of it in the trash.

Water-Based Paints...

Purchase water-based paints whenever possible. Look for products labeled "latex" or "clean up with water."

Recycle or Reuse Paints...

Recycle/reuse leftover paint by using it for touch-ups, or by giving it to someone who can use it, such as a theatre group, school, city or other community organization. If you're unable to give it away, contact 388-8401 for information on hazardous waste pick-up.



Paint Cleanup...



Avoid cleaning brushes and rinsing paint containers in a street, gutter, or storm drain. For water-based paints, "brush out" as much paint as possible and and rinse in the sink. For oil-based paints, "brush out" as much paint as possible, clean with thinner, and then filter and reuse thinner or solvent.

Paint Removal...

Chemical paint stripping residue, chips & dust from marine paints, and paints containing lead or tributyl tin are hazardous wastes. For disposal information, call 388-8401. Also, when stripping or cleaning building exteriors with high-pressure water, block storm drains and divert the washwater onto a designated dirt area. Check with your local wastewater treatment authority to find out if you can collect building cleaning water and discharge it to the sewer.



For more information, call your city's stormwater representative



ROADWORK & PAVING

Asphalt, saw-cut slurry, and excavated materials from Road paving, surfacing and pavement removal operations often make their way into the San Bernardino County storm drain system and **DO NOT GET TREATED** before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.



Follow these practices to help prevent stormwater pollution...

During Construction...

Cover catch basins and maintenance holes when applying seal coat, slurry seal, fog seal, etc. Use check dams, ditches or berms around excavations, and avoid over-application of water for dust control. **REMEMBER:** Never wash excess materials from exposed aggregate or concrete into a street, gutter, or storm drain; collect and recycle them.

Asphalt & Concrete Removal...



Barricade storm drain openings during saw-cutting, and after breaking up paving, be sure to remove all chunks and pieces and recycle them at a crushing company. For recycling information, call 386-8401.

Equipment Maintenance...

Maintain all vehicles and equipment by inspecting them frequently for leaks. Also, conduct maintenance and refueling at one location -- away from storm drains, and perform major equipment repairs and washings off site.

Spills...

Be ready for unexpected spills by preparing and using spill containment and cleanup kits. Kits should include safety equipment and cleanup materials such as kitty litter, sawdust or cornmeal. Prevent drips from paver machines by catching fluids with drip pans or by placing absorbent material (cloth, rags, etc....) underneath the machines when they're not in use. To report serious spills, call 1-800-33-TOXIC.



General Business Practices...

Schedule excavation and grading work during dry weather, and develop and implement erosion and sediment control plans for excavated embankments. In case it rains, cover exposed piles of soil and other construction materials with plastic sheeting to prevent contact with rain water.

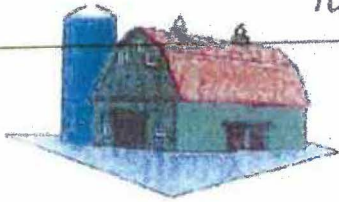


For more information, call your city's stormwater representative



RURAL HOMES

Pesticides, fertilizers, septic system overflows, soil, and animal manure from rural homes often make their way into the San Bernardino County storm drain system and **DO NOT GET TREATED** before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.



Follow these practices to help prevent stormwater pollution...

Protecting Your Well...

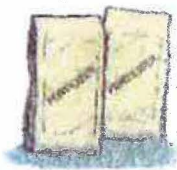
Since old, uncapped and abandoned wells can serve as direct conduits to our groundwater, it's important to maintain these areas. Keep all livestock confinement areas away from wells, and keep septic drain fields and chemical storage areas down slope from wells.

Install anti-siphoning devices between your well and water pipes to prevent backflow of pollutants and drinking water contamination. **REMEMBER:** Never dispose of anything in wells.



Fertilizers and Pesticides...

Avoid buying and mixing more pesticide than you need, and never apply more than the recommended amount. Consider spot treatments, rather than spraying pesticides everywhere. **REMEMBER:** Don't dispose of excess chemicals by dumping them on



the ground, pouring them down a well, or draining them into ditches, sewers, drains or septic systems. Call 1-800-OILY-CAT for disposal information.

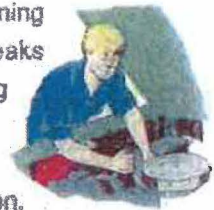
Finally, store chemicals in a covered area, with an impermeable lined floor to prevent contact with rainwater.

That Rural Landscape...

Reduce soil erosion by covering parking areas with gravel, and by covering other exposed soils with vegetation. Gravel and vegetation will not only improve the appearance of your home, but will also assist in filtering out pollutants from water. For information on reducing erosion, call 799-7407.

Autos & Other Equipment...

Repair vehicles and other equipment away from wells, ditches and drains. Avoid accidental spills by using a drip pan and funnel when draining or pouring fluids. Prevent leaks from stored vehicles by draining gas, hydraulic oil, and transmission, brake & radiator fluid. For recycling information, call 1-800-OILY-CAT



Septic Systems

Septic systems should never be piped into a road ditch, storm sewer, stream or farm drain tile system. Also, avoid washing or flushing grease, alcohol, or strong chemicals into your septic system; these substances kill the bacteria needed to break down wastes.



For more information, call your city's stormwater representative

