

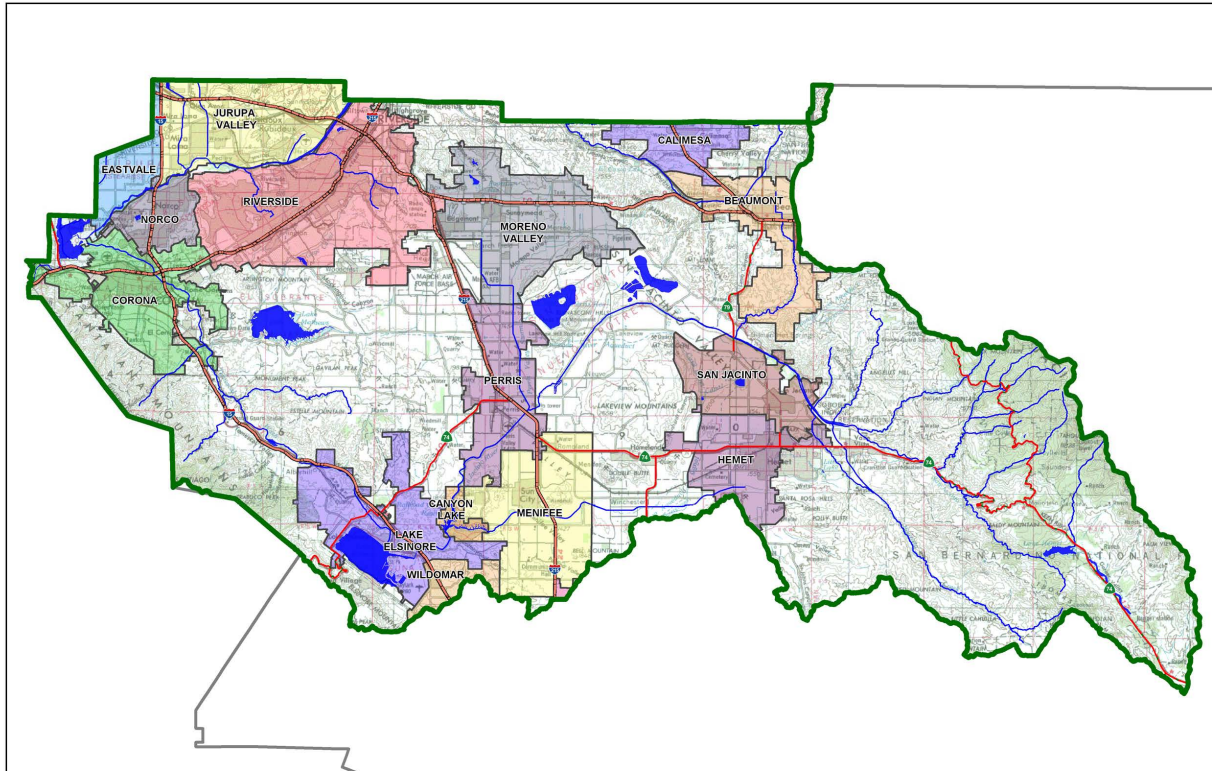
Project Specific Water Quality Management Plan

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

Project Title: North Corner Agua Mansa Road and Hall Avenue, Jurupa Valley, CA 92518

Development No: MA 18008

Design Review/Case No: MA 18008



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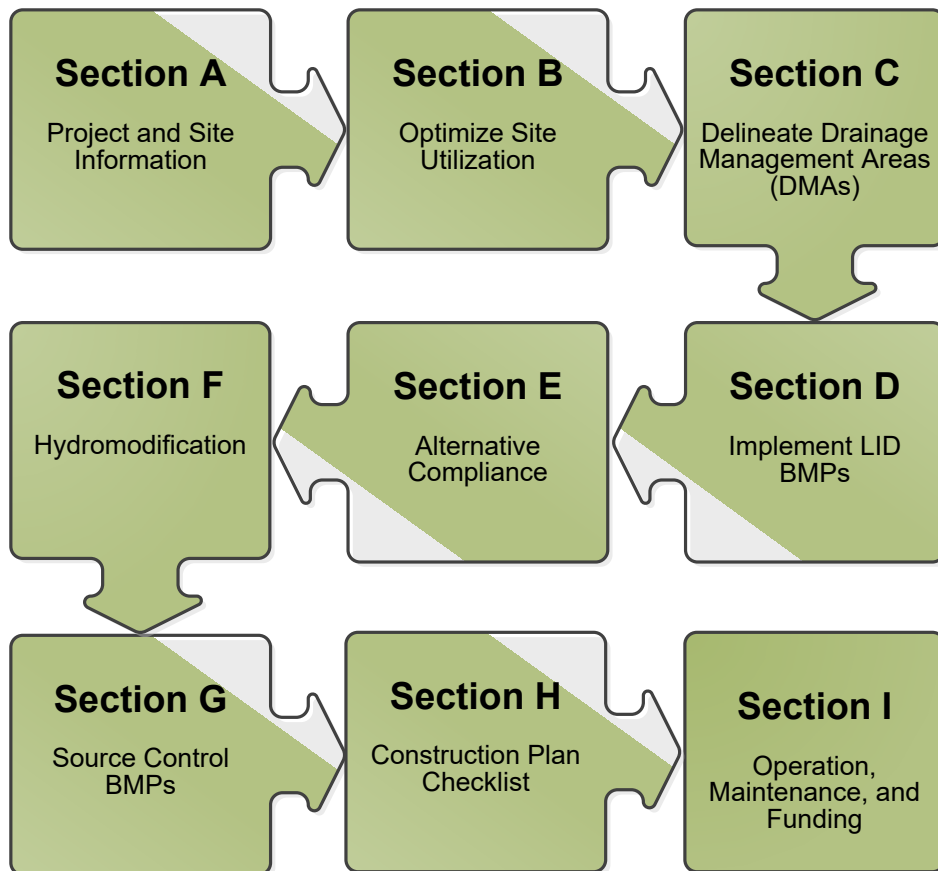
Revision Date(s):

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

Template revised June 30, 2016

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 The Carson Companies by Plotnik & Associates for the Agua Mansa Development project.

This WQMP is intended to comply with the requirements of the City of Jurupa Valley for Ordinance 2012-07 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 the City of Jurupa Valley Water Quality Ordinance (Municipal Code Section 6.05).

"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

Todd L. Burnight
Owner's Printed Name

Date

Sr. Vice 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

Jason E. Kimura
Preparer's Printed Name

2/4/20
Date

Civil Engineer / Project Manager
Preparer's Title/Position

Preparer's Licensure: RCE 42389, QSD 20358

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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Commercial/Industrial
Planning Area:	Insert text here
Community Name:	Insert text here
Development Name:	Insert Planning Area / Community Name/ Development Name, if known
PROJECT LOCATION	
Latitude & Longitude (DMS): 34°01'47.8"N 117°22'34.8"W	
Project Watershed and Sub-Watershed: Insert text here	
Gross Acres: 23.44 Acres	
APN(s): 175-210-032-5, 175-210-034-7 & 175-210-059-0	
Map Book and Page No.: PM 24088, Bk. 177/Pg. 37-41, PM 12104, Bk. 168/Pg. 51-54, Rivino Hts. Bk. 16/Pg. 92	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Comm./Ind./Manuf.
Proposed or Potential SIC Code(s)	4225
Area of Impervious Project Footprint (SF)	612,774
Total Area of <u>proposed</u> Impervious Surfaces within the Project Footprint (SF)/or Replacement	612,774
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 checked="" type="checkbox"/> Y <input 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 s.f.
Is the project located within any MSHCP Criteria Cell?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
If so, identify the Cell number: SU3-Delhi Sands Area	22
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?	0.67'

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
Santa Ana River Reach 4	Pathogens	Water contact recreation, warm freshwater habitat	N/A
Santa Ana River Reach 3	Copper, Lead, Pathogens	Water contact recreation, warm freshwater habitat	N/A
Santa Ana River Reach 2	Indicator Bacteria	Water contact recreation, warm freshwater habitat	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 checked="" type="checkbox"/> Y	<input type="checkbox"/> N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N
Other (<i>please list in the space below as required</i>)	<input type="checkbox"/> Y	<input checked="" 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, site drains to the southwest towards Hall Avenue and into underground storm drain system. Proposed design will follow the same general pattern.

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

No, site is vacant land with no appreciable vegetation or water supply.

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

No, project site is vacant. Two proposed buildings and associated truck maneuvering and parking areas are proposed.

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

Yes, impervious areas were minimized to the extent feasible for this type of warehouse development. Excess land at the north (approx. 6 acres) remains vacant and pervious.

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

Yes, pavement drainage is directed to landscaped areas where possible.

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
DMA1	Roof & Pavement	306,062	D
DMA2	Roof & Pavement	306,712	D
DMA3	Landscape	150,529	D
DMA4	Landscape	19,112	D
DMA5	Landscape	142,169	A
DMA6	Landscape	86,257	A

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)
DMA5	142,169	Landscape	Spray
DMA6	86,257	Landscape	Spray

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)	Storm Depth (inches)	DMA Name / ID	[C] from Table C.4	Required Retention Depth (inches)
		[A]	[B]		= [C]	

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

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]

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

DMA Name or ID	BMP Name or ID
DMA1	Infiltration Basin
DMA2	Underground Infiltration Chambers
DMA3	Infiltration Basin
DMA4	Underground Infiltration Chambers

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: N/A, well is to be abandoned.	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: 398067 s.f. = 9.14 Ac.

Type of Landscaping (Conservation Design or Active Turf): Conservative 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: 612,774 s.f. = 14.1 Ac.

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: 1.16

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: 16.3

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)
16.3 Ac.	9.14 Ac.

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: 40

Project Type: Commercial – warehouse use

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: 14.1 Ac.

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: 190

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: 2,679

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)
2,679	40

Other Non-Potable Use Feasibility

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

N/A

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

Average Daily Demand: N/A

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

Total Area of Impervious Surfaces: N/A

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

Enter the factor from Table 2-4: N/A

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use: N/A

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the 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)
N/A	N/A

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment 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	
DMA1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DMA2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DMA3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DMA4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input 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	Infiltration Basin		
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
	[A]		[B]	[C]	[A] x [C]			
D/DMA1	306,062	Roof/Pavt	1.0	0.892	273,007			
D/DMA3	150,529	Landscape	0.1	0.111	16,709			
	$A_T = \Sigma[A]$ 456,591				$\Sigma = [D]$ 289,716	[E] 0.67	$[F] = \frac{[D] \times [E]}{12}$ 16,176	[G] 17,000

[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	Underground Infiltration Chambers		
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
	[A]		[B]	[C]	[A] x [C]			
D/DMA2	306,712	Roof/Pavt	1.0	0.892	273,587			
D/DMA4	19,112	Landscape	0.1	0.111	2,121			
	$A_T = \Sigma[A]$ 325,824				$\Sigma = [D]$ 275,708	[E] 0.67	$[F] = \frac{[D] \times [E]}{12}$ 15,394	[G] 15,500

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.

List DMAs here.

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 checked="" 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 checked="" 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									
						<i>Design Storm Depth (in)</i> <i>Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)</i> <i>Total Storm Water Credit % Reduction</i> <i>Proposed Volume or Flow on Plans (cubic feet or cfs)</i>			
	$A_T = \sum[A]$				$\sum = [D]$	[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
Kristar Flogard Plus catch basin filter insert.*	Sediment, trash, petroleum, hydrocarbons	80%

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.

*Used for pretreatment.

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.

HCOE 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 HCOE Exemption? Y N

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

Prado Dam

F.2 HCOE Mitigation

If none of the above HCOE Exemption Criteria are applicable, HCOE 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 HCOEs. 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 HCOE analysis.
- b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOE 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. Copermmittee 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
Landscaping - fertilizers & pesticides	Infiltration basin & underground infiltration chambers	Residential information.
Parking lot & truck areas – vehicle drips, oil & grease	Catch basin filters	Residential information, monthly street sweeping.
Trash Enclosures - bacteria	Infiltration basin & underground infiltration chambers	Keep trash bins covered and area clean.

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)
BMP-1	Infiltration basin		
BMP-2	Kristar Flogard Plus catch basin filter insert		
BMP-6	Infiltration chambers		

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.

This section will be completed and addressed at the time of the final WQMP submittal.

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: Insert text here.

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

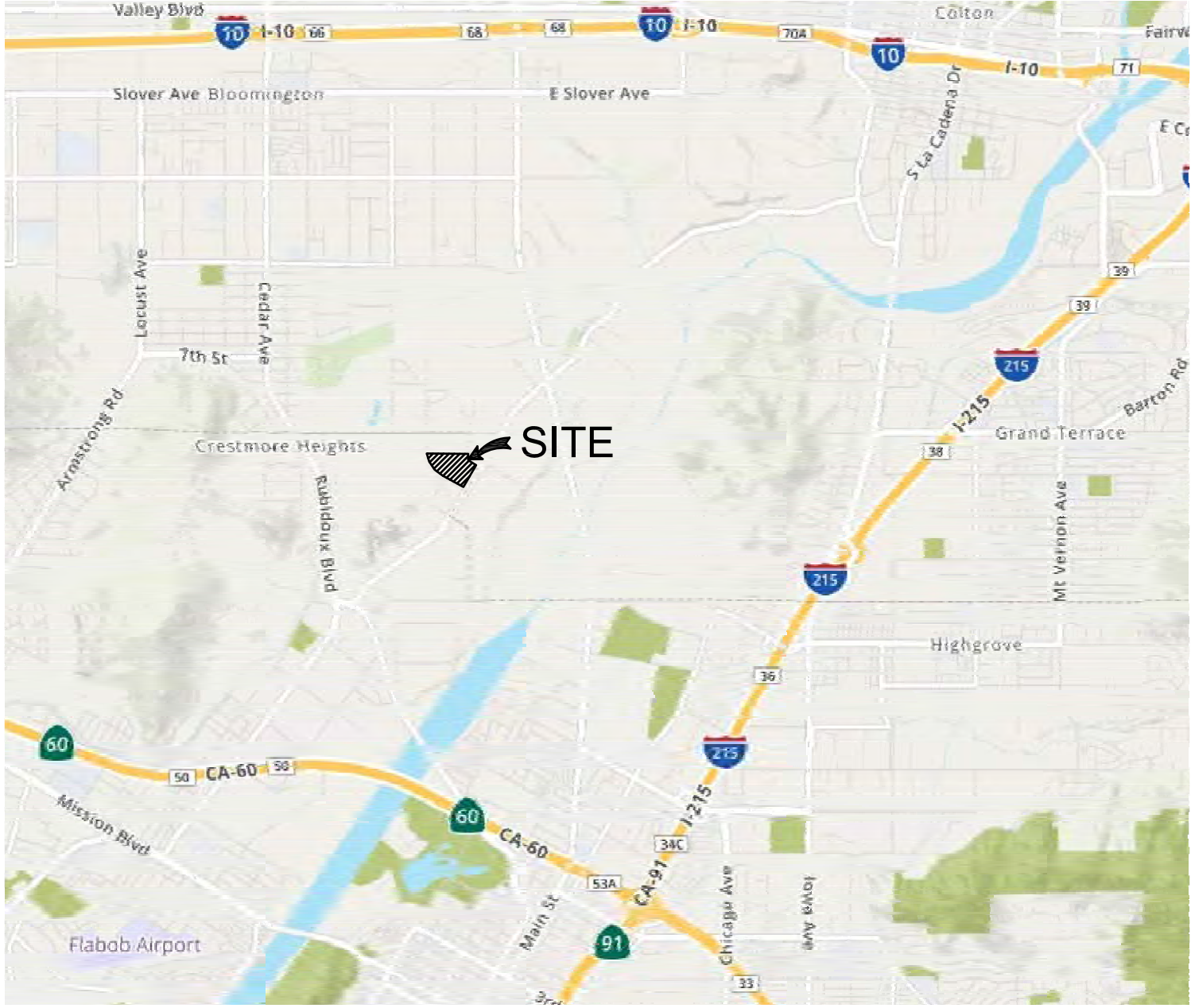
Y N

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.

This section will be completed and addressed at the time of the final WQMP submittal.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map



**Plotnik &
Associates**

18626 S. Wilmington Ave., Suite 100
Rancho Dominguez, California 90220
Tel: (310) 605-6657
Fax: (310) 605-6658
www.plotnik.com

VICINITY MAP
AGUA MANSÁ DEVELOPMENT

SCALE:	1" = 16,000'	DATE:	9/20/18
BY:	JEK	JOB NO.:	450.00

• CIVIL ENGINEERING • LAND SURVEYING



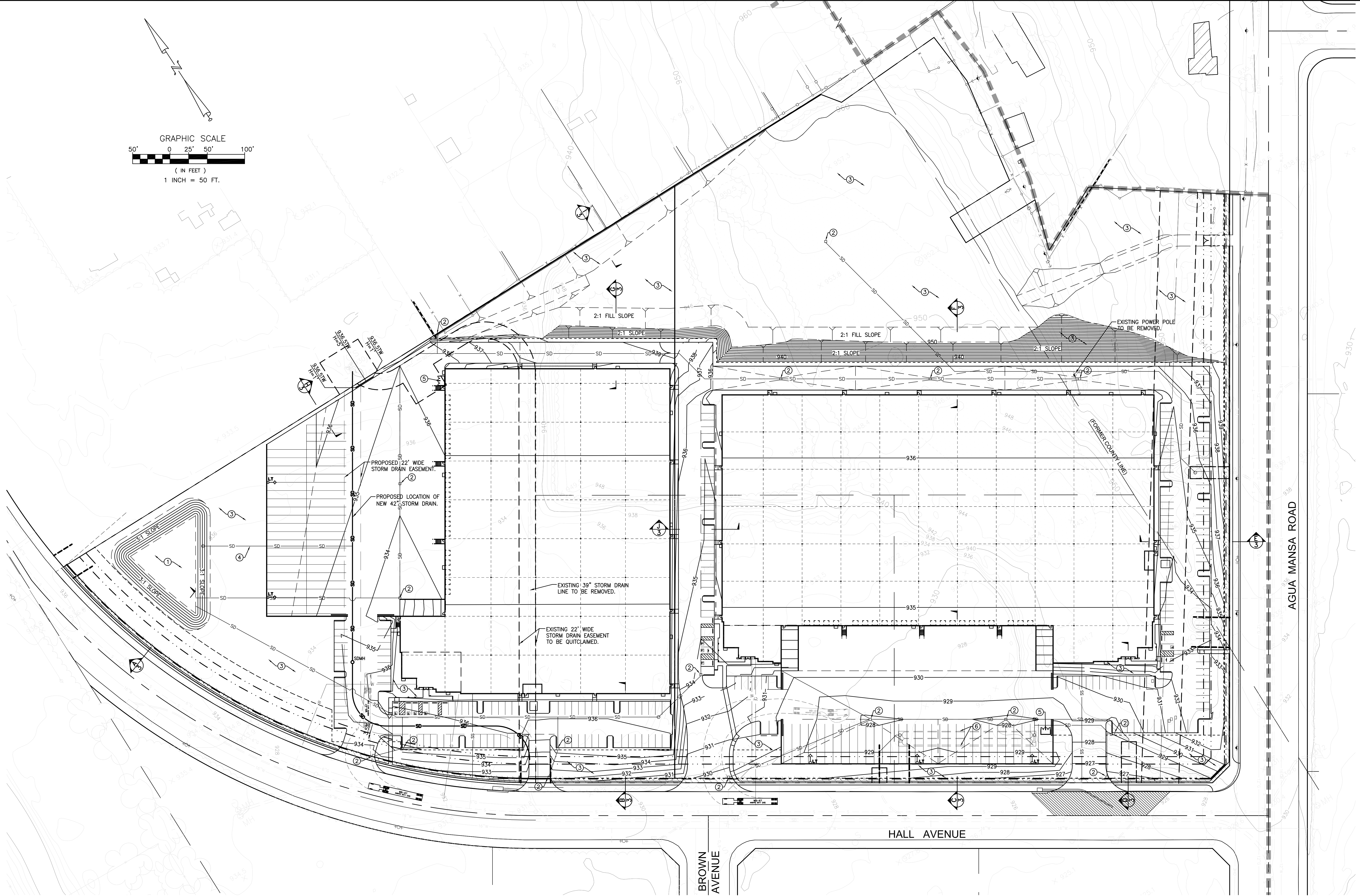
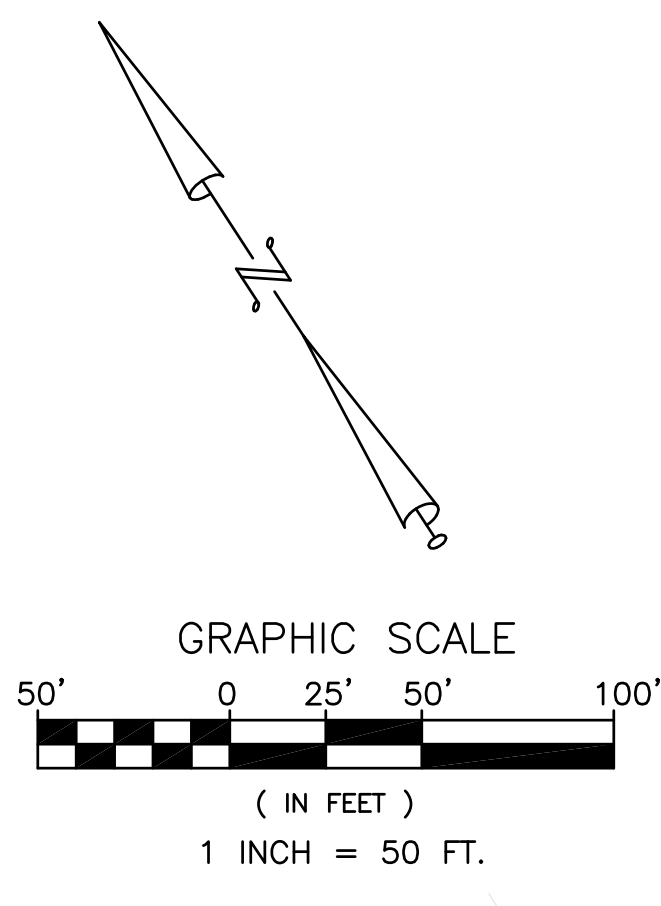
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Fax: (310) 605-6658
www.plotnik.com

RECEIVING WATERS MAP
AGUA MANSA DEVELOPMENT

SCALE: 1" = 16,000'	DATE: 9/20/18
BY: JEK	JOB NO.: 450.00



NO.	DATE	REVISION

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 Rancho Dominguez, California 90220
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POST CONSTRUCTION BMP SITE PLAN
 FOR
AGUA MANSA DEVELOPMENT
 NORTHERLY CORNER OF AGUA MANSA ROAD AND HALL AVENUE
 JURUPA VALLEY, CA 92509

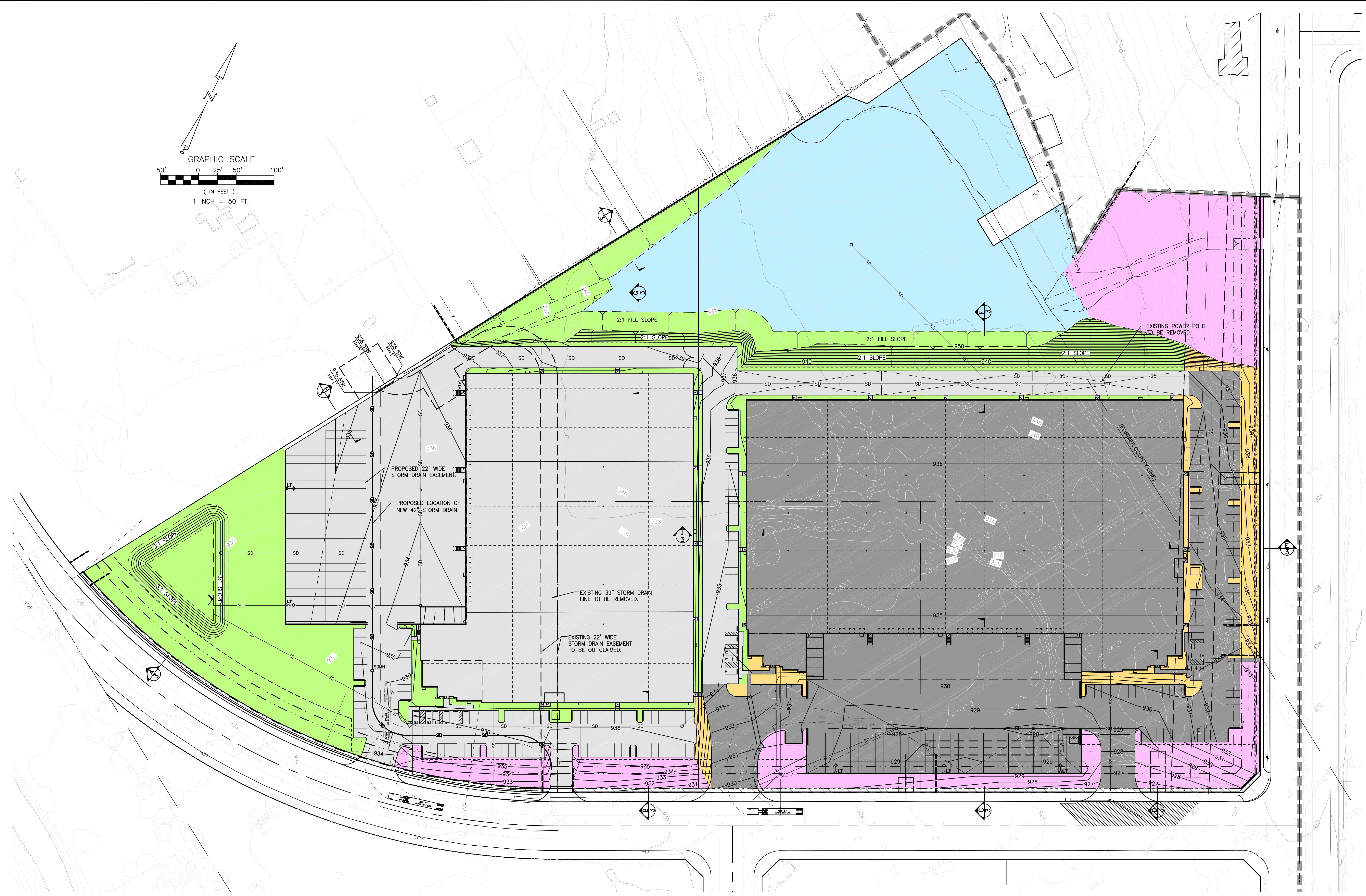
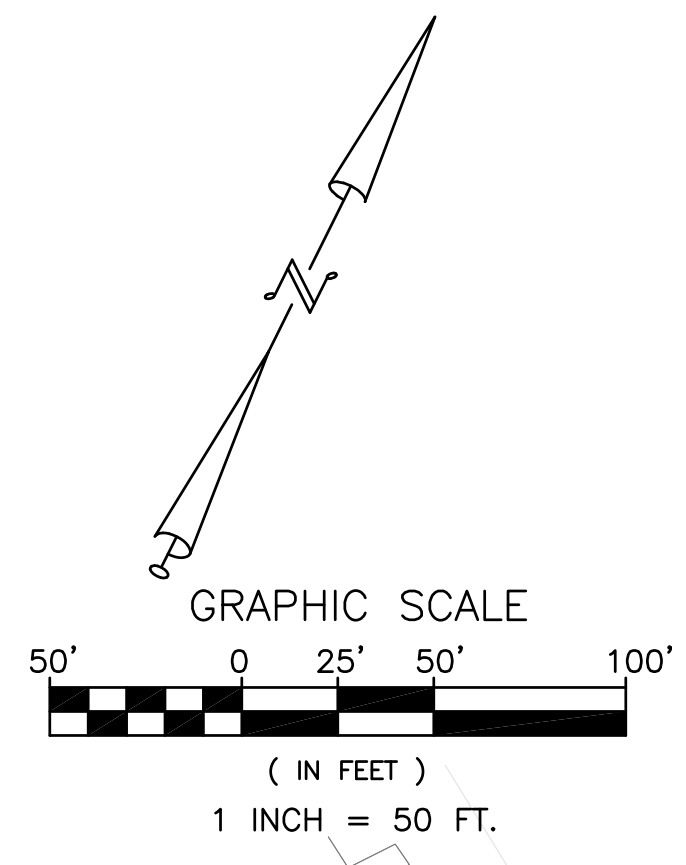
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 CHECKED: PC
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SHEET NO.
1/3
 PROJECT NUMBER
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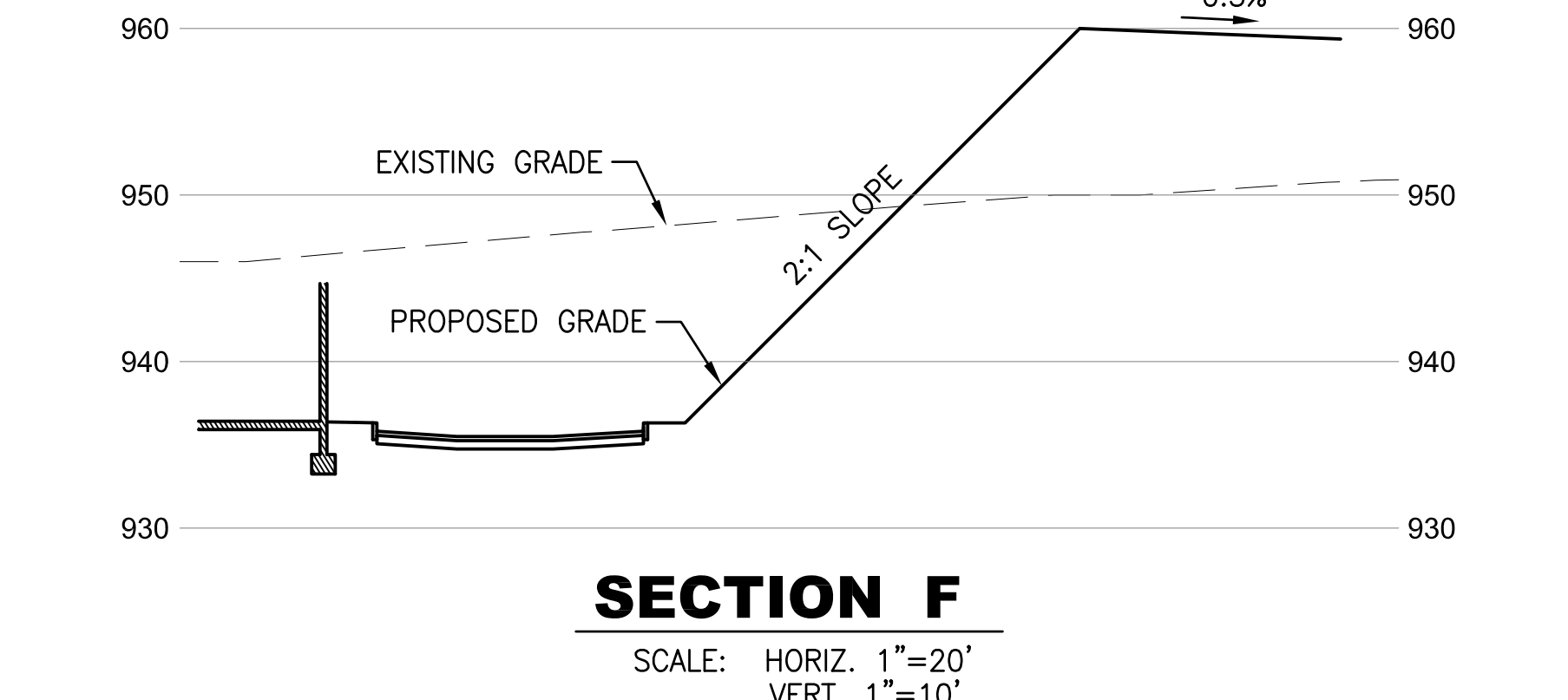
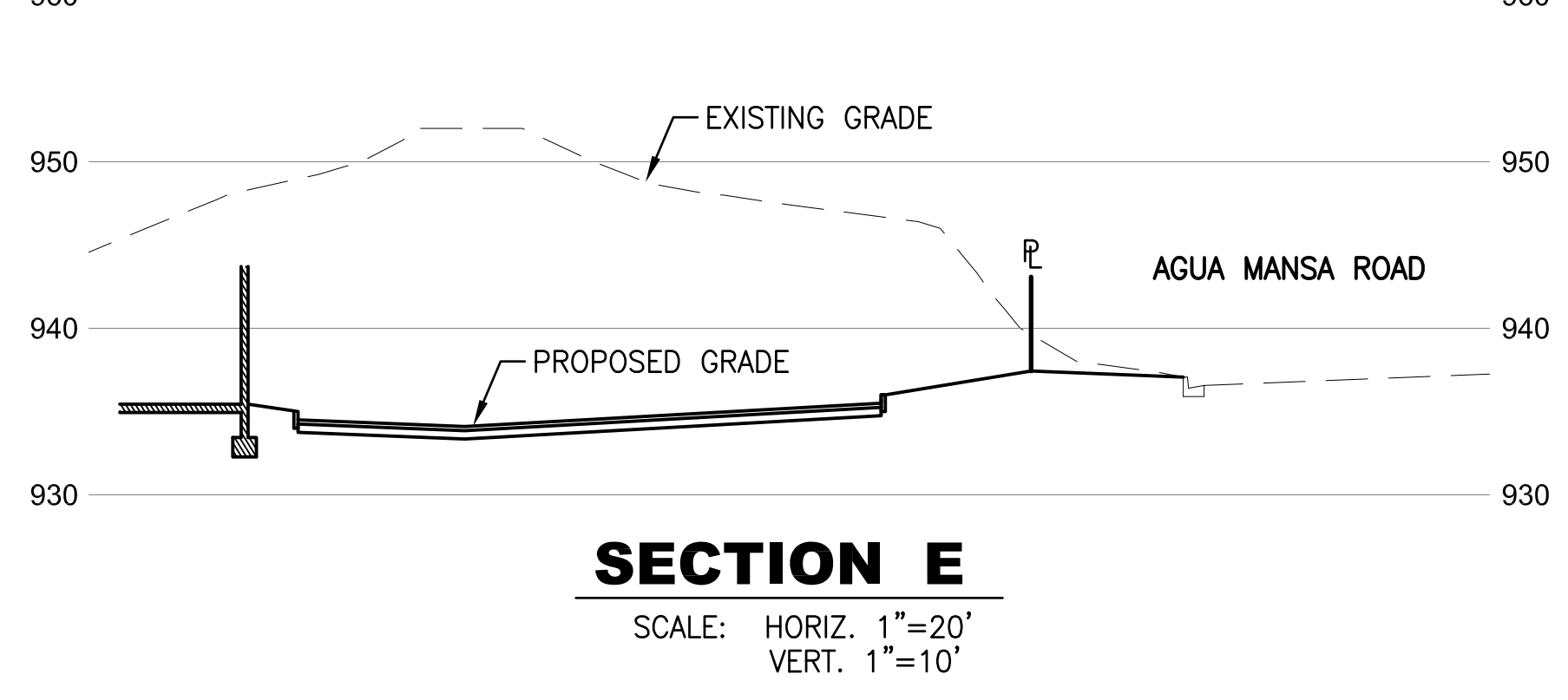
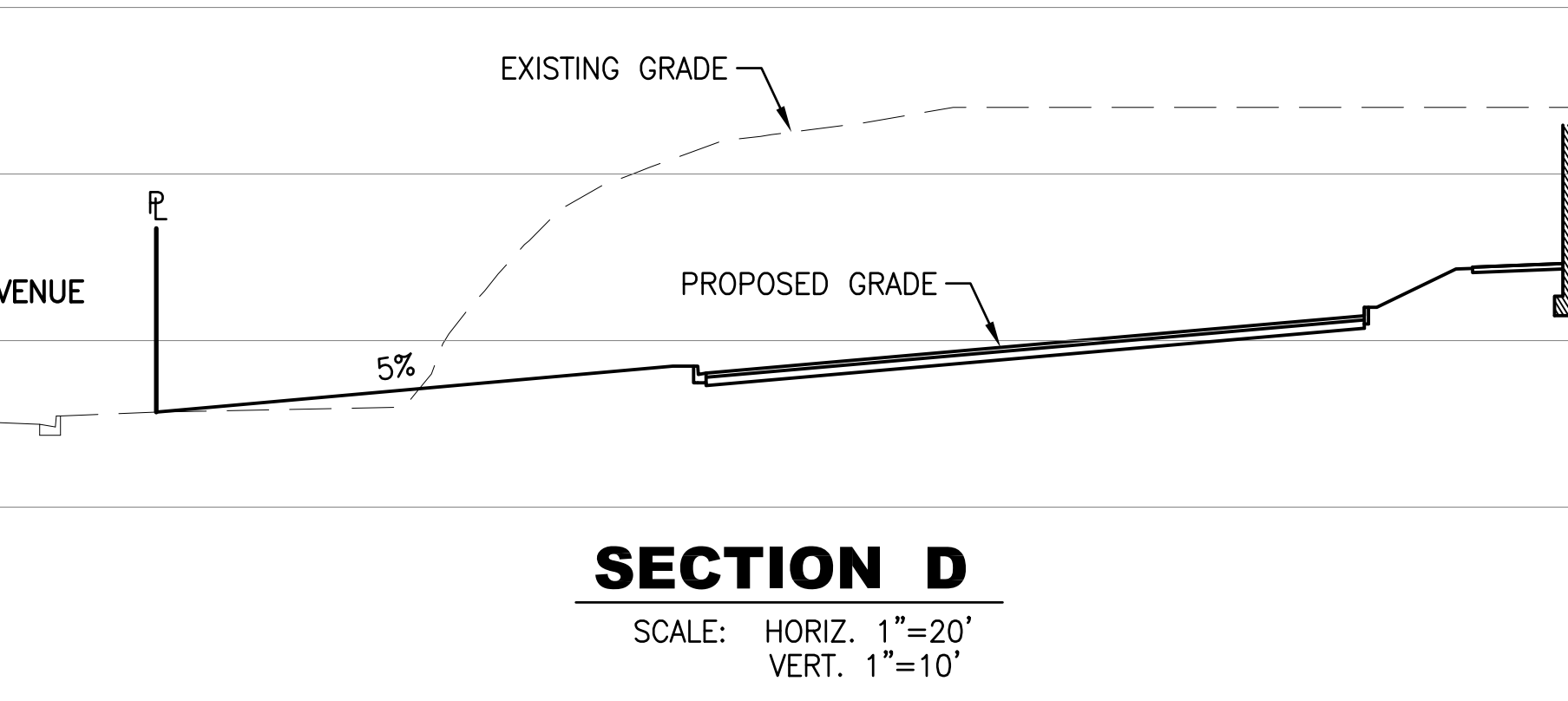
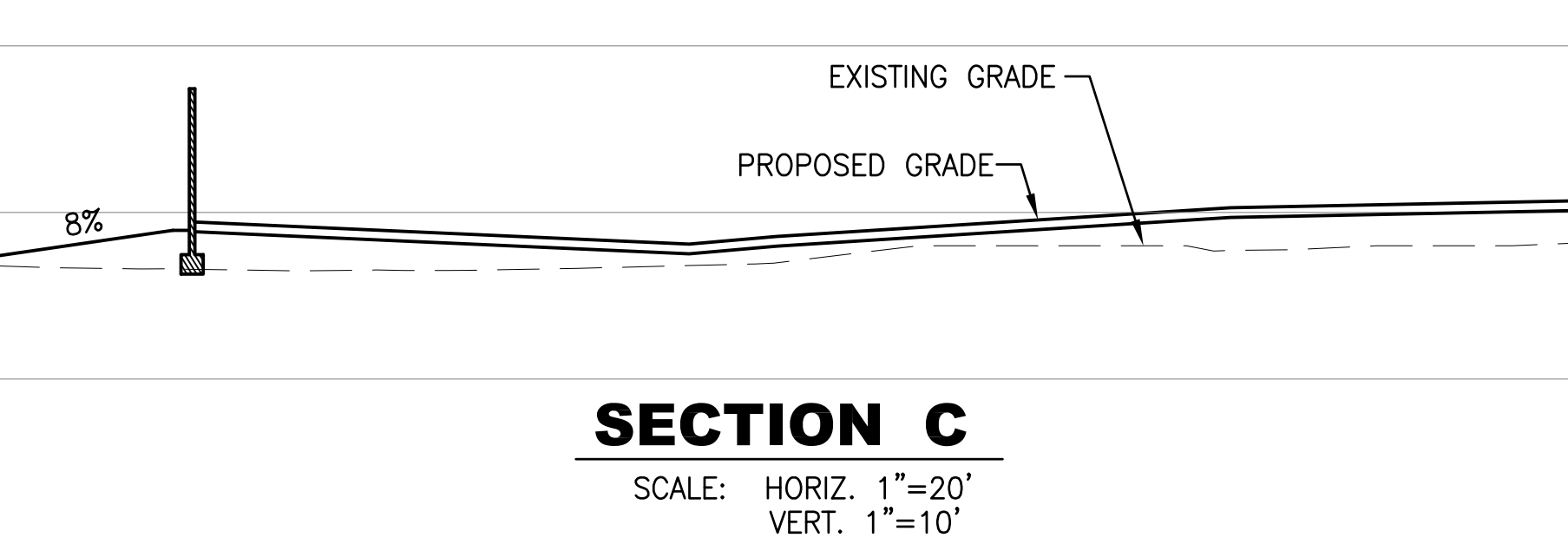
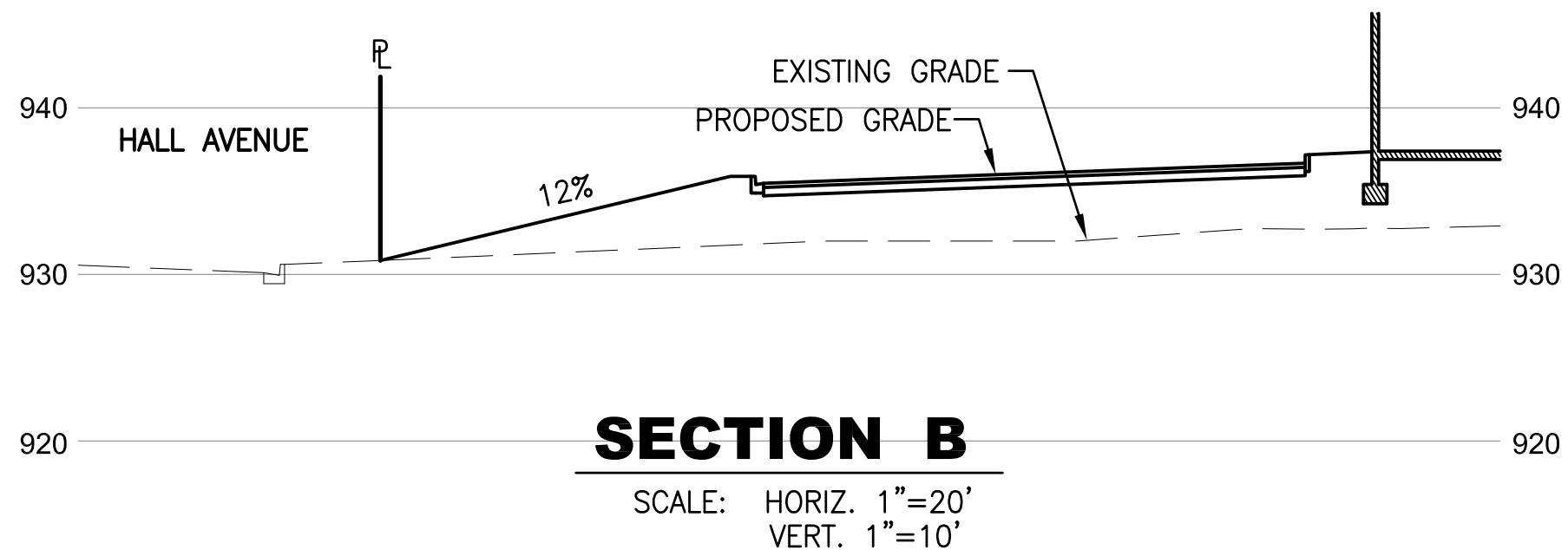
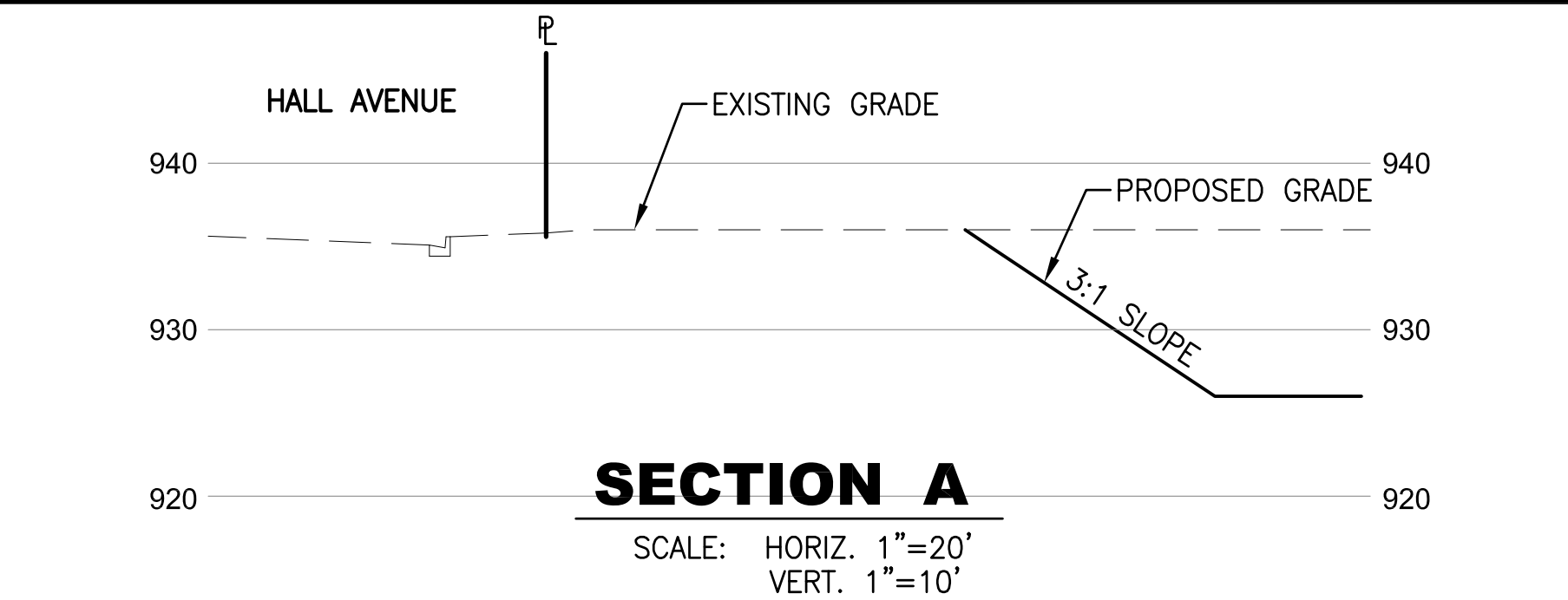
- WQMP NOTES
- NO POINTS OF RUN-ON FROM ADJACENT PROPERTIES.
 - ROOF DRAINS (RD) DISCHARGE ONTO PAVEMENT AND/OR INTO ONSITE STORM DRAINAGE SYSTEM.

- WQMP CONSTRUCTION NOTES
- INFILTRATION BASIN (TC-11).
 - CATCH BASIN WITH KRISTAR FLOGARD PLUS FILTER (PRETREATMENT ONLY) ALL TO BE MARKED "NO DUMPING-DRAINS TO RIVER" OR SIMILAR PER R.O.F.C.D.&W.C.D. (MP-52 & SD-13) SEE DETAILS HEREON.
 - LANDSCAPED AREA, EFFICIENT IRRIGATION, DROUGHT TOLLERANT PLANTING. (SD-10, SD-12, SC-73)
 - INFILTRATION AREA OVERFLOW OUTLET.
 - COVERED TRASH ENCLOSURE AREA. (SD-32)
 - UNDERGROUND H.D.P.E. INFILTRATION CHAMBERS.



DRAINAGE MANAGEMENT AREA (DMA) TABLE			
DMA ID	SURFACE TYPE	AREA (S.F.)	DMA TYPE
DMA1	ROOF/PAVEMENT	306,062	TYPE D - DRAINING TO BMP
DMA2	ROOF/PAVEMENT	306,712	TYPE D - DRAINING TO BMP
DMA3	LANDSCAPE	150,529	TYPE D - DRAINING TO BMP
DMA4	LANDSCAPE	19,112	TYPE D - DRAINING TO BMP
DMA5	LANDSCAPE	142,169	TYPE A - DRAINING TO STORM DRAIN
DMA6	LANDSCAPE	86,257	TYPE A - DRAINING TO STREET
TOTAL		1,010,841	

NO.	DATE	REVISION	<p>Plotnik & Associates</p> <p>1826 S. Wilmington Ave. Suite 100 Rancho Dominguez, California 90220 Tel: (310) 606-6657 Fax: (310) 606-6657 www.plotnik.com</p> <p>• CIVIL ENGINEERING • LAND SURVEYING</p>
<p>POST CONSTRUCTION BMP SITE PLAN</p> <p>FOR</p> <p>AGUA MANSA DEVELOPMENT</p> <p>NORTHERLY CORNER OF AGUA MANSA ROAD AND HALL AVENUE JURUPA VALLEY, CA 92509</p>			
<p>PROFESSIONAL STAMP</p>			
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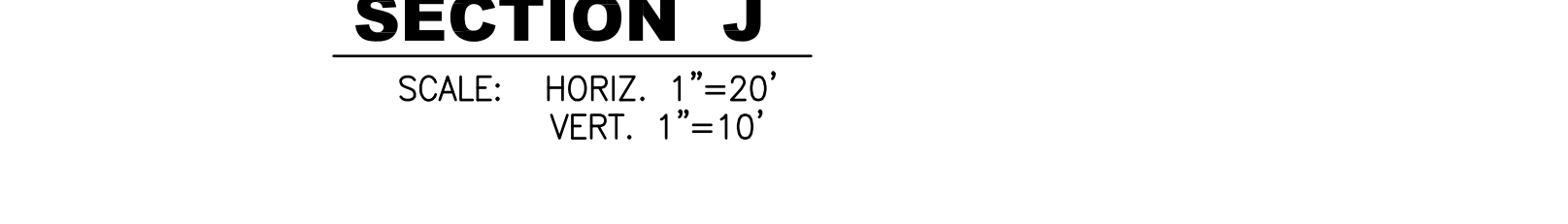
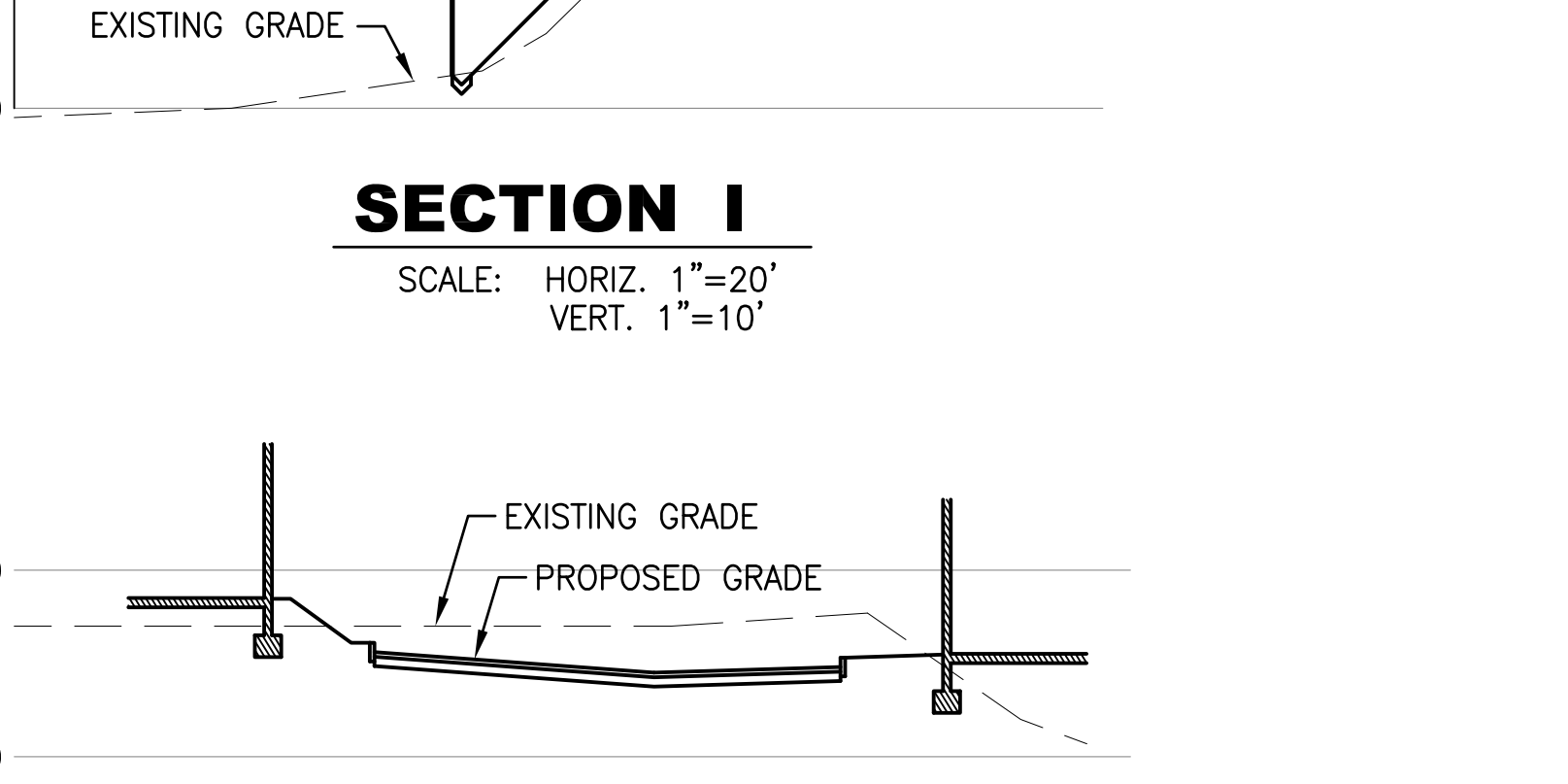
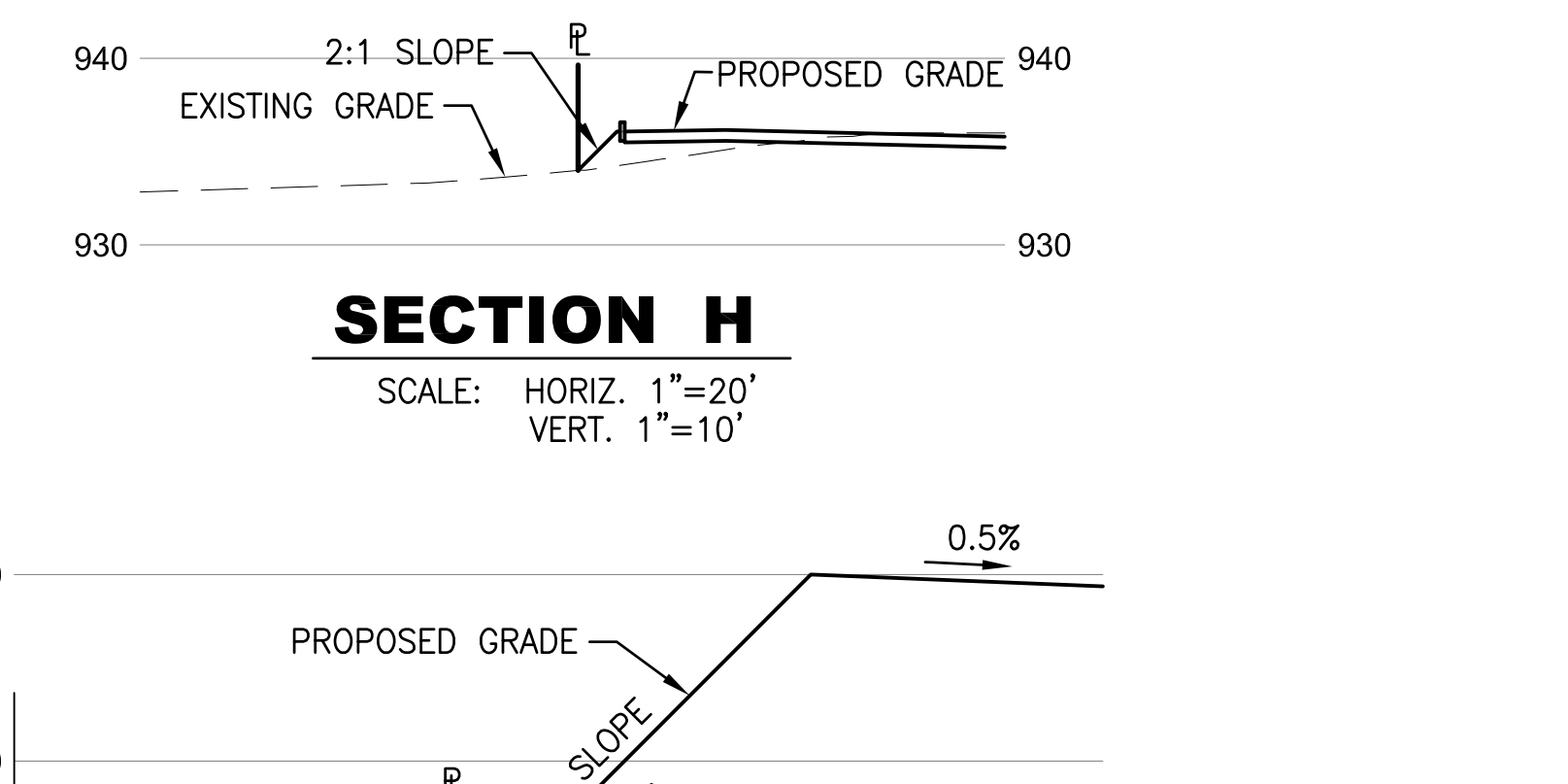
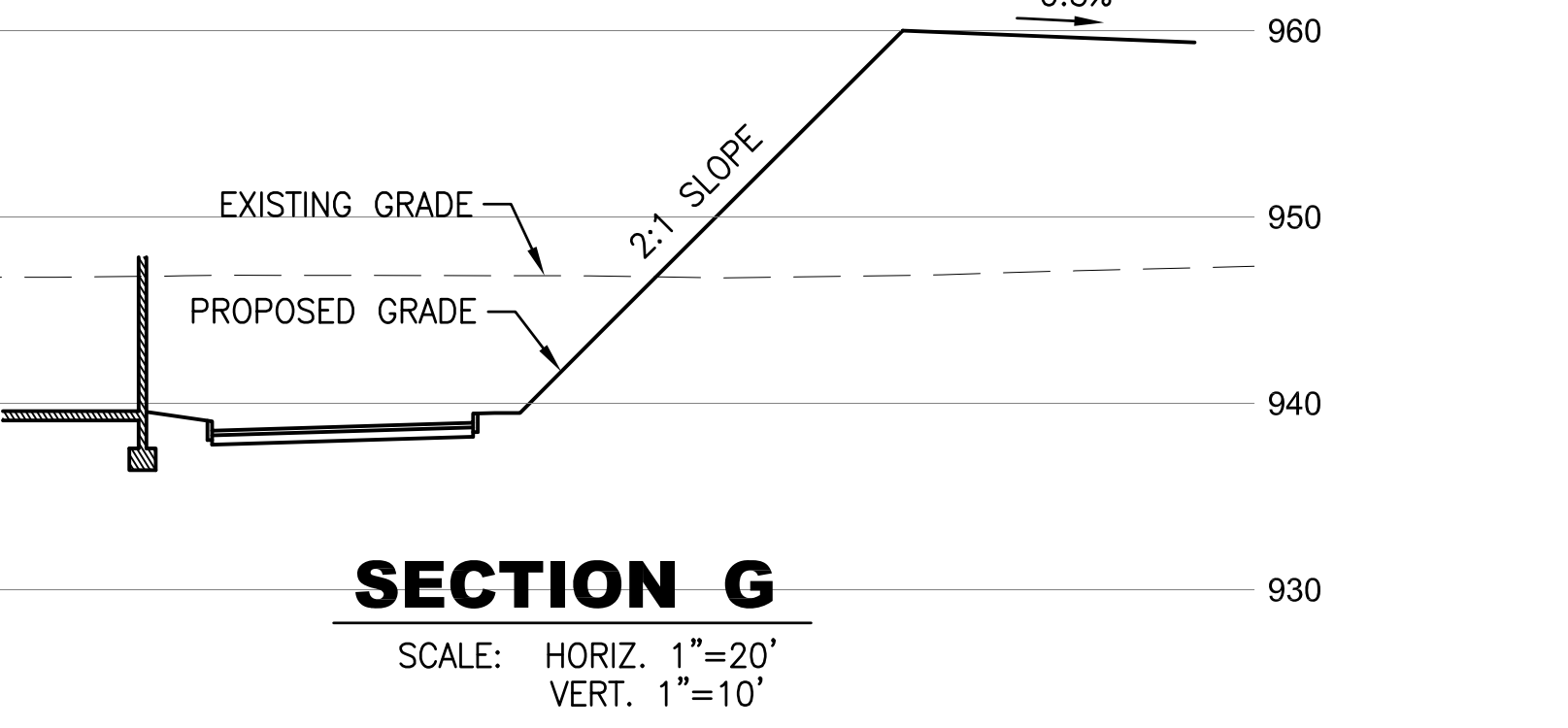
StormTech MC-4500 CHAMBER

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

STORMTECH MC-4500 CHAMBER (not to scale)	STORMTECH MC-4500 END CAP (not to scale)
Nominal Chamber Specifications	Nominal End Cap Specifications
Size (L x W x H) 52" x 100" x 60" 1,321 mm x 2,540 mm x 1,524 mm	Size (L x W x H) 35.1" x 90.2" x 59.4" 891 mm x 2,291 mm x 1,509 mm
Chamber Storage 106.5 ft ³ (3.01 m ³)	End Cap Storage 35.7 ft ³ (1.01 m ³)
Min. Installed Storage* 162.6 ft ³ (4.60 m ³)	Min. Installed Storage* 108.7 ft ³ (3.06 m ³)
Weight 120 lbs (54.4 kg)	Weight 120 lbs (54.4 kg)
Shipping 7 chambers/pallet 11 pallets/truck	Shipping 7 end caps/pallet 11 pallets/truck

*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below chambers, end caps and 40% stone porosity.

*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below, 6" (150 mm) of stone perimeter, 9" (230 mm) of stone between chambers, end caps and 40% stone porosity.



FloGard + Plus® Catch Basin Insert Filter

Removes pollutants from runoff at the source

FloGard + Plus is a catch basin insert filter designed to remove sediment, gross solids, trash, and petroleum hydrocarbons from stormwater runoff. FloGard + Plus is ideally suited for removal of primary pollutants from paved surfaces in commercial and residential areas. Rated filter flow capacities are designed to exceed the required "first flush" treatment flow rate, and the unique dual-bypass design typically exceeds catch basin inlet capacity.

Economical Treatment
Quick, easy, and cost-effective to install, inspect, and maintain.

Efficient Performance
Removes pollutants at the inlet where they are easiest to catch.

Versatile Applications
Appropriate and easy to use on new construction or retrofit projects.

Flexible Design
Available in a wide variety of sizes and configurations, including custom options.

Durable Construction
Built to last and withstand the loads from captured pollutants.

Environmentally Friendly
No standing water minimizes vector, bacteria, and odor problems.

Proven Performance
Field and laboratory tested with up to 86% removal of TSS and 80% removal of oils and grease.

How it Works:
Flows entering the unit pass through the filter liner basket for removal of sediment, trash, and debris. Optional Fossil Rock™ sorbent pouches installed in the basket effect hydrocarbon capture. As the storm flow exceeds the treatment flow rate, treatment will continue and excess flows will pass through the dual-bypass openings near the top of the unit.

FloGard + Plus Catch Basin Insert Filter

Catch basin insert designed to capture sediment, gross solids, trash, and petroleum hydrocarbons from low (first flush) flows, even during the most extreme weather conditions.

Example Types, Sizes, and Capacities
Additional sizes, including regional and custom options are available.

FloGard Combination Inlet					
STANDARD DEPTH	STANDARD & SHALLOW DEPTH		STANDARD DEPTH		SHALLOW DEPTH
	INLET ID (IN)	GRATE SIZE (IN)	TOTAL BYPASS CAPACITY (GPM)	FILTERED FLOW CAPACITY (GPM)	
FSP-165SDGD	16 X 20	16 X 20	7.0	2.5	1.7
FSP-185SDGD	18 X 24	18 X 24	8.0	2.8	1.8
FSP-245SDGD	24 X 30	24 X 30	8.1	2.8	2.1
FSP-245FDGD	24 X 30	24 X 30	8.0	3.4	2.0

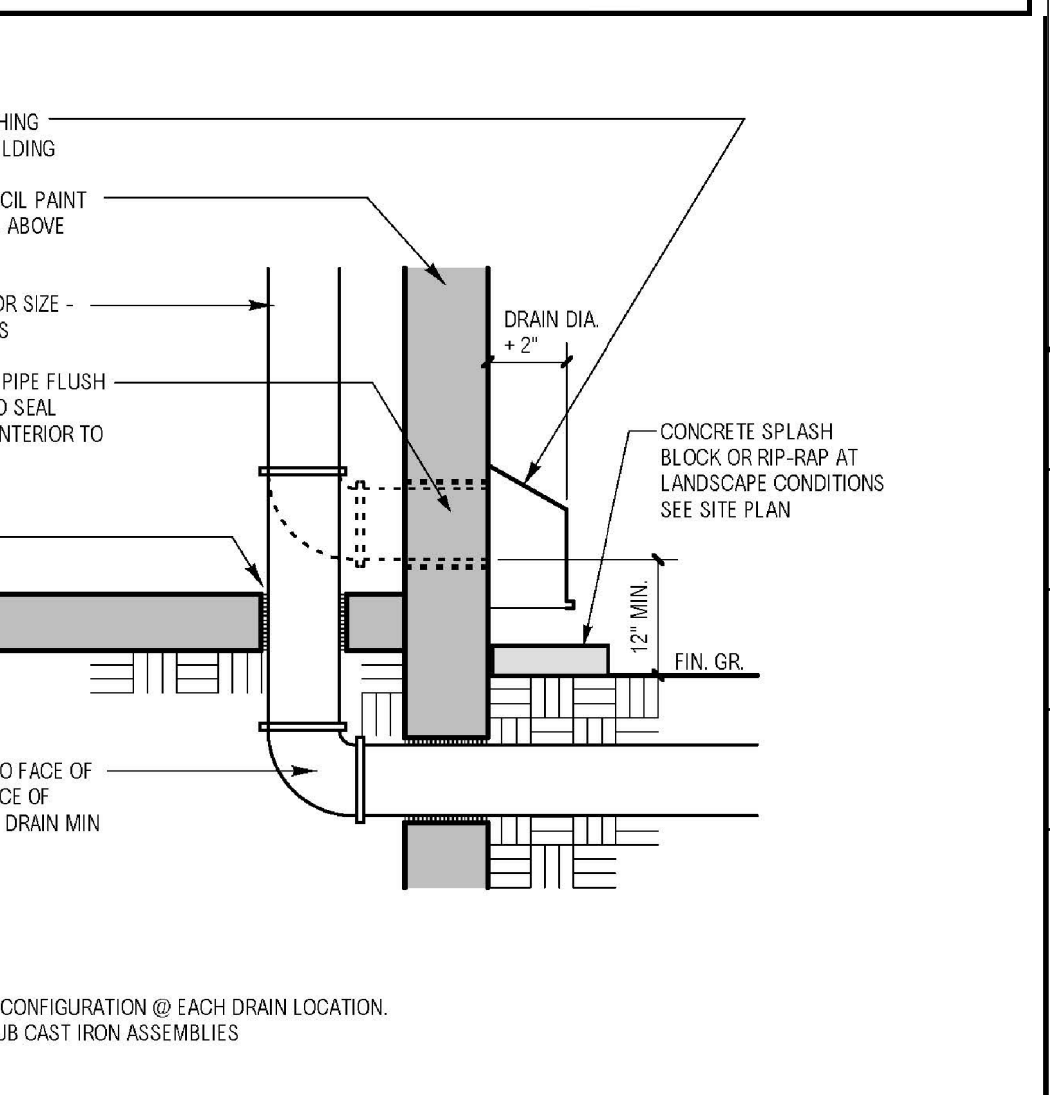
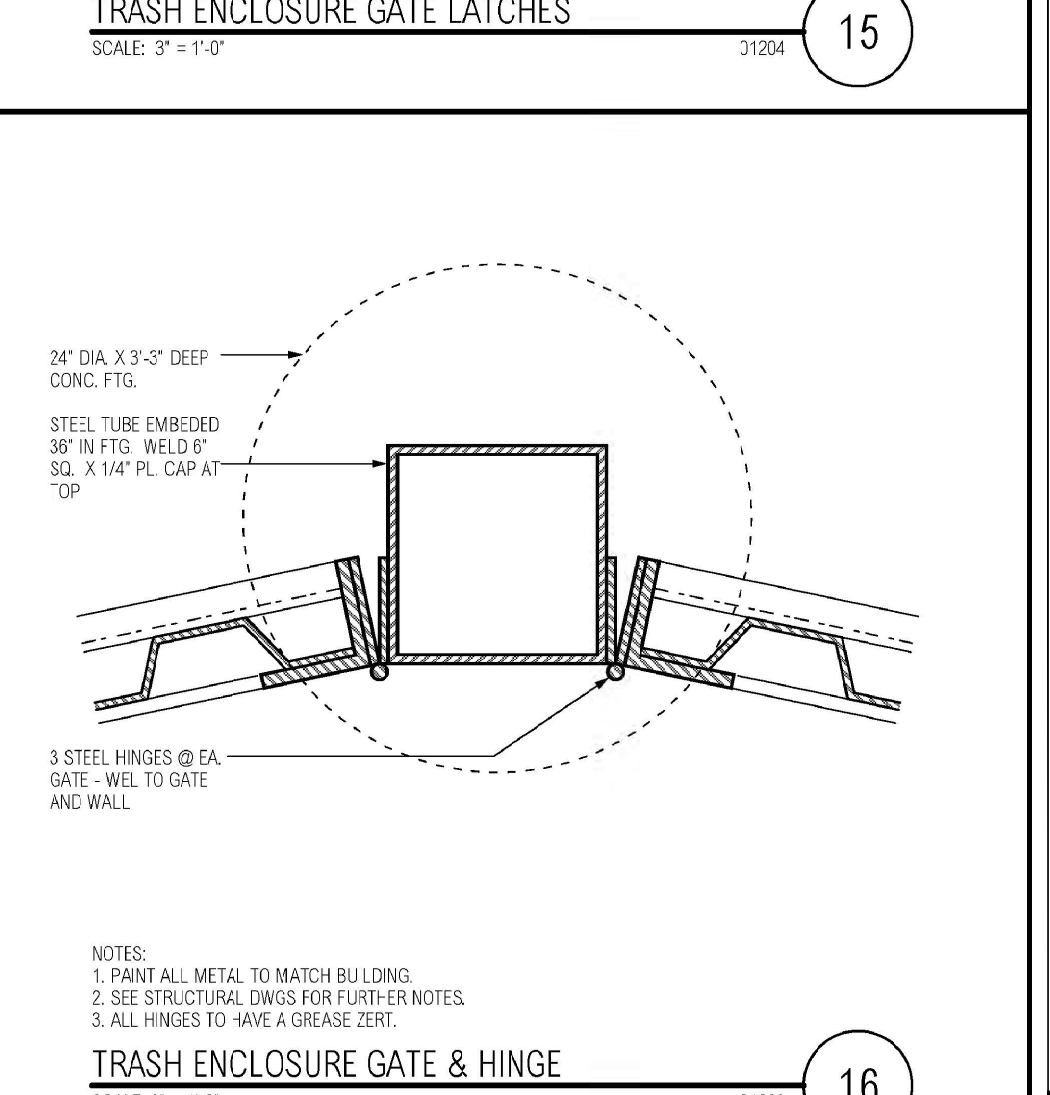
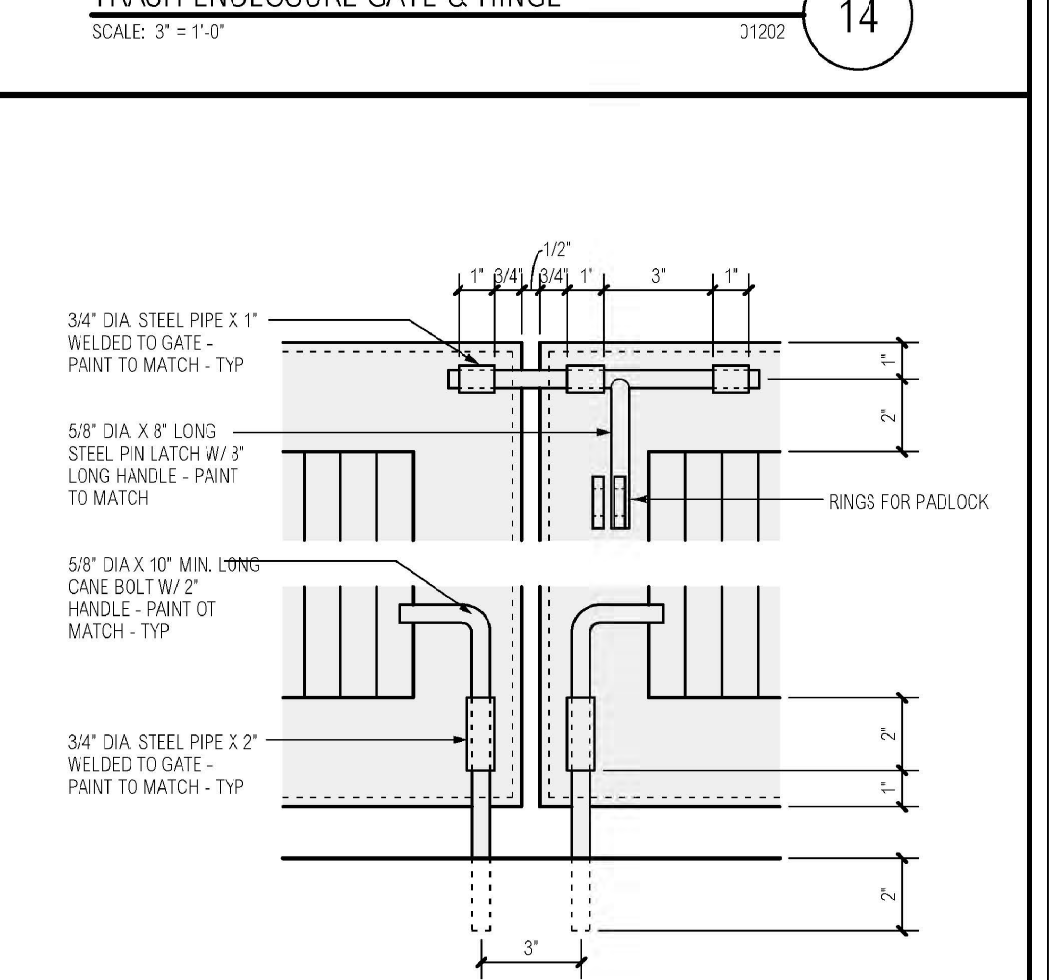
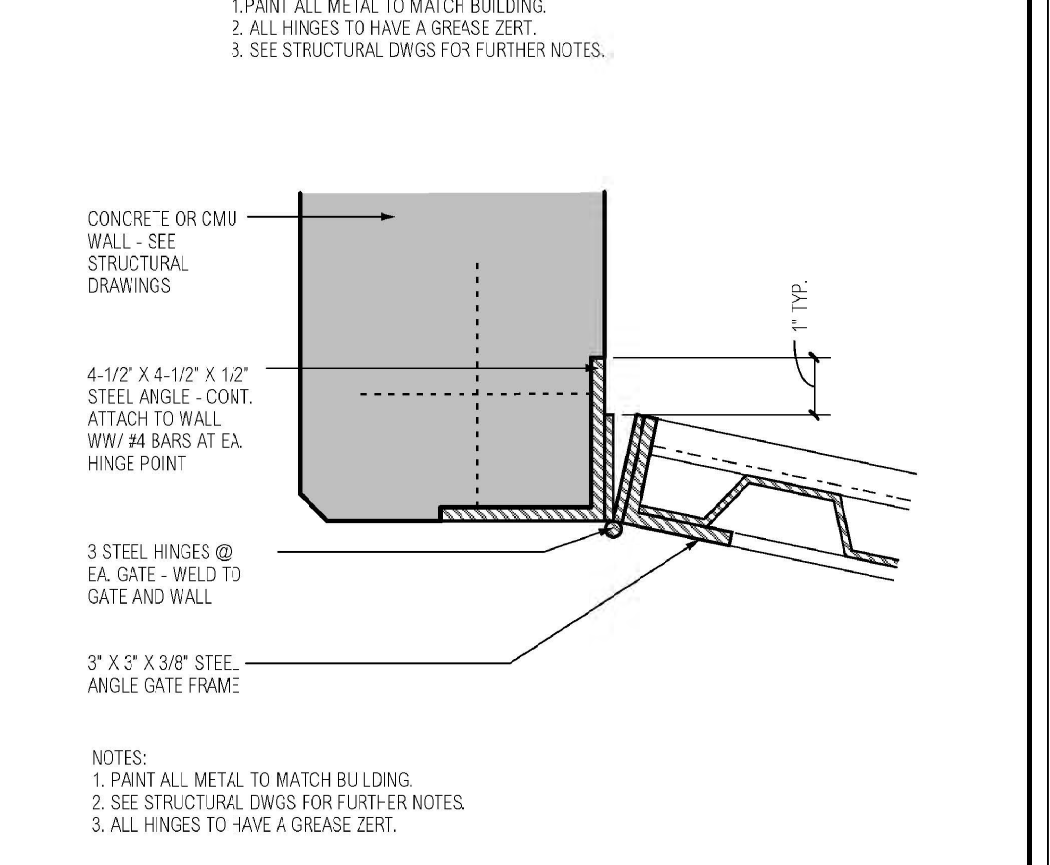
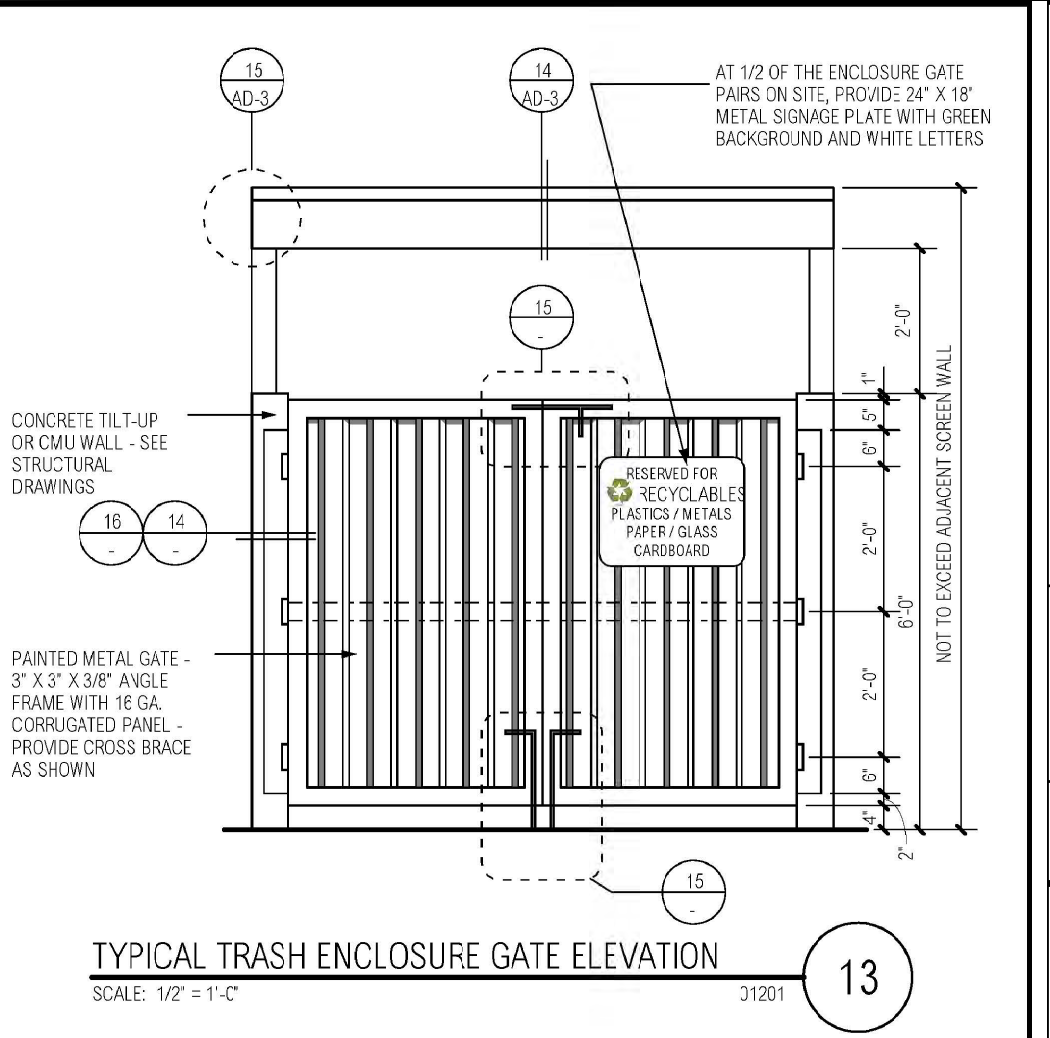
FloGard Flat Grated Inlet					
STANDARD DEPTH	STANDARD & SHALLOW DEPTH		STANDARD DEPTH		SHALLOW DEPTH
	INLET ID (IN)	GRATE SIZE (IN)	TOTAL BYPASS CAPACITY (GPM)	FILTERED FLOW CAPACITY (GPM)	
FSP-16F	16 X 12	16 X 12	4.7	0.8	0.4
FSP-18F	18 X 18	18 X 18	4.7	0.8	0.7
FSP-185F	18 X 20	18 X 20	6.0	2.3	1.6
FSP-21F	20 X 22	22 X 24	6.1	2.3	1.5
FSP-24F	24 X 24	24 X 27	6.1	2.2	1.5
FSP-245F	24 X 30	24 X 40	8.0	3.4	2.0
FSP-245FF	24 X 40	24 X 40	8.0	3.4	2.0
FSP-245FN	24 X 24	24 X 30	6.0	2.2	1.5
FSP-30F	30 X 30	30 X 36	8.1	3.6	2.0
FSP-305F	30 X 30	30 X 36	8.1	3.6	2.0
FSP-305FN	30 X 30	30 X 36	8.1	3.6	2.0
FSP-305FF	30 X 30	30 X 36	8.1	3.6	2.0
FSP-305F2P	30 X 30	30 X 36	11.5	6.8	3.2
FSP-48F	48 X 48	48 X 54	13.2	6.5	3.8
FSP-485F	48 X 24	48 X 36	8.0	2.3	1.6
FSP-225F	22 X 34	24 X 36	8.0	3.4	2.0

FloGard Circular Grated Inlet				
MODEL NUMBER	SPECIFIER CHART		TOTAL BYPASS CAPACITY (GFS)	TOTAL BYPASS CAPACITY (GFS)
	INLET ID (IN)	GRATE SIZE (IN)		
FSP-10F	10	10	0.3	0.4
FSP-12F	12	12	0.5	0.7
FSP-15F	15	15	0.8	1.1
FSP-18F	18	18	1.2	1.7
FSP-21F	21	21	1.6	2.3
FSP-24F	24	24	2.1	3.0
FSP-27F	27	27	2.7	3.8
FSP-30F	30	30	3.4	4.7
FSP-36F	36	36	5.1	7.0
FSP-42F	42	42	7.0	9.7
FSP-48F	48	48	9.0	12.4
FSP-54F	54	54	11.1	15.1
FSP-60F	60	60	13.2	17.8
FSP-72F	72	72	18.3	24.4
FSP-84F	84	84	23.4	31.0
FSP-96F	96	96	28.5	37.6

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Fax: (310) 606-9657
www.plotnik.com

PA Associates
• CIVIL ENGINEERING • LAND SURVEYING

SITE BMP DETAILS AND SECTIONS FOR AGUA MANSA DEVELOPMENT
NORTHERLY CORNER OF AGUA MANSA ROAD AND HALL AVENUE
JURUPA VALLEY, CA 92509

NO.	DATE	REVISION

PROFESSIONAL STAMP

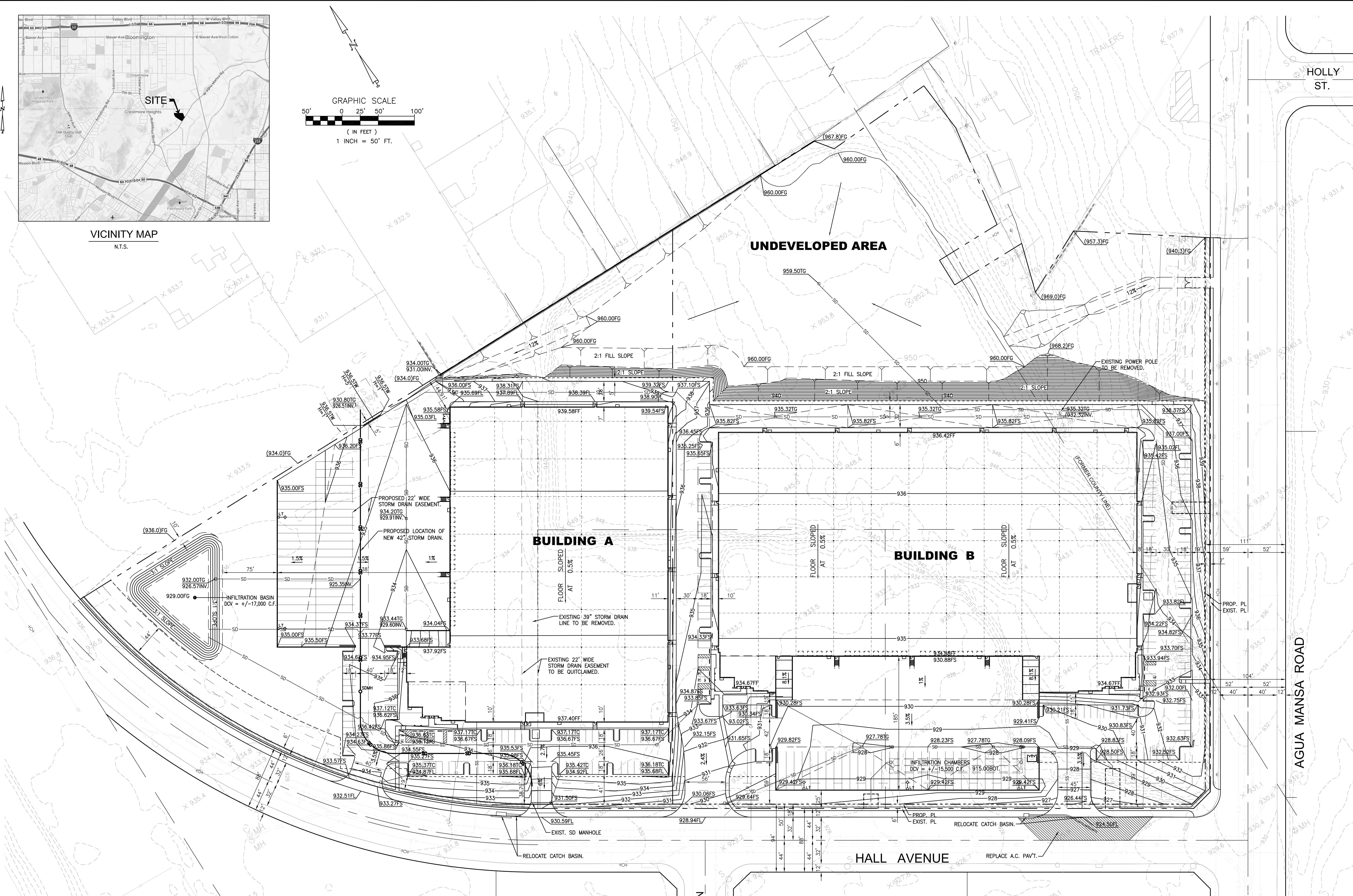
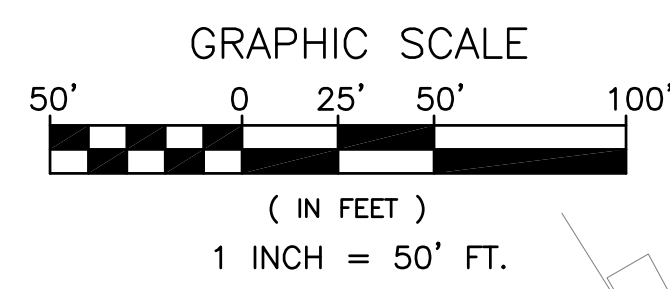
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CHECKED: PC
DATE: 11/13/19
SCALE: N/A
SHEET NO. 3/3
PROJECT NUMBER 477.00

Appendix 2: Construction Plans

Grading and Drainage Plans



VICINITY MAP
N.T.S.



OWNER:
CARSON-VA INDUSTRIAL II, LP
100 BAYVIEW CIRCLE, SUITE 3500
NEWPORT BEACH, CA 92660
TEL: (949) 725-6500
FAX: (949) 725-6550

APPLICANT:
CARSON COMPANIES
100 BAYVIEW CIRCLE, SUITE 3500
NEWPORT BEACH, CA 92660
ATTN: BOB ALLEBORN
TEL: (949) 725-6500
FAX: (949) 725-6550

LEGEND

- - - - - EXISTING CONTOUR
- - - - - PROPOSED CONTOUR
- FS FINISHED SURFACE
- FL FLOW LINE
- FG FINISHED GRADE
- TG TOP OF GRATE
- TOP OF SLOPE
- TOE OF SLOPE
- SD- PROPOSED STORM DRAIN
- - - - - PROPERTY LINE

CONCEPTUAL EARTHWORK QUANTITIES

	BUILDING A	BUILDING B	BASIN	UNDEV. AREA
CUT	14,700	130,000	2,500	-
FILL	18,700	7,800	-	20,000
IMPORT	4,000	-	-	20,000
EXPORT	-	122,200	2,500	-

NET EXPORT = 100,700 C.Y.
NOTE: QUANTITIES DO NOT INCLUDE SHRINKAGE
SUBSIDENCE, REMOVAL AND RECOMPACTION,
FOOTING OR UTILITY SPOILS.

REVISION

NO.	DATE	DESCRIPTION

18008 S. Wilmington Ave., Suite 100
Rancho Dominguez, CA 92650
Tel: (949) 725-6500
Fax: (949) 725-6550
www.carson.com

Plotnik & Associates
PA
CIVIL ENGINEERING - LAND SURVEYING

**AGUA MANSO ROAD
CASE NO. MA 18008
CITY OF JURUPA VALLEY, CA**

CONCEPTUAL GRADING & DRAINAGE PLAN

PROFESSIONAL STAMP

DRAWN: JEK
CHECKED: PC
DATE: 2/3/20
SCALE: 1" = 50'
SHEET NO. 1/1
PROJECT NUMBER 450.00

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

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

September 6, 2018

Project Number 16800-13

The Carson Companies
100 Bayview Circle
Newport Beach, California 92660

Attn: Dan Darnell

RE: **Supplemental Soil Infiltration Study** - Proposed Office/Warehouse Development - Located at the Northwest Corner of Agua Mansa Road and Hall Avenue, in the County of Riverside, California

Dear Mr. Darnell:

As requested, supplemental infiltration testing has been completed to further assess the site for stormwater capture/infiltration systems. Three additional test sites and depths were selected by Plotnik & Associates and supplement the earlier tests as detailed in our report dated May 21, 2013. Logs of the additional test pits are included in Appendix A.

1.0 INFILTRATION TESTING

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

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

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

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

For the inner ring calculated as follows:

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

where:

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

ΔV_{ir} = volume of water used during time interval to maintain constant head in the inner ring, cm³

A_{ir} = internal area of the inner ring, cm²

Δt = time interval, hr

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

The use of on-site disposal system by means of retention/infiltration basins appears to be geotechnically feasible for future development. The field infiltration rates given below may be utilized in the final basin design with a safety factor of 2.0 or greater.

<u>Test No.*</u>	<u>Depth (feet bgs)</u>	<u>Soil Type</u>	<u>Infiltration Rate</u>	
			<u>(cm/hr)</u>	<u>(in/hr)</u>
IT-3	10.0	silty Sand	74	30
IT-4	10.0	silty Sand	49	20
IT-5	12.0	silty Sand	81	32

* Results for tests IT-1 and IT-2 included in previous report dated May 21, 2013.

Soils in all excavations at test elevations consisted of a medium dense silty Sand. It is our opinion that the soils in test excavations IT-3 to IT-5 are suitable for infiltration without increasing the potential of settlement of proposed and existing structures or adversely affecting retaining/basement walls located either on or adjacent to the subject site. In addition, the potential for hydro-consolidation and the susceptibility for any ground settlements are considered low. All systems shall meet the California Regional Water Quality Control Board (CRWQCB) requirements.

2.0 CLOSURE

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

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

NorCal Engineering

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

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

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

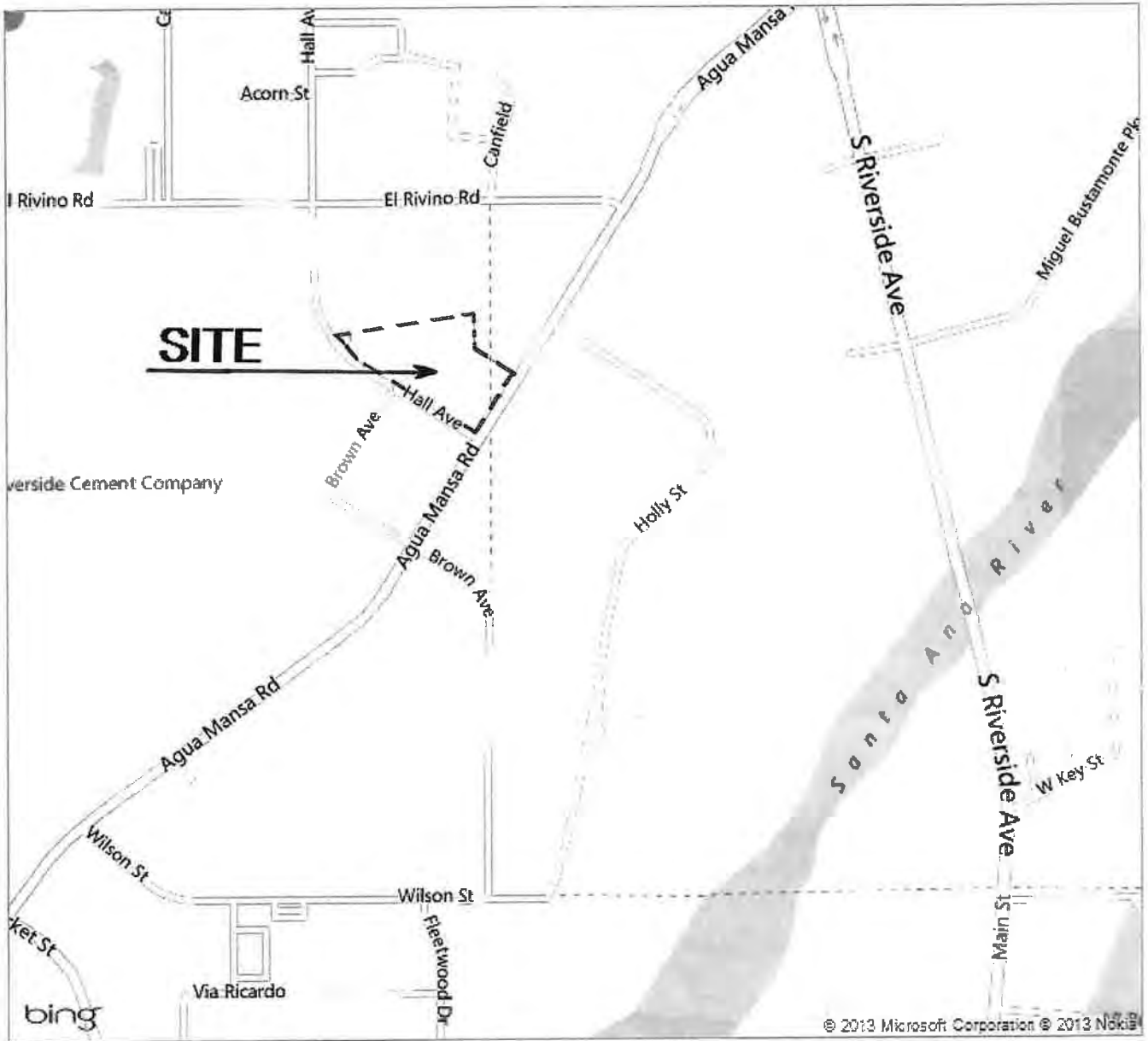
Respectfully submitted,
NORCAL ENGINEERING


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




Mark A. Burkholder
Project Manager

NorCal Engineering

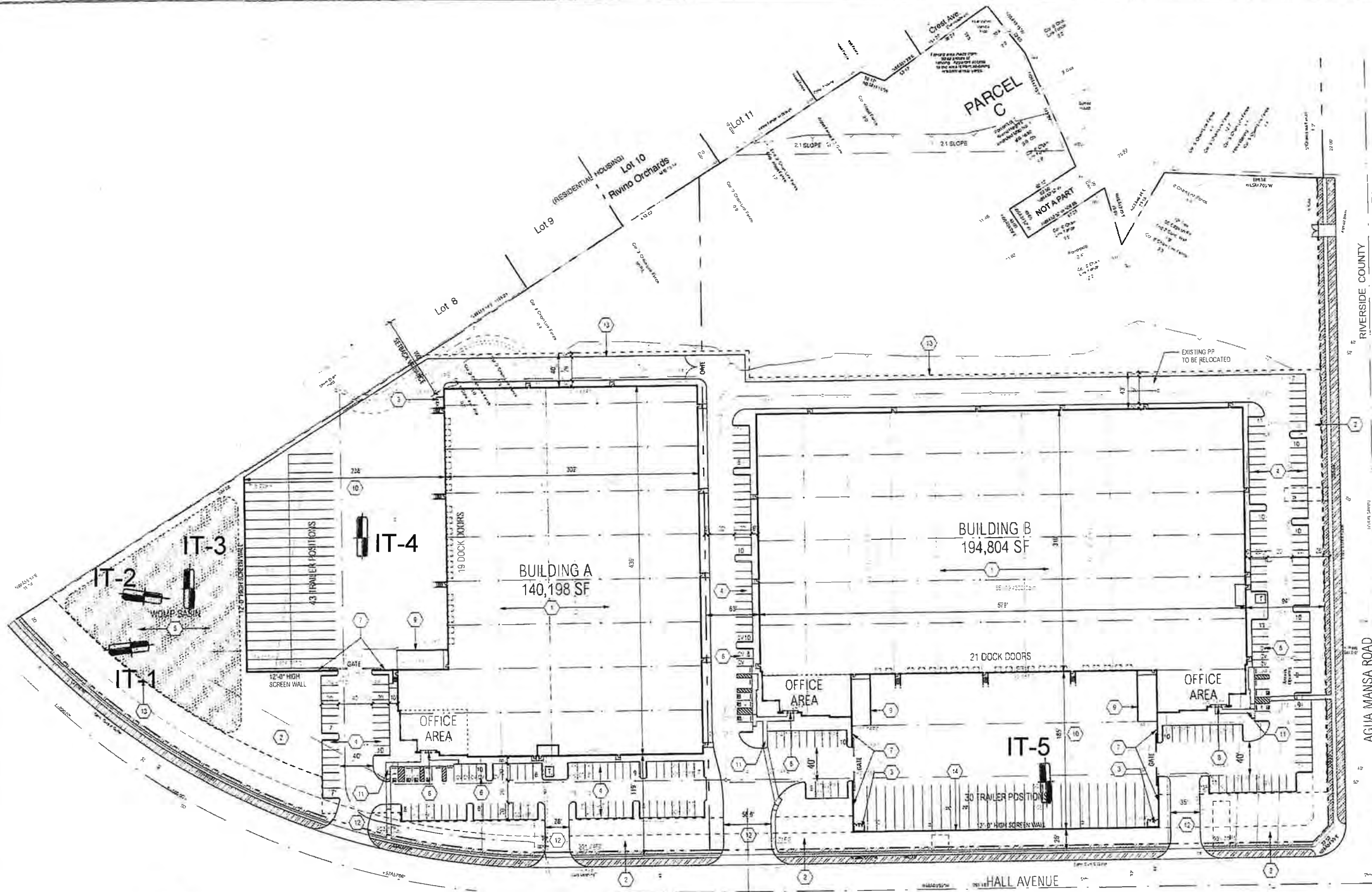


NorCal Engineering
 SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 16800-13 DATE SEPT 2018

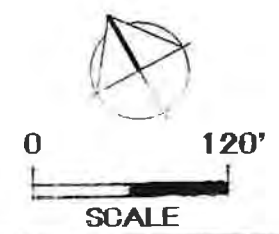
VICINITY MAP

FIGURE 1



RIVERSIDE COUNTY
SAN BERNARDINO COUNTY
AGUA MANSA ROAD

Parcel 6 (VACANT)
Parcel 7 (VACANT)



IT-1 and IT-2 (2013 report)
IT-3 to IT-5 (2018 Supplemental report)

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 16800-13 DATE 9/2018

LOCATIONS OF TEST EXCAVATIONS

FIGURE 2

APPENDIX A

Boring Location: NWC Agua Mansa & Hall, Riverside

Date of Drilling: 9/5/18

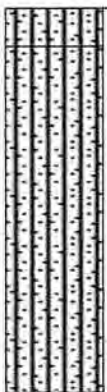
Groundwater Depth: None Encountered

Drilling Method: Backhoe

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory	
			Type	Blow Counts	Moisture	Dry Density
0		FILL SOILS Silty SAND with rootlets Brown, loose, dry				
5		NATURAL SOILS Silty SAND Brown, medium dense, dry to damp				
10	Trench completed at depth of 10'					
15						
20						
25						
30						
35						

Boring Location: NWC Agua Mansa & Hall, Riverside

Date of Drilling: 9/5/18

Groundwater Depth: None Encountered

Drilling Method: Backhoe

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory	
			Type	Blow Counts	Moisture	Dry Density
0		FILL SOILS Silty SAND with occasional gravel and rootlets Brown, upper 8 inches loose to medium dense, dry				
5		NATURAL SOILS Silty SAND Brown, medium dense, damp Sandy SILT Grey-brown, medium dense, damp				
10		Silty SAND Brown, medium dense, damp Trench completed at depth of 10'				
15						
20						
25						
30						
35						

Boring Location: NWC Agua Mansa & Hall, Riverside

Date of Drilling: 9/5/18

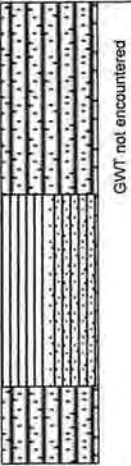
Groundwater Depth: None Encountered

Drilling Method: Backhoe

Hammer Weight:

Drop:

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples		Laboratory	
			Type	Blow Counts	Moisture	Dry Density
0		FILL SOILS Silty SAND with occasional gravel, some asphalt, plastic pipe pieces Brown, loose to medium dense, dry to damp				
5		NATURAL SOILS Sandy SILT to Silty SAND Brown, medium stiff to dense, damp				
10		Silty SAND Brown, medium dense, damp				
Trench completed at depth of 12'						
15						
20						
25						
30						
35						

APPENDIX B



SOILS AND GEOTECHNICAL CONSULTANTS

Project: The Carson Companies
Project No: 16800-13
Date: 9/5/18
Test No. IT-3
Depth: 10'
Tested By: J.S.

	TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE (cm)	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
1	8:53			98.2			43.0					
	8:56	3	3	103.6	5.4		49.6	6.6				
2	8:56			98.1			42.8					
	8:59	3	6	102.1	4.0		48.4	5.6				
3	8:59			98.4			41.7					
	9:02	3	9	102.0	3.6		47.0	5.3				
4	9:02			97.7			43.2					
	9:05	3	12	101.5	3.8		48.2	5.0				
5	9:05			99.4			42.5					
	9:08	3	15	103.0	3.6		48.0	5.5				
6	9:08			98.4			42.3					
	9:11	3	18	102.2	3.8		48.2	5.9				
7	9:11			98.4			42.8					
	9:14	3	21	102.1	3.7		48.0	5.2		74	104	
8	9:14			98.0			42.7					
	9:17	3	24	101.6	3.6		47.7	5.0		72	100	
9	9:17			98.4			43.1					
	9:20	3	27	102.2	3.8		48.1	5.0		76	100	
10	9:20			98.2			42.7					
	9:23	3	30	102.0	3.8		47.8	5.1		76	102	
11	9:23			97.9			43.0					
	9:26	3	33	101.4	3.5		48.2	5.2		70	104	
12	9:26			97.8			42.6					
	9:29	3	36	101.5	3.7		47.8	5.2		74	104	

Average = 74 / 102 cm/hr



SOILS AND GEOTECHNICAL CONSULTANTS

Project: The Carson Companies
Project No: 16800-13
Date: 9/5/18
Test No. IT-4
Depth: 10'
Tested By: J.S.

	TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE (cm)	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
1	11:10			99.2			44.1					
	11:20	10	10	107.8	8.6		53.0	8.9				
2	11:20			97.3			41.0					
	11:30	10	20	106.1	8.8		49.8	8.8				
3	11:30			97.8			39.9					
	11:40	10	30	106.3	8.5		49.3	9.4				
4	11:40			97.7			39.8					
	11:50	10	40	105.9	8.2		49.2	9.4				
5	11:50			98.0			40.0					
	12:00	10	50	106.1	8.1		49.2	9.2				
6	12:00			98.3			41.8					
	12:10	10	60	106.5	8.2		50.8	9.0				
7	12:10			98.4			40.7					
	12:20	10	70	106.5	8.1		50.3	9.6		48.6	57.6	
8	12:20			98.3			40.0					
	12:30	10	80	106.3	8.0		48.8	8.8		48	52.8	
9	12:30			97.7			39.9					
	12:40	10	90	106.2	8.5		49.0	9.1		51	54.6	
10	12:40			98.5			41.5					
	12:50	10	100	106.8	8.3		50.2	8.7		49.8	52.2	
11	12:50			98.5			42.0					
	1:00	10	110	106.6	8.1		50.5	8.5		48.6	51	
12	1:00			97.9			40.0					
	1:10	10	120	106.0	8.1		48.5	8.5		48.6	51	

Average = 49 / 53 cm/hr



SOILS AND GEOTECHNICAL CONSULTANTS

Project: The Carson Companies
Project No: 16800-13
Date: 9/5/18
Test No. IT-5
Depth: 12'
Tested By: J.S.

	TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE (cm)	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
1	2:05			98.4			41.3					
	2:10	5	5	105.9	7.5		51.4	10.1				
2	2:10			98.2			40.5					
	2:15	5	10	105.2	7.0		51.3	9.8				
3	2:15			99.5			49.6					
	2:20	5	15	106.3	6.8		52.8	8.8				
4	2:20			98.7			40.8					
	2:25	5	20	105.4	6.7		50.0	9.2				
5	2:25			98.3			41.2					
	2:30	5	25	104.7	6.4		50.3	9.1				
6	2:30			98.0			41.4					
	2:35	5	30	105.1	7.1		50.2	8.8				
7	2:35			98.2			42.5					
	2:40	5	35	105.0	6.2		51.3	8.8		81.6	105.6	
8	2:40			98.2			41.2					
	2:45	5	40	105.2	7.0		50.2	9.2		84	110.4	
9	2:45			97.6			42.5					
	2:50	5	45	104.5	6.9		51.3	9.5		82.8	114.0	
10	2:50			98.3			41.3					
	2:55	5	50	105.0	6.7		50.5	9.2		80.4	110.4	
11	2:55			98.5			40.9					
	3:00	5	55	105.1	6.6		49.5	8.6		79.2	103.2	
12	3:00			98.1			40.4					
	3:05	5	60	104.8	6.7		49.2	8.8		80.4	105.6	

Average = 81 / 108 cm/hr

Appendix 4: Historical Site Conditions

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

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

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

An infiltration basin is a shallow impoundment that is designed to infiltrate stormwater. Infiltration basins use the natural filtering ability of the soil to remove pollutants in stormwater runoff. Infiltration facilities store runoff until it gradually exfiltrates through the soil and eventually into the water table. This practice has high pollutant removal efficiency and can also help recharge groundwater, thus helping to maintain low flows in stream systems. Infiltration basins can be challenging to apply on many sites, however, because of soils requirements. In addition, some studies have shown relatively high failure rates compared with other management practices.

California Experience

Infiltration basins have a long history of use in California, especially in the Central Valley. Basins located in Fresno were among those initially evaluated in the National Urban Runoff Program and were found to be effective at reducing the volume of runoff, while posing little long-term threat to groundwater quality (EPA, 1983; Schroeder, 1995). Proper siting of these devices is crucial as underscored by the experience of Caltrans in siting two basins in Southern California. The basin with marginal separation from groundwater and soil permeability failed immediately and could never be rehabilitated.

Advantages

- Provides 100% reduction in the load discharged to surface waters.
- The principal benefit of infiltration basins is the approximation of pre-development hydrology during which a

Design Considerations

- Soil for Infiltration
- Slope
- Aesthetics

Targeted Constituents

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

Legend (Removal Effectiveness)

- | | | | |
|---|--------|---|------|
| ● | Low | ■ | High |
| ▲ | Medium | | |



significant portion of the average annual rainfall runoff is infiltrated and evaporated rather than flushed directly to creeks.

- If the water quality volume is adequately sized, infiltration basins can be useful for providing control of channel forming (erosion) and high frequency (generally less than the 2-year) flood events.

Limitations

- May not be appropriate for industrial sites or locations where spills may occur.
- Infiltration basins require a minimum soil infiltration rate of 0.5 inches/hour, not appropriate at sites with Hydrologic Soil Types C and D.
- If infiltration rates exceed 2.4 inches/hour, then the runoff should be fully treated prior to infiltration to protect groundwater quality.
- Not suitable on fill sites or steep slopes.
- Risk of groundwater contamination in very coarse soils.
- Upstream drainage area must be completely stabilized before construction.
- Difficult to restore functioning of infiltration basins once clogged.

Design and Sizing Guidelines

- Water quality volume determined by local requirements or sized so that 85% of the annual runoff volume is captured.
- Basin sized so that the entire water quality volume is infiltrated within 48 hours.
- Vegetation establishment on the basin floor may help reduce the clogging rate.

Construction/Inspection Considerations

- Before construction begins, stabilize the entire area draining to the facility. If impossible, place a diversion berm around the perimeter of the infiltration site to prevent sediment entrance during construction or remove the top 2 inches of soil after the site is stabilized. Stabilize the entire contributing drainage area, including the side slopes, before allowing any runoff to enter once construction is complete.
- Place excavated material such that it can not be washed back into the basin if a storm occurs during construction of the facility.
- Build the basin without driving heavy equipment over the infiltration surface. Any equipment driven on the surface should have extra-wide (“low pressure”) tires. Prior to any construction, rope off the infiltration area to stop entrance by unwanted equipment.
- After final grading, till the infiltration surface deeply.
- Use appropriate erosion control seed mix for the specific project and location.

Performance

As water migrates through porous soil and rock, pollutant attenuation mechanisms include precipitation, sorption, physical filtration, and bacterial degradation. If functioning properly, this approach is presumed to have high removal efficiencies for particulate pollutants and moderate removal of soluble pollutants. Actual pollutant removal in the subsurface would be expected to vary depending upon site-specific soil types. This technology eliminates discharge to surface waters except for the very largest storms; consequently, complete removal of all stormwater constituents can be assumed.

There remain some concerns about the potential for groundwater contamination despite the findings of the NURP and Nightingale (1975; 1987a,b,c; 1989). For instance, a report by Pitt et al. (1994) highlighted the potential for groundwater contamination from intentional and unintentional stormwater infiltration. That report recommends that infiltration facilities not be sited in areas where high concentrations are present or where there is a potential for spills of toxic material. Conversely, Schroeder (1995) reported that there was no evidence of groundwater impacts from an infiltration basin serving a large industrial catchment in Fresno, CA.

Siting Criteria

The key element in siting infiltration basins is identifying sites with appropriate soil and hydrogeologic properties, which is critical for long term performance. In one study conducted in Prince George's County, Maryland (Galli, 1992), all of the infiltration basins investigated clogged within 2 years. It is believed that these failures were for the most part due to allowing infiltration at sites with rates of less than 0.5 in/hr, basing siting on soil type rather than field infiltration tests, and poor construction practices that resulted in soil compaction of the basin invert.

A study of 23 infiltration basins in the Pacific Northwest showed better long-term performance in an area with highly permeable soils (Hilding, 1996). In this study, few of the infiltration basins had failed after 10 years. Consequently, the following guidelines for identifying appropriate soil and subsurface conditions should be rigorously adhered to.

- Determine soil type (consider RCS soil type 'A, B or C' only) from mapping and consult USDA soil survey tables to review other parameters such as the amount of silt and clay, presence of a restrictive layer or seasonal high water table, and estimated permeability. The soil should not have more than 30% clay or more than 40% of clay and silt combined. Eliminate sites that are clearly unsuitable for infiltration.
- Groundwater separation should be at least 3 m from the basin invert to the measured ground water elevation. There is concern at the state and regional levels of the impact on groundwater quality from infiltrated runoff, especially when the separation between groundwater and the surface is small.
- Location away from buildings, slopes and highway pavement (greater than 6 m) and wells and bridge structures (greater than 30 m). Sites constructed of fill, having a base flow or with a slope greater than 15% should not be considered.
- Ensure that adequate head is available to operate flow splitter structures (to allow the basin to be offline) without ponding in the splitter structure or creating backwater upstream of the splitter.

- Base flow should not be present in the tributary watershed.

Secondary Screening Based on Site Geotechnical Investigation

- At least three in-hole conductivity tests shall be performed using USBR 7300-89 or Bouwer-Rice procedures (the latter if groundwater is encountered within the boring), two tests at different locations within the proposed basin and the third down gradient by no more than approximately 10 m. The tests shall measure permeability in the side slopes and the bed within a depth of 3 m of the invert.
- The minimum acceptable hydraulic conductivity as measured in any of the three required test holes is 13 mm/hr. If any test hole shows less than the minimum value, the site should be disqualified from further consideration.
- Exclude from consideration sites constructed in fill or partially in fill unless no silts or clays are present in the soil boring. Fill tends to be compacted, with clays in a dispersed rather than flocculated state, greatly reducing permeability.
- The geotechnical investigation should be such that a good understanding is gained as to how the stormwater runoff will move in the soil (horizontally or vertically) and if there are any geological conditions that could inhibit the movement of water.

Additional Design Guidelines

- (1) Basin Sizing - The required water quality volume is determined by local regulations or sufficient to capture 85% of the annual runoff.
- (2) Provide pretreatment if sediment loading is a maintenance concern for the basin.
- (3) Include energy dissipation in the inlet design for the basins. Avoid designs that include a permanent pool to reduce opportunity for standing water and associated vector problems.
- (4) Basin invert area should be determined by the equation:

$$A = \frac{WQV}{kt}$$

where A = Basin invert area (m²)

WQV = water quality volume (m³)

k = 0.5 times the lowest field-measured hydraulic conductivity (m/hr)

t = drawdown time (48 hr)

- (5) The use of vertical piping, either for distribution or infiltration enhancement shall not be allowed to avoid device classification as a Class V injection well per 40 CFR146.5(e)(4).

Maintenance

Regular maintenance is critical to the successful operation of infiltration basins. Recommended operation and maintenance guidelines include:

- Inspections and maintenance to ensure.
- Observe drain time for the design storm after completion or modification of the facility to confirm that the desired drain time has been obtained.
- Schedule semiannual inspections for beginning and end of the wet season to identify potential problems such as erosion of the basin side slopes and invert, standing water, trash and debris, and sediment accumulation.
- Remove accumulated trash and debris in the basin at the start and end of the wet season.
- Inspect for standing water at the end of the wet season.
- Trim vegetation at the beginning and end of the wet season to prevent establishment of woody vegetation and for aesthetic and vector reasons.
- Remove accumulated sediment and regrade when the accumulated sediment volume exceeds 10% of the basin.
- If erosion is occurring within the basin, revegetate immediately and stabilize with an erosion control mulch or mat until vegetation cover is established.
- To avoid reversing soil development, scarification or other disturbance should only be performed when there are actual signs of clogging, rather than on a routine basis. Always remove deposited sediments before scarification, and use a hand-guided rotary tiller, if possible, or a disc harrow pulled by a very light tractor.

Cost

Infiltration basins are relatively cost-effective practices because little infrastructure is needed when constructing them. One study estimated the total construction cost at about \$2 per ft (adjusted for inflation) of storage for a 0.25-acre basin (SWRPC, 1991). As with other BMPs, these published cost estimates may deviate greatly from what might be incurred at a specific site. For instance, Caltrans spent about \$18/ft³ for the two infiltration basins constructed in southern California, each of which had a water quality volume of about 0.34 ac.-ft. Much of the higher cost can be attributed to changes in the storm drain system necessary to route the runoff to the basin locations.

Infiltration basins typically consume about 2 to 3% of the site draining to them, which is relatively small. Additional space may be required for buffer, landscaping, access road, and fencing. Maintenance costs are estimated at 5 to 10% of construction costs.

One cost concern associated with infiltration practices is the maintenance burden and longevity. If improperly maintained, infiltration basins have a high failure rate. Thus, it may be necessary to replace the basin with a different technology after a relatively short period of time.

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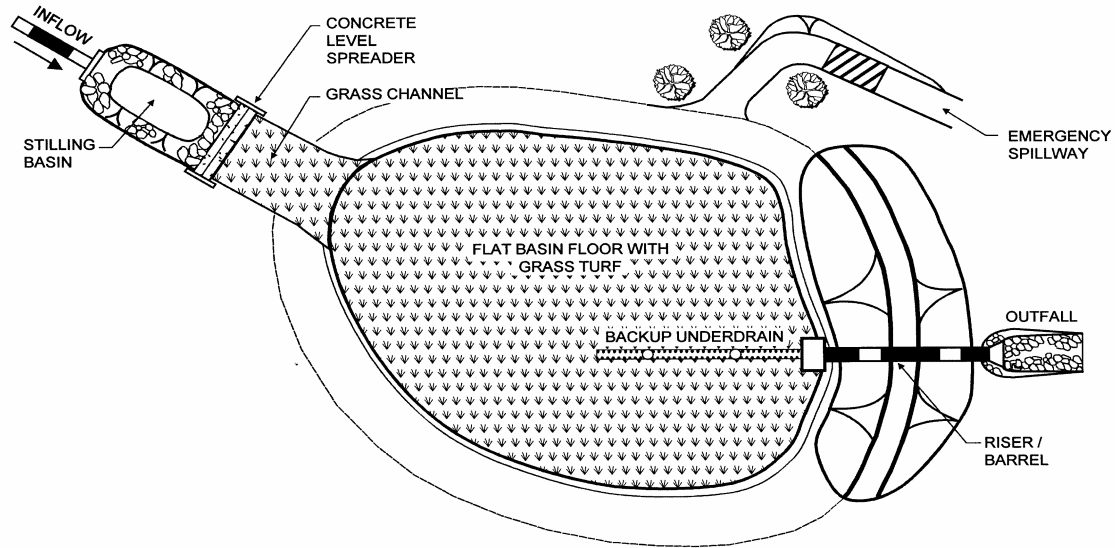
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Information Resources

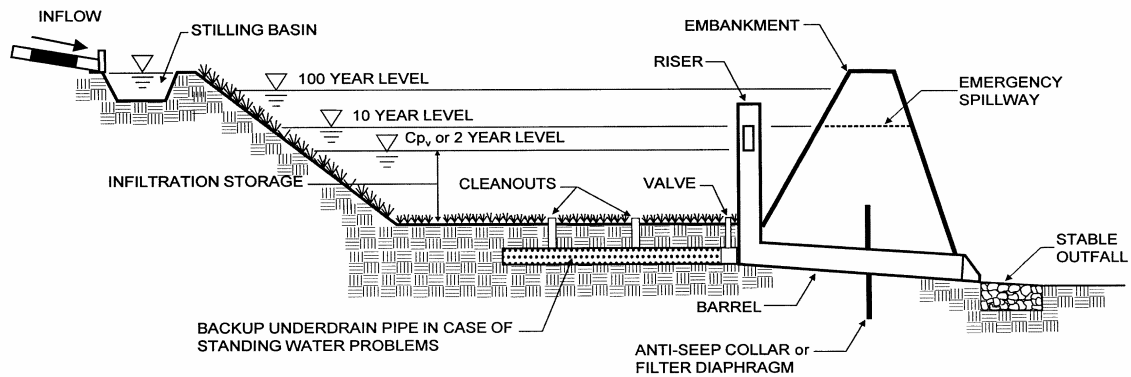
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PLAN VIEW



PROFILE

General Description

Water quality inlets (WQIs), also commonly called trapping catch basins, oil/grit separators or oil/water separators, consist of one or more chambers that promote sedimentation of coarse materials and separation of free oil (as opposed to emulsified or dissolved oil) from stormwater. Some WQIs also contain screens to help retain larger or floating debris, and many of the newer designs also include a coalescing unit that helps promote oil/water separation.

These devices are appropriate for capturing hydrocarbon spills, but provide very marginal sediment removal and are not very effective for treatment of stormwater runoff. WQIs typically capture only the first portion of runoff for treatment and are generally used for pretreatment before discharging to other best management practices (BMPs).

Inspection/Maintenance Considerations

High sediment loads can interfere with the ability of the WQI to effectively separate oil and grease from the runoff. During periods of high flow, sediment can be resuspended and released from the WQI into surface waters. Maintenance of WQIs can be easily neglected because they are underground. Establishment of a maintenance schedule is helpful for ensuring proper maintenance occurs. The required maintenance effort will be site-specific due to variations in sediment and hydrocarbon loading. Since WQI residuals contain hydrocarbon by-products, they may require disposal as hazardous waste. Many WQI owners coordinate with waste haulers to collect and dispose of these residuals.

Maintenance Concerns, Objectives, and Goals

- High Sediment Loads
- Hazardous Waste
- Vector Control

Targeted Constituents

✓ Sediment	●
✓ Nutrients	●
✓ Trash	▲
✓ Metals	●
✓ Bacteria	●
✓ Oil and Grease	▲
✓ Organics	●
✓ Oxygen Demanding	●

Legend (Removal Effectiveness)

- Low
- High
- ▲ Medium



Inspection Activities	Suggested Frequency
<ul style="list-style-type: none"> ■ Inspect after every storm event to determine if maintenance is required. 	Monthly during the wet season, or after significant rain events
Maintenance Activities	Suggested Frequency
<ul style="list-style-type: none"> ■ Clean out and dispose of accumulated oil, grease, and sediments. Remove accumulated trash and debris. The clean out and disposal techniques should be environmentally acceptable and in accordance with local regulations. 	Annual, before the wet season, or more frequent as needed

Additional Information

Since WQIs can be relatively deep, they may be designated as confined spaces. Caution should be exercised to comply with confined space entry safety regulations if it is required.

References

<http://www.co.pierce.wa.us/pc/services/home/environ/water/swm/sppman/bmpt1.htm>