WATER QUALITY TECHNICAL REPORT FOR TORREY MEADOWS DRIVE OVERCROSSING

Prepared for:

Prepared by:

T·Y·LIN INTERNATIONAL

August 17, 2015

CERTIFICATION

This Hydrology and Hydraulics Analysis report has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer (Engineer) attests to the technical information contained herein and the engineering data upon which the following design, recommendations, conclusions, and decisions are based.

_____

Jeff Burdick, PE   RCE C75396   Exp: 12/31/2015

Registered Civil Engineer

T.Y. Lin International
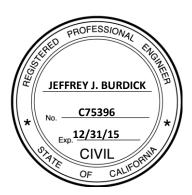
404 Camino Del Rio South, Suite 700

San Diego, CA 92108

DRAFT Water Quality Technical Report

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Section 1

General Information
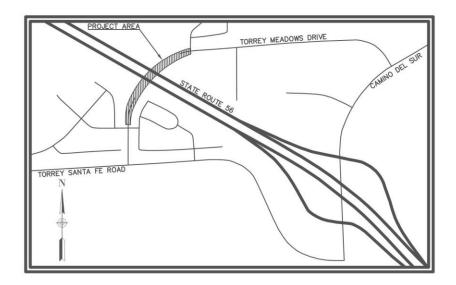
Project Description

The City of San Diego, in cooperation with the California Department of Transportation (Caltrans) District 11 and Kilroy Realty, is proposing to construct a bridge overcrossing State Route 56 (SR-56) to connect Torrey Meadows Drive in the Torrey Highlands community of San Diego. The purpose of the project is to connect the divided community of Torrey Highlands, which is currently bisected by SR-56. In addition, the execution of this project would physically integrate Torrey Highlands to the greater Rancho Peñasquitos and Santaluz communities north of State Route 56. The proposed bridge would provide residents an alternate way of entering and leaving their cul-de-sac community.

The build alternative proposes constructing a bridge overcrossing at Torrey Meadows Drive over SR-56. The proposed bridge would be a two-span, cast-in-place concrete bridge, 53 feet wide and 337 feet long. This would allow for a two-lane over crossing, with 6' sidewalks as required by the Caltrans Bridge Design Standards. Torrey Meadows Drive would be extended from the north and

south into Caltrans Right-of-Way to connect to the proposed bridge. The total disturbed soil area (DSA) was calculated to include new slopes, removal of existing roadway, and new roadway. The total DSA for the project is 1.5 acres. The proposed project will increase the impervious surface area by 0.8 acres. The project is located within the City of San Diego urban Municipal Separate Storm Sewer System (MS4) area.

Figure 1. Site Map

Site Map- Not to scale

Soil Erosion Potential and Mitigation

- Much of the topography within the affected area consists of level terrain with the exception of two prominent slopes on either side of SR-56. The project risk level was determined by the GIS Map Method (EPA Rainfall Erosibity Calculator & GIS Map). Based on the summary table below, the project risk is expected to be Level 2 (RL-2).

	Sediment Risk Factor				Receiving Water Risk		
Alternative	R	K	LS	Risk Factor	RWQCB	Risk Factor	Combined Risk
2	35	0.32	3.67	Medium	9	High	Level 2

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- The Soil Conservation Service classifies soils within the project area as possessing a severe potential for erosion by water.

    o Available mitigation methods during construction include: timing of grading to avoid the rainy season, use of sand bags and/or hay bales in graded areas, silt fences, temporary drainage facilities, prompt seeding and re-vegetation of graded areas.

    o Available measures for the post-construction phase include: adequate maintenance of permanent drainage facilities and adequate maintenance of permanent vegetative cover.

Site Slope

- Existing slopes vary from 2:1 to 3:1 and flatter. Proposed improvements will create new slopes and modify existing slopes. Profiles and layouts were reviewed to minimize impact to existing slopes and requirement of new high cut/fill slopes. New slopes will be graded at 4:1 or flatter in fill and 2:1 or flatter in cut wherever feasible to enhance aesthetics and facilitate re-vegetation.

- Because slopes are proposed greater than 4:1, an erosion control plan is required.

- Proposed grading will potentially increase erosion at the site. The following construction activities will be considered to offer slope/surface protection; new proposed fill slopes will maintain similar height and inclination as existing slopes wherever feasible. The proposed slopes will not be high enough to warrant the implementation of benches or terraces. The flows will be collected in stabilized drains or channels to protect slopes.

    Vegetated surfaces will be designed to minimize overland and concentrated flow depths and velocities, and maximize contact time between water and vegetated surfaces. This will enhance infiltration and pollutant removal opportunities.

    If feasible, topsoil (duff) and vegetation removed during construction will be stripped and stockpiled. These materials will be used in the surface preparation prior to seeding operations. Slope roughening, terracing, rounding, and stepping will be implemented where necessary.

- Vegetation along SR-56 mainline consists mostly of groundcover, shrubs, with scattered trees. Vegetation removal will be necessary to implement project improvements.

- Hard surfaces (rock blankets, pervious paving, etc) are not anticipated to maintain slope/surfacing protection. Vegetation should provide adequate erosion protection for all disturbed soil area.

- Further consideration for DPP BMPs will be examined in the PS&E phase.

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Site Data and Storm Water Quality Design Issues

- The proposed overcrossing is located within the jurisdictional boundary of the San Diego Regional Water Quality Control Board (SDRWQCB).   The project is part of the Peñasquitos Hydrologic Unit, in the Miramar Reservoir Hydrologic Area, identified as Hydrologic Sub-Area 906.10. More specifically, the project is located within the Carmel Valley-Poway Creek Watershed. The Carmel Valley-Poway Creek Watershed is a high risk receiving watershed.

- The project drains into the Carmel Valley-Poway Creek Watershed, which is the receiving body of water and is a tributary of Hydrologic Sub-area 906.10. Runoff flows through McGonigle Canyon to Los Peñasquitos Lagoon.

- No seasonal construction, construction exclusion dates or restrictions required by federal, state, or local regulatory agencies are known at this time.

- According to the Storm Water Requirements Applicability Checklist (SWRAC) this construction site is high priority, see Appendix B. The project requires an approved Storm Water Pollution Prevention Plan (SWPPP) due to the amount of new impervious surfaces produced by the improvements and the amount of disturbed soil area affected.

- There are no Drinking Water Reservoirs and/or Recharge Facilities within project limits.

- There are no known local agency requirements for this project at this point.

- The project is located in the north-central portion of San Diego County, which is part of the South Coast hydrologic region. Climate data was taken from 1971-2000. January is the coldest month, with a mean temperature of 55.3°. August is the hottest month, with a mean temperature of 72.3°. The average annual rainfall in the region is 11.97 inches, with wide annual variations and most of the precipitation falling between the months of November and March.

  According to the Caltrans Project Planning and Design Guide, the rainfall intensity for calculation of water quality flow from areas discharging to flow-based Best Management Practices (BMPs) is 0.2" per hour.

Preservation of Existing Vegetation

- Clearing and grubbing will occur where appropriate over the entire disturbed soil area. Steps have been taken to minimize disturbed area. Proposed construction follows existing contours to minimize cut and fill. All landscape within Caltrans right-of-way that is disturbed or removed will be replaced following Caltrans Replacement planting policy. As an interim measure, erosion control will be applied to all disturbed areas following Caltrans Policy and Procedures.

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- There are no known Environmentally Sensitive Areas (ESAs) present within the project limits.

Non-storm Water Discharges

Landscaping features may be added to the project site in the future and it is possible that the landscaped areas could result in non-storm water discharges due to irrigation. Plans will include application methods of irrigation water that will minimize runoff of excess irrigation water into the storm water conveyance system.

Section 2

Pollutants and Conditions of Concern

Pollutants of Concern from the Project Area

- The Los Peñasquitos Lagoon is included on the 2010 Clean Water Act (CWA) Section 303(d) List of Water Quality Limited Segments Requiring Total Maximum Daily Loads (TMDLs). For sedimentary siltation the list was accessed using the Caltrans Water Quality Planning Tool (WQPT). Pollutants of concern include sediment and dissolved solids. Total Maximum Daily Loads (TMDLs) have not been implemented for Los Peñasquitos Lagoon at this time.

- The targeted Design Constituents (TDCs) for this project is sediment.

- A written request for section 401 water quality certification is not necessary since there are no wetlands within the project area.

Conditions of Concern

- The following measures will be utilized to avoid or reduce potential storm water impacts.

  Erosion from slopes will be minimized using the following methods: disturbing existing slopes only when necessary, minimizing cut and fill areas to reduce slope length, incorporating retaining walls, providing cut and fill slopes flat enough to allow re-vegetation and limit erosion to pre-construction rates, rounding and shaping slopes to reduce concentrated flow, and collecting concentrated flows in stabilized drains and channels. Construction items requiring extensive soil disturbance will be scheduled outside of the rainy season as much as practically feasible.

  Permanent storm water pollution controls will be installed as early in the construction process as feasible to provide additional protection and possibly utilize them in addressing construction storm water impacts.

- There are three Vortechnics hydrodynamic separators located in the project area to treat storm water runoff from the existing developments.

Section 3

Proposed Permanent Storm Water Best Management Practices (BMPs)

BMPs Analysis and Description

In order to achieve certain performance standards as required in Model BMP Design Manual San Diego Region for Permanent Site Design, Storm Water Treatment and Hydro modification Management, dated January 2015, biofiltration basins are utilized due to their efficiency of water storage and treatment.

- Site conditions provide adequate areas for the installation of water quality and hydro modification treatment devices to fully address the projects proposed increased impervious area.

- The proposed hydro modification BMPs are biofiltration basins located in various locations on the project as shown in Appendix H. Biofiltration facilities use a combination of filtration through soil media and plant roots to treat water. Soil media is recommended to have a surface area of .04 times the impervious area based on 5 in/hr for infiltration through the soil media. The biofiltration facilities consist of vegetated basins with 18" soil media and 18" gravel media for filtration and storage of storm flows. The biofiltration basin has been designed as a volume based system that provides both surface and subsurface storage. Biofiltration basins are sized based on the County of San Diego's BMP Sizing Calculator. Outputs can be found in the Table 3 and in greater detail in Appendix B. The proposed BMPs make use of the existing drainage infrastructure.

- For the purposes of selecting Treatment Control BMPs, Pollutants of Concern are grouped as coarse sediment and trash, pollutants that tend to associate with fine particles, and pollutants that remain dissolved according to Table B.6-2 of the Model BMP Design Manual San Diego Region Appendix B (reproduced below as Table 1).

Table 1 – Grouping of Pollutants			
Pollutant	Coarse Sediment and Trash	Pollutants that tend to associate with fine particles during treatment	Pollutants that tend to be dissolved following treatment
Sediment	X	X	
Nutrients		X	X
Heavy Metals		X	
Organic Compounds		X	
Trash & Debris	X		
Oxygen Demanding		X	
Bacteria		X	
Oil & Grease		X	
Pesticides		X	

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Hydrology Calculations to Determine Treatment Flow Rate and Volume

According to the calculations for the project site, the storm water runoff can be treated in biofiltration facilities onsite. The design capture volume (DCV) is the hydrologic method used to calculate the storage of the hydro modification system, which is designed to store the volume of storm water runoff resulting from the 85th percentile, 24-hour storm event onsite. Table 3 shows the DCV requirement per DMA.

Table 3- Worksheet B.2-1 Design Capture Volume						
Design Capture Volume		**Worksheet B-2.1 Model BMP Design Manual January 2015**				
			DMA 1	**DMA 2**	**DMA 3**	**DMA 4**
1	85th percentile 24-hr storm depth from Figure B.1	d= inches	0.62	0.62	0.62	0.62
2	Area tributary to BMPs	A= acres	1.13	0.79	0.50	0.48
3	Area weighted runoff factor (estimate using section B.1 and B.2.1)	C= unitless	1.0	1.0	1.0	1.0
4	Street trees volume reduction	TCV= cubic-feet (10ft^3/tree)	120	120	110	100
5	Rain barrels volume reduction	RCV= cubic-feet	0	0	0	0
6	Calculate DVC= (C x d x A x 43560 x (1/12))-TCV-RCV	DCV= cubic-feet	**2413.73**	**1661.21**	**1014.83**	**973.94**

Table 4 below, shows the proposed and required sizing of the hydromodification BMPs for the project. The onsite storage exceeds the required storage calculated from Table 3 for the DCV, see Appendix J for additional calculations. In addition, the BMPs have been sized per the County of San Diego BMP Sizing Calculator Methodology to meet the flow control requirement of $0.1Q_2$ and Q_{10}, see Appendix I.

Table 4- Required and Proposed BMP Sizing			
	Proposed BMP Area (sf)	Area Required Flow Control (sf)	Area Required Design Capture Volume (sf)
BMP #1.1	3835.03	3519.20	312.12
BMP# 1.2	2344.31		
BMP #2	2218.81*	3702.34	214.81
BMP #3	2987.61	1871.79	131.23
BMP #4	2427.08	1808.47	125.94

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Total	**11,594.03**	**10,901.80**	**784.10**

*BMP#1.1 treats the square footage not covered by BMP#2;
BMP#1.1, 1.2 and 2 are directed to the same outfall.

The project discharges to two locations of McGonigle Canyon Creek. This first location of discharge is located on the south side of SR-56. Storm water runoff for outfall 1 is treated by BMP#1.1 and 1.2 (biofiltration basins A and B) and BMP#2 (biofiltration basin C), see Appendix H for locations; as well as in the existing Vortechnics hydrodynamic separator treatment facility. Although, the proposed BMPs exceed the requirement, the hydrodynamic separator has additional capacity to treat additional runoff, if needed. The second location of discharge is located on the north side of SR-56. Storm water runoff is treated by BMP #3(biofiltration basin D) and BMP#4 (biofiltration basin E) before discharging into the McGonigle Creek; it should be noted that the treatment for outfall 1 and 2 exceed the minimum requirement for both DCV and Flow Control. Additional calculations are provided in Appendices J and I.

Acceptance of Maintenance Responsibility

At the time a construction permit is issued, it is recommended that a statement for accepting responsibility for interim O&M of facilities is obtained from the contractor. The responsible party to implement and maintain BMPs in perpetuity will be transferred to the City of San Diego upon notice of completion.

Inspection, Operation, and Maintenance Plan

An example of an Inspection, Operation, and Maintenance Plan (IOMP) is provided in Appendix K.

Annual Maintenance Cost

Since rainfall amounts can vary wildly from year to year, it is difficult pinpoint a reliable annual maintenance cost. For planning purposes maintenance costs assume average annual rainfall. A breakdown of the estimate for annual maintenance costs has been included in Appendix K. A summary of the general range for annual operation and maintenance costs for each BMP is shown in Table 5.

Table 5 – Summary of Annual Maintenance Cost		
BMP	**Frequency**	**Annual Cost (each)**
Biofiltration Basin A	2/YR	$5,900
Biofiltration Basin B	2/YR	$4,100
Biofiltration Basin C	2/YR	$4,100

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Biofiltration Basin D	2/YR	$4,100
Biofiltration Basin E	2/YR	$4,100

Code or Requirement Conflicts

There are no conflicts with codes or requirements other than the items addressed to implement the proposed facilities.

Section 4

Proposed Temporary Construction Site BMPs

- Construction Site Best Management Practices (BMPs) are to be applied during construction activities to reduce the pollutants in storm water discharges throughout construction. These Construction Site BMPs provide both temporary erosion and sediment control, as well as control for potential pollutants other than sediment. The following categories of BMPs are designed to be used for controlling potential pollutants on construction sites: Soil Stabilization Practices; Sediment Control Practices; Tracking Control Practices; Wind Erosion Control; Non-Storm water Controls; and Waste Management and Material Pollution Controls.

- Dewatering is not anticipated for this project.

- Turbidity and pH are not considered design pollutants for this project, therefore, Active treatment systems (ATS) will not be considered for the project.

- Concurrence with the District Construction Storm Water Coordinator will occur in the PS&E phase.

- The project risk level was determined by the GIS Map Method (EPA Rainfall Erosivity Calculator & GIS Map). The project risk is expected to be Level 2 (RL-2). Therefore, the following items are not applicable: Receiving Water Bioassessment and Sampling, and Analysis for Suspended Sediment Concentration (SSC).

- Funds allocated incorporate construction items required by the new permit, which includes funds for separate bid line items (Prepare Storm Water Pollution Prevention Plan, Job Site Management, Storm Water Annual Report, Rain Event Action Plan, Storm Water Sampling and Analysis Day, Move-in/Move-out (Temporary Erosion Control), Temporary Fiber Roll, Temporary Concrete Washout, Temporary Construction Entrance, Temporary Check Dam, Temporary Drainage Inlet Protection, Street Sweeping, Water Pollution Control Maintenance Sharing, Additional Water Pollution Control, and Storm Water Sampling and Analysis.)

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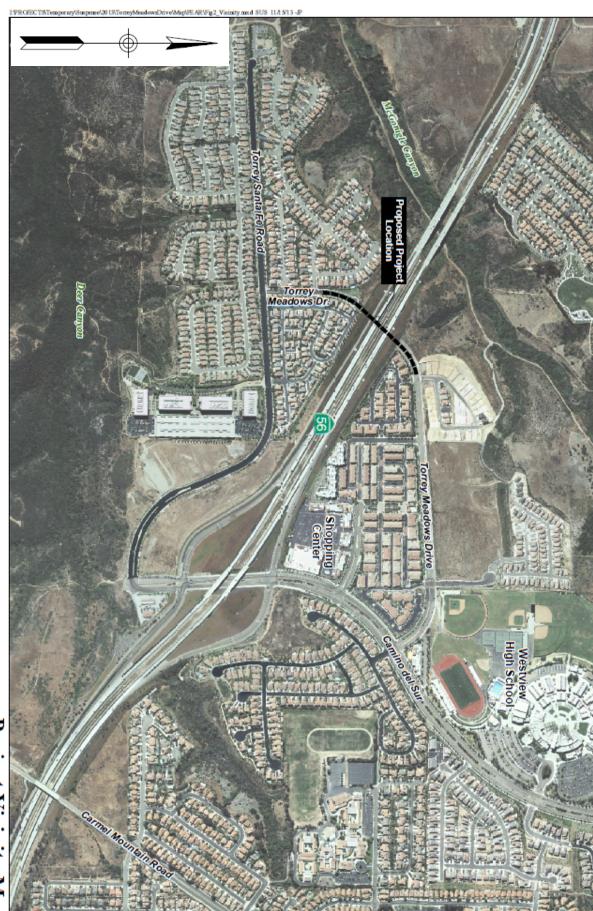
Section 5

Conclusion

The proposed hydro modification treatment facilities meet the requirements per the Model BMP Design Manual San Diego Region for Permanent Site Design, Storm Water Treatment and Hydro modification Management, dated January 2015.

Appendix A

Vicinity Map and FEMA FIRMETTE

Project Vicinity Map

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 3 WEST AND TOWNSHIP 14 SOUTH, RANGE 3 WEST AND THE RANCHO SAN DIEGUITO LAND GRANT AND THE RANCHO SAN DIEGUITO LAND GRANT AND THE RANCHO LOS PENASQUITOS LAND GRANT.

CITY OF SAN DIEGO
060295

ZONE X

ZONE A

MAP SCALE 1" = 1000'

0   500   1,000   1,500   2,000 FEET

PANEL 1335G

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY,
CALIFORNIA
AND INCORPORATED AREAS

PANEL 1335 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO COUNTY	060284	1335	G
SAN DIEGO, CITY OF	060295	1335	G

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1335G

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

U.S. DEPARTMENT OF HOMELAND SECURITY

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Appendix B

Storm Water Requirements Applicability Checklist

City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

THE CITY OF SAN DIEGO
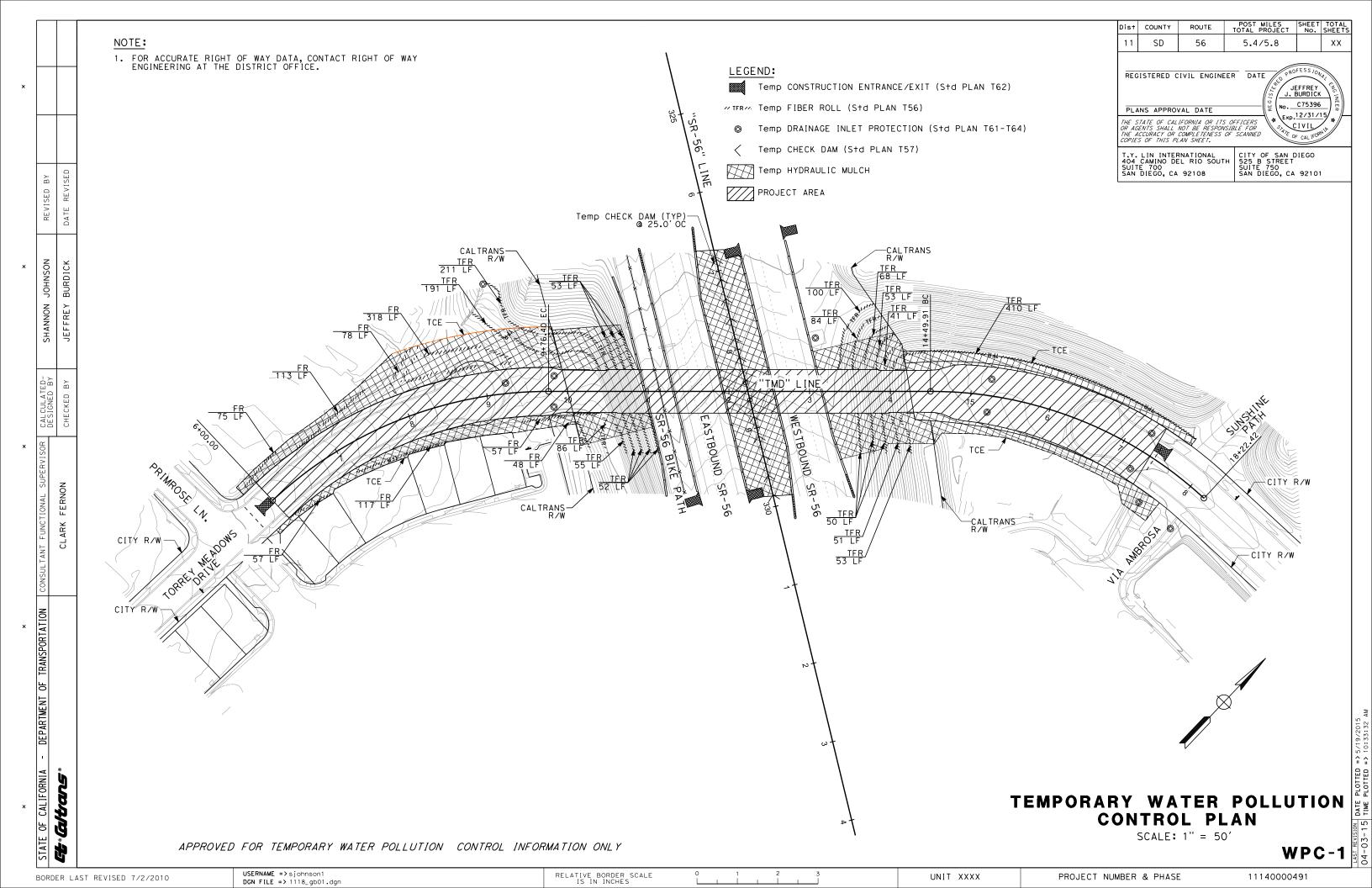
Storm Water Requirements Applicability Checklist

FORM
DS-560

JANUARY **2011**
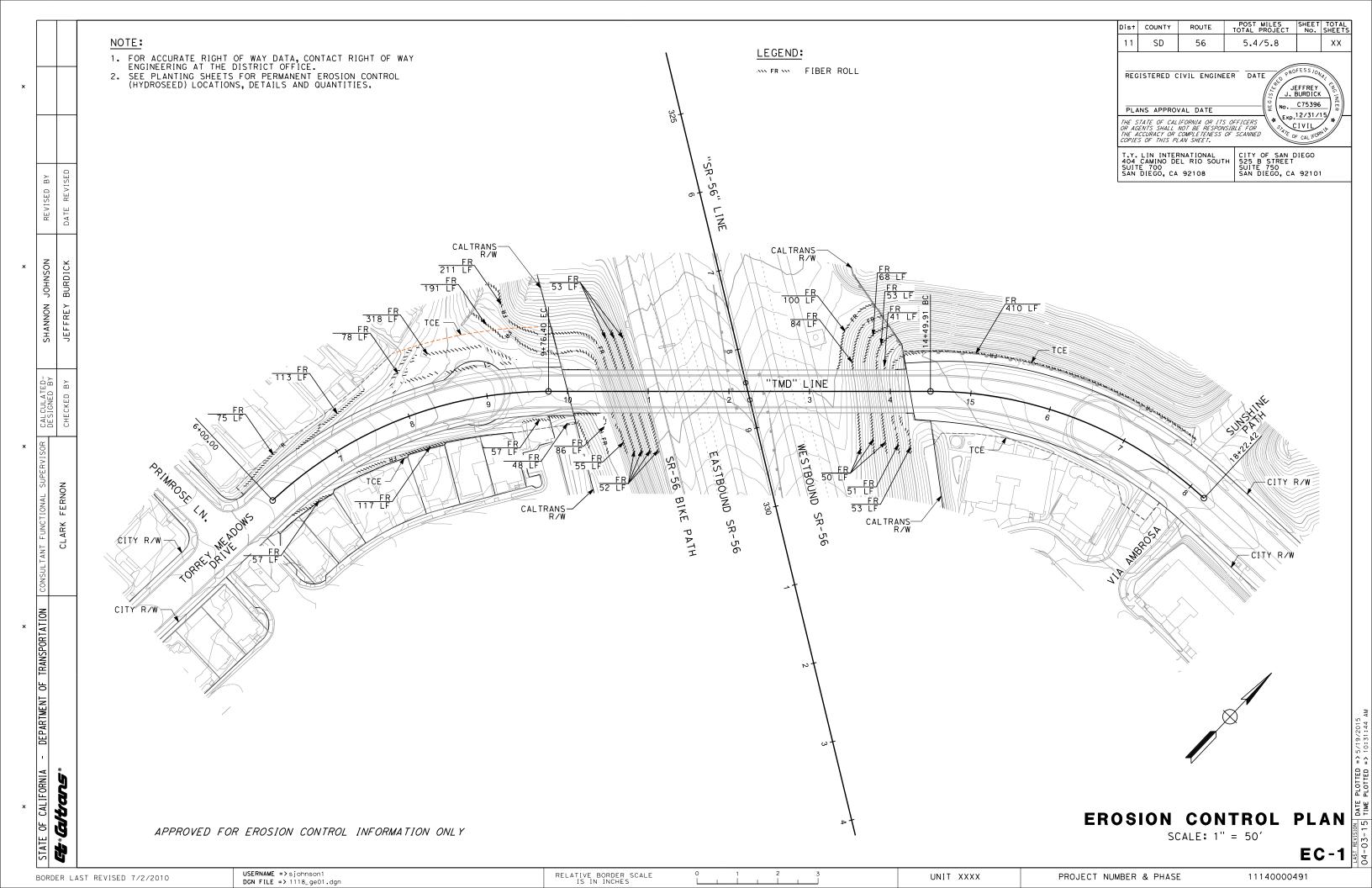
Project Address:	Project Number *(for City Use Only):*

SECTION 1. Permanent Storm Water BMP Requirements:

Additional information for determining the requirements is found in the <u>Storm Water Standards Manual</u>.

Part A: Determine if Exempt from Permanent Storm Water BMP Requirements.
Projects that are considered maintenance, or are otherwise not categorized as "development projects" or "redevelopment projects" according to the Storm Water Standards manual are not required to install permanent storm water BMPs. **If "Yes" is checked for any line in Part A, proceed to Part C and check the box labeled "Exempt Project." If "No" is checked for all of the lines, continue to Part B.**

1.	The project is not a Development Project as defined in the <u>Storm Water Standards Manual</u>: for example habitat restoration projects, and construction inside an existing building.	❏ Yes ❏ No
2.	The project is only the construction of underground or overhead linear utilities.	❏ Yes ❏ No
3.	The project qualifies as routine maintenance (replaces or renews existing surface materials because of failed or deteriorating condition). This includes roof replacement, pavement spot repairs and resurfacing treatments such as asphalt overlay or slurry seal, and replacement of damaged pavement.	❏ Yes ❏ No
4.	The project only installs sidewalks, bike lanes, or pedestrian ramps on an existing road, and does not change sheet flow condition to a concentrated flow condition.	❏ Yes ❏ No

Part B: Determine if Subject to Priority Development Project Requirements.

Projects that match one of the definitions below are subject to additional requirements including preparation of a Water Quality Technical Report.
If "Yes" is checked for any line in Part B, proceed to Part C and check the box labeled "Priority Development Project." If "No" is checked for all of the lines, continue to Part C and check the box labeled "Standard Development Project."

1.	**Residential development of 10 or more units.**	❏ Yes ❏ No
2.	**Commercial development and similar non-residential development greater than one acre.** Hospitals; laboratories and other medical facilities; educational institutions; recreational facilities; municipal facilities; commercial nurseries; multi-apartment buildings; car wash facilities; mini-malls and other business complexes; shopping malls; hotels; office buildings; public warehouses; automotive dealerships; and other light industrial facilities.	❏ Yes ❏ No
3.	**Heavy industrial development greater than one acre.** Manufacturing plants, food processing plants, metal working facilities, printing plants, and fleet storage areas.	❏ Yes ❏ No
4.	**Automotive repair shop.** Facilities categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.	❏ Yes ❏ No
5.	**Restaurant.** Facilities that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), and where the land area for development is greater than 5,000 square feet.	❏ Yes ❏ No
6.	**Hillside development greater than 5,000 square feet.** Development that creates 5,000 square feet of impervious surface and is located in an area with known erosive soil conditions and where the development will grade on any natural slope that is twenty-five percent or greater.	❏ Yes ❏ No
7.	**Water Quality Sensitive Area.** Development located within, directly adjacent to, or discharging directly to a Water Quality Sensitive Area (as depicted in Appendix C) in which the project either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" is defined as being situated within 200 feet of the Water Quality Sensitive Area. "Discharging directly to" is defined as outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.	❏ Yes ❏ No
8.	**Parking lot with a minimum area of 5,000 square feet or a minimum of 15 parking spaces** and potential exposure to urban runoff (unless it meets the exclusion for parking lot reconfiguration on line 11).	❏ Yes ❏ No

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Upon request, this information is available in alternative formats for persons with disabilities.
DS-560 (01-25-11)

9. **Street, road, highway, or freeway.** New paved surface in excess of 5,000 square feet used for the transportation of automobiles, trucks, motorcycles, and other vehicles (unless it meets the exclusion for road reconfiguration on line 11).	❏ Yes ❏ No
10. **Retail Gasoline Outlet (RGO)** that is: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.	❏ Yes ❏ No
11. **Significant Redevelopment**; project installs and/or replaces 5,000 square feet or more of impervious surface and the existing site meets at least one of the categories above. The project is not considered Significant Redevelopment if reconfiguring an existing road or parking lot without a change to the footprint of an existing developed road or parking lot. The existing footprint is defined as the outside curb or the outside edge of pavement when there is no curb.	❏ Yes ❏ No
12. **Other Pollutant Generating Project.** Any other project not covered in the categories above, that disturbs one acre or more and is not excluded by the criteria below.	❏ Yes ❏ No

Projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces or if they sheet flow to surrounding pervious surfaces.

Part C: Select the appropriate category based on the outcome of Parts A & B.

1. If "Yes" is checked for any line in Part A, then check this box. Continue to Section 2.	❏ Exempt Project
2. If "No" is checked for all lines in Part A, and Part B, then check this box. Continue to Section 2.	❏ Standard Development Project
3. If "No" is checked for all lines in Part A, and "Yes" is checked for at least one of the lines in Part B, then check this box. Continue to Section 2. See the Storm Water Standards Manual for guidance on determining if Hydromodification Management Plan requirements apply.	❏ Priority Development Project

SECTION 2. Construction Storm Water BMP Requirements:
For all projects, complete Part D. If "Yes" is checked for any line in Part D, then continue to Part E.

Part D: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES Permit for Storm Water Discharges Associated with Construction Activities? (See State Water Resources Control Board Order No. 2009-0009-DWQ for rules on enrollment)	❏ Yes ❏ No
2. Does the project propose grading or soil disturbance?	❏ Yes ❏ No
3. Would storm water or urban runoff have the potential to contact any portion of the construction area, including washing and staging areas?	❏ Yes ❏ No
4. Would the project use any construction materials that could negatively affect water quality if discharged from the site (such as, paints, solvents, concrete, and stucco)?	❏ Yes ❏ No
5. Check this box if "Yes" is checked for line 1. Continue to Part E.	❏ SWPPP Required
6. Check this box if "No" is checked for line 1, and "Yes is checked for any line 2-4. Continue to Part E.	❏ WPCP Required
7. Check this box if "No" is checked for all lines 1-4. Part E does not apply.	❏ No Document Required

Part E: Determine Construction Site Priority
This prioritization must be completed with this form, noted on the plans, and included in the SWPPP or WPCP. The City reserves the right to adjust the priority of the projects both before and during construction. [Note: The construction priority does NOT change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by City staff.]

❏ 1. **High Priority**
   a) Projects where the site is 50 acres or more and grading will occur during the wet season
   b) Projects 1 acre or more and tributary to an impaired water body for sediment (e.g., Peñasquitos watershed)
   c) Projects 1 acre or more within or directly adjacent to or discharging directly to a coastal lagoon or other receiving water within a Water Quality Sensitive Area.
   d) Projects subject to phased grading or advanced treatment requirements.

❏ 2 **Medium Priority**. Projects 1 acre or more but not subject to a high priority designation.

❏ 3 **Low Priority.** Projects requiring a Water Pollution Control Plan but not subject to a medium or high priority designation.

Name of Owner or Agent *(Please Print):*	Title:
Signature:	Date:

Appendix C

Temporary Water Pollution Control Plan

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:
- ▧ Temp CONSTRUCTION ENTRANCE/EXIT (Std PLAN T62)
- ⁄⁄TFR⁄⁄ Temp FIBER ROLL (Std PLAN T56)
- ◉ Temp DRAINAGE INLET PROTECTION (Std PLAN T61-T64)
- ‹ Temp CHECK DAM (Std PLAN T57)
- ▨ Temp HYDRAULIC MULCH
- ▨ PROJECT AREA

REGISTERED CIVIL ENGINEER   DATE

JEFFREY J. BURDICK
No. C75396
Exp. 12/31/15
CIVIL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH
SUITE 700
SAN DIEGO, CA 92108

CITY OF SAN DIEGO
525 B STREET
SUITE 750
SAN DIEGO, CA 92101

Temp CHECK DAM (TYP) @ 25.0' OC

"SR-56" LINE

CALTRANS R/W

TFR 211 LF
TFR 191 LF
FR 318 LF
FR 78 LF
FR 113 LF
FR 75 LF
TCE
TFR 53 LF
TFR 100 LF
TFR 84 LF
CALTRANS R/W
TFR 68 LF
TFR 53 LF
TFR 141 LF
TFR 410 LF
TCE

"TMD" LINE

SUNSHINE PATH

6+00.00
PRIMROSE LN.
TORREY MEADOWS DRIVE
CITY R/W
CITY R/W
FR 57 LF

FR 57 LF
FR 48 LF
TFR 86 LF
TFR 55 LF
TCE
FR 117 LF
CALTRANS R/W
TFR 52 LF

SR-56 BIKE PATH
EASTBOUND SR-56
WESTBOUND SR-56

TCE
TFR 50 LF
TFR 51 LF
TFR 53 LF
CALTRANS R/W
CITY R/W
CITY R/W
VIA AMBROSA

TEMPORARY WATER POLLUTION CONTROL PLAN
SCALE: 1" = 50'

WPC-1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL INFORMATION ONLY

BORDER LAST REVISED 7/2/2010

USERNAME => sjohnson1
DGN FILE => 1118_gb01.dgn

RELATIVE BORDER SCALE IS IN INCHES
0 1 2 3

UNIT XXXX

PROJECT NUMBER & PHASE

11140000491

LAST REVISION DATE PLOTTED => 5/19/2015
04-03-15 TIME PLOTTED => 10:33:32 AM

Appendix D

Erosion Control Plan

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. SEE PLANTING SHEETS FOR PERMANENT EROSION CONTROL (HYDROSEED) LOCATIONS, DETAILS AND QUANTITIES.

LEGEND:

‖‖‖ FR ‖‖‖   FIBER ROLL

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	56	5.4/5.8		XX

REGISTERED CIVIL ENGINEER   DATE

REGISTERED PROFESSIONAL ENGINEER
JEFFREY J. BURDICK
No. C75396
Exp. 12/31/15
CIVIL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH
SUITE 700
SAN DIEGO, CA 92108

CITY OF SAN DIEGO
525 B STREET
SUITE 750
SAN DIEGO, CA 92101

"SR-56" LINE

325

CALTRANS R/W

FR 211 LF
FR 191 LF
FR 53 LF
FR 318 LF
FR 78 LF
FR 113 LF
FR 75 LF

TCE

9+76.40 EC

CALTRANS R/W

FR 68 LF
FR 53 LF
FR 41 LF
14+49.91 BC
FR 100 LF
FR 84 LF

FR 410 LF

TCE

"TMD" LINE

SUNSHINE PATH

18+22.42

PRIMROSE LN.

6+00.00

CITY R/W

TORREY MEADOWS DRIVE

FR 57 LF

FR 117 LF
TCE

FR 57 LF
FR 48 LF
FR 86 LF
FR 55 LF
FR 52 LF

CALTRANS R/W

SR-56 BIKE PATH

EASTBOUND SR-56

330

WESTBOUND SR-56

FR 50 LF
FR 51 LF
FR 53 LF

CALTRANS R/W

TCE

CITY R/W

VIA AMBROSA

CITY R/W

CITY R/W

APPROVED FOR EROSION CONTROL INFORMATION ONLY

EROSION CONTROL PLAN

SCALE: 1" = 50'

EC-1

Appendix E

Existing Condition Hydrology Map

(Additional Information in Drainage Study)

EXISTING HYDROLOGY MAP

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	56	PM 5.4/5.8		

REGISTERED CIVIL ENGINEER   DATE

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

LEGEND
Drainage Basin Boundary
Flow Path
Right of Way
Existing Drainage Systems
Flow Direction
Drainage Basins

N

1" = 80'

SHAW PROPERTY - UNIT 1
SHAW PROPERTY - UNIT 2
LXMU PROPERTY

CALTRANS R/W
CITY R/W
TCE

WB STATE ROUTE - 56
EB STATE ROUTE - 56

TORREY MEADOWS DR
VIA SABBIA
VIA SAN LORENZA
PRIMROSE LN
HEALIS PL
TORREY SANTA FE RD

2.0S
3.01
3.02
3.0S
1.01
1.0S
4

BORDER LAST REVISED 7/2/2010

USERNAME =>$USER
DGN FILE => $REQUEST

RELATIVE BORDER SCALE IS IN INCHES

UNIT

PROJECT NUMBER & PHASE   110000049

Appendix F

Proposed Hydrology Map

(Additional Information in Drainage Study)

PROPOSED HYDROLOGY MAP

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	56	PM 5.4/5.8		

REGISTERED CIVIL ENGINEER   DATE

PLANS APPROVAL DATE

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LEGEND
Drainage Basin Boundary
Flow Path
Existing Drainage Systems
Proposed Drainage Systems
Flow Direction
Drainage Basins

1" = 80'

N

TORREY MEADOWS DR
PRIMROSE LN
HEALIS PL
TORREY SANTA FE RD
VIA SAN LORENZA
VIA SABBIA

CALTRANS R/W
CITY R/W
TCE
WB STATE ROUTE - 56
EB STATE ROUTE - 56
SHAW PROPERTY - UNIT 1
SHAW PROPERTY - UNIT 2
LXMU PROPERTY

PROJECT NUMBER & PHASE   110000048

Appendix G

Proposed Drainage Plan and Profiles

NOTES:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

GENERAL NOTES:

1. VERIFY THE EXISTENCE AND HORIZONTAL/VERTICAL LOCATION OF ALL UTILITIES WITHIN THE PROJECT AREA THAT MAY CONFLICT WITH THE PROPOSED CONSTRUCTION. VERIFY THAT ANY UTILITIES SHOWN TO BE RELOCATED BY OTHERS HAVE BEEN RELOCATED AND ARE NO LONGER IN CONFLICT. IMMEDIATELY NOTIFY THE ENGINEER OF ANY REMAINING UTILITY CONFLICTS PRIOR TO THE START OF ANY DEMOLITION WORK.

2. CONTRACTOR TO SURVEY THE INVERTS AT ALL STORM DRAIN CONNECTIONS & NOTIFY ENGINEER IMMEDIATELY OF ANY CONFLICTS PRIOR TO CONSTRUCTION.

LEGEND:

(X) DRAINAGE SYSTEM No.

(x) DRAINAGE UNIT

Drawing labels:

CALTRANS R/W
REMOVE Exist 18" RCP (h)
REMOVE Exist INLET (i)
(g) Exist TYPE B-8 INLET (MOD)
(a) TYPE B INLET
(b) 18" RCP
(a) MOD. TYPE A DRAINAGE DITCH SEE DD SHEETS
CALTRANS R/W
(e) 24" RCP W/ Conc COLLAR
(d) TYPE B-1 INLET L=7' (MOD)
TCE
(h) Exist 24" RCP
(a) TYPE B-1 INLET L=7' (MOD)
(b) 18" RCP
(c) TYPE A CLEANOUT
CITY R/W

"SR-56" LINE
"TMD" LINE
SR-56 BIKE PATH
EASTBOUND SR-56
WESTBOUND SR-56
CALTRANS R/W
SUNSHINE PATH
VIA AMBROSA

24" RCP (c)
TYPE B-1 INLET (b)
24" RCP W/ Conc COLLAR (a)
CALTRANS R/W
24" RCP W/ Conc COLLAR (g)
18" RCP (f)
TYPE B-1 INLET L=7' (MOD) (e)
24" RCP W/ Conc COLLAR (d)
CITY R/W

TCE
24" RCP W/ CONC COLLAR (f)
Exist TYPE B INLET (MOD) (e)
18" RCP W/ CONC COLLAR (d)
TYPE B INLET (c)

PRIMROSE LN.
TORREY MEADOWS DRIVE
CITY R/W
TCE
CITY R/W
6+00.00
9+76.40 EC
14+49.91 BC
18+22.42

ACCURATE FOR DRAINAGE WORK ONLY.

DRAINAGE PLAN
SCALE: 1" = 50'
D-1

BORDER LAST REVISED 7/2/2010
USERNAME => sjohnson1
DGN FILE => 1118_iq01.dgn
RELATIVE BORDER SCALE IS IN INCHES
0 1 2 3
UNIT XXXX
PROJECT NUMBER & PHASE
11140000491
LAST REVISION DATE PLOTTED => 8/20/2015
08-20-15 TIME PLOTTED => 3:08:24 PM

REGISTERED CIVIL ENGINEER   DATE

PLANS APPROVAL DATE

JEFFREY J. BURDICK
No. C75396
Exp. 12/31/15
CIVIL

REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

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CITY OF SAN DIEGO
525 B STREET
SUITE 750
SAN DIEGO, CA 92101

DRAINAGE SYSTEM No. ⟨1a⟩

90° CONTINUES TO 1b

RIM ELEV=359.06
TYPE B INLET (a)
H=6.44

22.25' LT "TMD"
9+83.20

22.25' Rt "TMD"
9+83.20

RIM ELEV=359.06
TYPE B INLET (c)
H=7.29

OG
FG

8in PVC
FL=353.00

INSTALL 0.5"
FLOW CONTROL ORIFICE

FL
352.62

FL
351.77

18in x 40.50 RCP (b)
S=2.10%

PROPOSED 16" WATER
IE 348.30

DRAINAGE SYSTEM No. ⟨1b⟩

96° CONTINUES TO 1C

RIM ELEV=359.06
TYPE B INLET (c)
H=7.29

22.25' Rt "TMD"
9+83.20

22.24' Rt "TMD"
9+61.58

FG
OG

8in PVC
FL=355.50

8in PVC
FL=355.00

INSTALL 0.5"
FLOW CONTROL ORIFICE

INSTALL 0.5"
FLOW CONTROL ORIFICE

FL
351.44

FL
(351.24)

CONC. COLLAR

18in x 16.91 RCP (d)
S=1.18%

DRAINAGE SYSTEM No. ⟨1c⟩

(e) Exist TYPE B INLET

22.24' Rt "TMD"
9+61.58

(g) Exist TYPE B-8 (MOD) INLET
FG

OG

8in PVC
FL=355.50

8in PVC
FL=352.23

FL
(351.36)

INSTALL 0.5"
FLOW CONTROL ORIFICE

FL
(351.03)

CONC. COLLAR

PROPOSED 16" WATER
IE 348.19

FL
(349.03)

INSTALL 0.5"
FLOW CONTROL ORIFICE

Exist 24 in RCP

FL
(350.53)

CONC. COLLAR

(f) 24in x 40.53 RCP
S=1.23%

FL
(347.94)

FL
(347.87)

FL
(347.26)

Exist 18in H x 36in W RCB

⟨1a⟩ ⟨1b⟩ ⟨1c⟩

DRAINAGE PROFILES

SCALE: Horiz 1"=10'
Vert 1"=10'

DP-1

REVISED BY
DATE REVISED
SHANNON JOHNSON
JEFFREY BURDICK
CALCULATED-DESIGNED BY
CHECKED BY
CONSULTANT FUNCTIONAL SUPERVISOR
CLARK FERNON

LAST REVISION DATE PLOTTED => 8/20/2015
08-20-15 TIME PLOTTED => 3:09:14 PM

BORDER LAST REVISED 7/2/2010
USERNAME => sjohnson1
DGN FILE => 1118_ib01.dgn
RELATIVE BORDER SCALE IS IN INCHES
0 1 2 3
UNIT XXXX
PROJECT NUMBER & PHASE
11140000491

REGISTERED CIVIL ENGINEER   DATE

JEFFREY J. BURDICK
No. C75396
Exp.12/31/15
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

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SAN DIEGO, CA 92101

DRAINAGE SYSTEM No. ⟨3⟩

RIM ELEV=358.47
TYPE B-1 INLET (L=7) ⟨b⟩
H=16.60

22.89' Rt "TMD"
15+23.48

PROPOSED 16" WATER
IE 355.30

RIM ELEV=359.03
TYPE B-1 INLET (L=7) ⟨d⟩
H=18.56

22.83' Lt "TMD"
15+23.39

FG
OG

8in PVC
FL=351.09

8in PVC
FL=354.00

8in PVC
FL=355.15

INSTALL 0.5"
FLOW CONTROL ORIFICE

8in PVC
FL=351.08

Conc COLLAR

INSTALL 0.5"
FLOW CONTROL ORIFICE

⟨c⟩ 24in x 41.77' RCP
S= 2.56%

Conc COLLAR

Exist 24in RCP
(S=0.64%)

FL
342.44

FL
341.87

FL
340.80

FL
338.88

24in x 35.00' RCP W/ Conc COLLAR ⟨a⟩
S= 0.64%

FL
342.21

FL
340.47

Exist 24in RCP
(S=-26.11%)

24in x 5.00' RCP W/ Conc COLLAR ⟨e⟩
S= 31.8%

DRAINAGE SYSTEM No. ⟨4⟩

RIM ELEV=355.74'
TYPE B-1 INLET (L=7) ⟨a⟩
H=11.16

27.25' Lt "TMD"
17+25.00

RIM ELEV=355.25'
TYPE A CLEANOUT ⟨c⟩
H=11.76

20.00' Rt "TMD"
17+25.00

27.25' Rt "TMD"
17+25.00

⟨e⟩ RIM ELEV=355.66'
TYPE B-1 INLET (L=7)
H=11.73

OG
FG

⟨b⟩ 18in x 43.26' RCP
S= 1.80%

(2) 8in PVC
FL=350.60

INSTALL 0.5"
FLOW CONTROL ORIFICE

INSTALL 0.5"
FLOW CONTROL ORIFICE

(2) 8in PVC
FL=350.98

FL
344.43

FL
343.86

FL
343.65

⟨f⟩ 18in x 3.75' RCP
S= 5.60%

FL
343.65

⟨3⟩ ⟨4⟩

DRAINAGE PROFILES

SCALE: Horiz 1"=10'
Vert 1"=10'

DP-2

BORDER LAST REVISED 7/2/2010

USERNAME => sjohnson1
DGN FILE => 1118_ib02.dgn

RELATIVE BORDER SCALE
IS IN INCHES
0 1 2 3

UNIT XXXX

PROJECT NUMBER & PHASE

11140000491

LAST REVISION DATE PLOTTED => 8/20/2015
08-20-15 TIME PLOTTED => 3:09:56 PM

DRAINAGE SYSTEM No. ⬡4

Exist TYPE B-1 INLET
Exist TYPE A-8 CLEANOUT

20.00' Rt "TMD"
17+25.00

Ⓒ RIM ELEV=355.25'
TYPE A CLEANOUT
H=11.76

OG
FG

Conc COLLAR
Conc COLLAR

Exist 18in RCP
Exist 24in RCP

FL
(344.55)
FL
(344.40)
FL
(343.81)
FL
(343.56)
FL
(343.45)

Ⓓ 24in × 6.00' RCP
S=0.64%

Ⓗ Exist 24in RCP

24in × 6.00' RCP Ⓖ
S=0.64%
FL
343.52
FL
343.49

DRAINAGE PROFILES

⬡4

SCALE: Horiz 1"=10'
Vert 1"=10'

DP-3

Appendix H

Proposed Preliminary Hydro modification and Treatment Control BMP Map

TYPICAL SECTION FOR TYPE B INLET (MOD) OPENING

3.0'
BASIN
1.0'
FL
FL

EXIST TYPE B INLET (MOD)

8" PERFORATED UNDERDRAIN WRAPPED IN FILTER FABRIC

EXIST TYPE B INLET (MOD)

8" PERFORATED UNDERDRAIN WRAPPED IN FILTER FABRIC

8" PVC CAP

PROP. 18" RCP

FL

EXIST TYPE B INLET (MOD)

PROP. 18" RCP

GENERAL NOTES:

1. VERIFY THE EXISTENCE AND HORIZONTAL/VERTICAL LOCATION OF ALL UTILITIES WITHIN THE PROJECT AREA THAT MAY CONFLICT WITH THE PROPOSED CONSTRUCTION. VERIFY THAT ANY UTILITIES SHOWN TO BE RELOCATED BY OTHERS HAVE BEEN RELOCATED AND ARE NO LONGER IN CONFLICT. IMMEDIATELY NOTIFY THE ENGINEER OF ANY REMAINING UTILITY CONFLICTS PRIOR TO THE START OF ANY DEMOLITION WORK.

2. CONTRACTOR TO SURVEY THE INVERTS AT ALL STORM DRAIN CONNECTIONS & NOTIFY ENGINEER IMMEDIATELY OF ANY CONFLICTS PRIOR TO CONSTRUCTION.

3. THESE PLANS ARE ACCURATE FOR DRAINAGE IMPROVEMENTS ONLY.

4. SEE LANDSCAPE AND IRRIGATION PLANS FOR THE RECONFIGURATION AND/OR REMOVAL OF EXISTING IRRIGATION SYSTEM(S) IN THE PROPOSED BIORETENTION BASIN AREAS.

CONSTRUCTION NOTES:

1. INSTALL CURB INLET TYPE B PER CSDSD SDD-116

2. INSTALL 8" PERFORATED PVC STORM DRAIN PER DETAIL

3. INSTALL CURB CUTS PER DETAIL

48.06' L± "TMD" 9+03.57
IE 352.55
ANGLE POINT, 22.5° ELBOW

BIOFILTRATION BASIN A

22.50' L± "TMD" 9+80.69
IE 353.00

52.89' L± "TMD" 8+50.67
IE 352.84

22.50' L± "TMD" 9+63.61
IE 352.24

18.50' L± "TMD" 8+56.19

25.68' L± "TMD" 9+57.52
IE 352.24

57.68' L± "TMD" 8+24.26
IE 353.00

22.50' L± "TMD" 9+01.70
IE 354.58

22.50' L± "TMD" 8+52.89
IE 356.27

22.50' L± "TMD" 8+34.59
IE 356.91

18.50' L± "TMD" 7+92.77

22.50' L± "TMD" 7+87.32
IE 358.56

22.50' L± "TMD" 9+19.00
IE 353.97

22.50' L± "TMD" 7+68.95
IE 359.20

IE 356.50

25.20' L± "TMD" 9+58.94
IE 352.50

BIOFILTRATION BASIN B

18.50' L± "TMD" 9+69.34

18.50' L± "TMD" 7+21.25

18.50' R± "TMD" 8+68.72

22.50' L± "TMD" 7+14.17
IE 361.10

22.50' L± "TMD" 6+95.88
IE 361.74

22.50' R± "TMD" 9+58.84
IE 355.00

18.50' R± "TMD" 7+92.77

22.50' R± "TMD" 9+63.71
IE 355.00

18.50' L± "TMD" 6+50.17

22.50' L± "TMD" 6+47.15
IE 363.44

22.50' R± "TMD" 9+80.69
IE 355.50

22.50' L± "TMD" 6+28.81
IE 364.08

22.50' R± "TMD" 7+90.37
IE 359.74

22.50' R± "TMD" 8+65.11
IE 357.64

22.50' R± "TMD" 7+70.32
IE 360.30

22.50' R± "TMD" 8+45.45
IE 358.19

18.50' R± "TMD" 7+21.25

22.50' R± "TMD" 7+18.67
IE 361.75

22.50' R± "TMD" 6+98.39
IE 362.32

BIOFILTRATION BASIN C

18.50' R± "TMD" 6+50.17

22.90' L± "TMD" 5+76.21
IE 365.91

22.50' R± "TMD" 6+44.52
IE 363.83

19.19' L± "TMD" 5+81.84

22.50' R± "TMD" 6+24.60
IE 364.39

18.54' R± "TMD" 5+81.84

21.82' R± "TMD" 5+75.88
IE 365.76

DRAINAGE DETAILS
SCALE: 1"=20'

DD-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

REVISED BY   DATE REVISED

SHANNON JOHNSON   JEFFREY BURDICK

CALCULATED-DESIGNED BY   CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR   CLARK FERNON

BORDER LAST REVISED 7/2/2010

USERNAME => sjohnson1
DGN FILE => 1118_ic01.dgn

RELATIVE BORDER SCALE IS IN INCHES
0 1 2 3

LAST REVISION 08-20-15
DATE PLOTTED => 8/20/2015
TIME PLOTTED => 3:11:33 PM

UNIT XXXX   PROJECT NUMBER & PHASE   11140000491

REGISTERED CIVIL ENGINEER   DATE

PLANS APPROVAL DATE

JEFFREY J. BURDICK
No. C75396
Exp. 12/31/15
CIVIL

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH
SUITE 700
SAN DIEGO, CA 92108

CITY OF SAN DIEGO
525 B STREET
SUITE 750
SAN DIEGO, CA 92101

TYPICAL SECTION FOR TYPE B-1 INLET (MOD) OPENING

7.0' BASIN
3.0'
FL
TYPE B-1 CURB INLET (MOD)
8" PERFORATED UNDERDRAIN WRAPPED IN FILTER FABRIC
PROP. 18" RCP

FL
TYPE B-1 CURB INLET (MOD)
8" PERFORATED UNDERDRAIN WRAPPED IN FILTER FABRIC
8" PVC CAP
PROP. 18" RCP

GENERAL NOTES:

1. VERIFY THE EXISTENCE AND HORIZONTAL/VERTICAL LOCATION OF ALL UTILITIES WITHIN THE PROJECT AREA THAT MAY CONFLICT WITH THE PROPOSED CONSTRUCTION. VERIFY THAT ANY UTILITIES SHOWN TO BE RELOCATED BY OTHERS HAVE BEEN RELOCATED AND ARE NO LONGER IN CONFLICT. IMMEDIATELY NOTIFY THE ENGINEER OF ANY REMAINING UTILITY CONFLICTS PRIOR TO THE START OF ANY DEMOLITION WORK.

2. CONTRACTOR TO SURVEY THE INVERTS AT ALL STORM DRAIN CONNECTIONS & NOTIFY ENGINEER IMMEDIATELY OF ANY CONFLICTS PRIOR TO CONSTRUCTION.

3. THESE PLANS ARE ACCURATE FOR DRAINAGE IMPROVEMENTS ONLY.

4. SEE LANDSCAPE AND IRRIGATION PLANS FOR THE RECONFIGURATION AND/OR REMOVAL OF EXISTING IRRIGATION SYSTEM(S) IN THE PROPOSED BIORETENTION BASIN AREAS.

CONSTRUCTION NOTES:

1. INSTALL CURB INLET TYPE B PER CSDSD SDD-116

2. INSTALL 8" PERFORATED PVC STORM DRAIN PER DETAIL

3. INSTALL CURB CUTS PER DETAIL

16.03' Lt "TMD" 15+09.91
IE 355.28
ANGLE POINT

23.78' Lt "TMD" 15+20.93
IE 355.15

24.14' Lt "TMD" 14+64.69
IE 355.75

23.89' Lt "TMD" 15+25.71
IE 351.08

25.93' Lt "TMD" 15+37.57
IE 351.20
ANGLE POINT

18.50' Lt "TMD" 14+50.96

19.80' Lt "TMD" 15+52.05

27.55' Lt "TMD" 16+02.04
IE 351.88
HIGH POINT

BIOFILTRATION BASIN D

18.50' Rt "TMD" 14+85.31

22.70' Lt "TMD" 16+67.55

29.95' Lt "TMD" 17+06.34
IE 350.78
ANGLE POINT

28.25' Lt "TMD" 17+22.62
IE 350.60

28.26' Lt "TMD" 17+27.36
IE 350.60

25.00' Rt "TMD" 14+82.12
IE 355.50

30.41' Lt "TMD" 17+50.43
IE 350.85
ANGLE POINT

25.20' Rt "TMD" 15+07.29
IE 354.53
ANGLE POINT

23.60' Rt "TMD" 15+20.77
IE 354.00

23.74' Rt "TMD" 15+25.71
IE 351.09

28.24' Rt "TMD" 16+17.67
IE 351.96
HIGH POINT

BIOFILTRATION BASIN E

25.98' Rt "TMD" 15+35.86
IE 351.19
ANGLE POINT

30.34' Lt "TMD" 17+69.43
IE 351.05

19.92' Rt "TMD" 15+52.05

23.11' Rt "TMD" 16+67.55

23.50' Lt "TMD" 17+35.80

30.50' Rt "TMD" 17+11.15
IE 351.08
ANGLE POINT

28.02' Rt "TMD" 17+21.84
IE 350.98

27.83' Rt "TMD" 17+27.13
IE 350.98

24.00' Rt "TMD" 17+33.48

30.50' Rt "TMD" 17+39.15
IE 351.10
ANGLE POINT

30.50' Rt "TMD" 17+54.71
IE 351.25

DRAINAGE DETAILS

SCALE: 1"=20'

DD-2

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

BORDER LAST REVISED 7/2/2010

USERNAME => sjohnson1
DGN FILE => 1118_ic02.dgn

RELATIVE BORDER SCALE IS IN INCHES
0 1 2 3

UNIT XXXX

PROJECT NUMBER & PHASE

11140000491

LAST REVISION 08-20-15
DATE PLOTTED => 8/20/2015
TIME PLOTTED => 3:13:34 PM

REVISED BY
DATE REVISED
SHANNON JOHNSON
JEFFREY BURDICK
CALCULATED-DESIGNED BY
CHECKED BY
CLARK FERNON
CONSULTANT FUNCTIONAL SUPERVISOR

Appendix I

Preliminary Hydro modification Analysis

(BMP Sizing Calculator)

BMP Sizing Spreadsheet V1.04

Project Name:	Torrey Meadows Drive Overcrossing
Project Applicant:	T.Y. Lin International
Jurisdiction:	County of San Diego
Parcel (APN):	
Hydrologic Unit:	Penasquitos
Rain Gauge:	Oceanside
Total Project Area (sf):	116883.73
Channel Susceptibility:	High

BMP Sizing Spreadsheet V1.04		
Project Name:	orrey Meadows Drive Overcrossin	Hydrologic Unit:	Penasquitos
Project Applicant:	T.Y. Lin International	Rain Gauge:	Oceanside
Jurisdiction:	County of San Diego	Total Project Area:	116883.73
Parcel (APN):		Low Flow Threshold:	0.1Q2
BMP Name:	BMP #1.1 (Basin A)	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
1.1	7100.415	D	Flat	Landscape	0.1	0.13	0.1083	0.078	92	77	55
1.2	12825.33	D	Flat	Concrete	1.0	0.13	0.1083	0.078	1667	1389	1000
Total BMP Area	19925.745							Minimum BMP Size	1759.598295	1466	1056
								Proposed BMP Size*	3835.03	2397	2301
								Soil Matrix Depth	24.00	in	
								Minimum Ponding Depth	3.09	in	
								Maximum Ponding Depth	8.70	in	
								Selected Ponding Depth	6.00	in	

Describe the BMP's in sufficient detail in your SWMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
Designated Staff have final review and approval authority over the project design.

This Sizing Calculator has been developed in compliance with the Countywide Model SUSMP. For questions or concerns please contact the jurisdiction in which your project is located.

	BMP Sizing Spreadsheet V1.04		
Project Name:	y Meadows Drive Overcr	Hydrologic Unit:	Penasquitos
Project Applicant:	T.Y. Lin International	Rain Gauge:	Oceanside
Jurisdiction:	County of San Diego	Total Project Area:	116883.73
Parcel (APN):		Low Flow Threshold:	0.1Q2
BMP Name	BMP #1.1 (Basin A)	BMP Type:	Bioretention

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q_2 (cfs)	Orifice Area (in2)
		Soil Type	Cover	Slope				
1.1	Oceanside	D	Scrub	Flat	0.175	0.163	0.003	0.07
1.2	Oceanside	D	Scrub	Flat	0.175	0.294	0.005	0.13

0.008	0.20	0.50
Tot. Allowable Orifice Flow (cfs)	Tot. Allowable Orifice Area (in2)	Max Orifice Diameter (in)

0.008	0.20	0.50
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	66.2

BMP Sizing Spreadsheet V1.04		
Project Name:	Torrey Meadows Drive Overcrossing	Hydrologic Unit:	Penasquitos
Project Applicant:	T.Y. Lin International	Rain Gauge:	Oceanside
Jurisdiction:	County of San Diego	Total Project Area:	116883.73
Parcel (APN):		Low Flow Threshold:	0.1Q2
BMP Name:	BMP #1.2 (Basin B)	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
1.1	7100.415	D	Flat	Landscape	0.1	0.13	0.1083	0.078	92	77	55
1.2	12825.33	D	Flat	Concrete	1.0	0.13	0.1083	0.078	1667	1389	1000
Total BMP Area	19925.745							Minimum BMP Size	1759.598295	1466	1056
								Proposed BMP Size*	2344.31	1465	1407
								Soil Matrix Depth	24.00	in	
								Minimum Ponding Depth	6.00	in	
								Maximum Ponding Depth	14.22	in	
								Selected Ponding Depth	6.00	in	

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		BMP Sizing Spreadsheet V1.04		
Project Name:	y Meadows Drive Overcr	Hydrologic Unit:		Penasquitos
Project Applicant:	T.Y. Lin International	Rain Gauge:		Oceanside
Jurisdiction:	County of San Diego	Total Project Area:		116883.73
Parcel (APN):		Low Flow Threshold:		0.1Q2
BMP Name	BMP #1.2 (Basin B)	BMP Type:		Bioretention

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q_2 (cfs)	Orifice Area (in2)
		Soil Type	Cover	Slope				
1.1	Oceanside	D	Scrub	Flat	0.175	0.163	0.003	0.07
1.2	Oceanside	D	Scrub	Flat	0.175	0.294	0.005	0.13

0.008	0.20	0.50
Tot. Allowable Orifice Flow (cfs)	Tot. Allowable Orifice Area (in2)	Max Orifice Diameter (in)

0.008	0.20	0.50
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	40.5

BMP Sizing Spreadsheet V1.04		
Project Name:	orrey Meadows Drive Overcrossin	Hydrologic Unit:	Penasquitos
Project Applicant:	T.Y. Lin International	Rain Gauge:	Oceanside
Jurisdiction:	County of San Diego	Total Project Area:	116883.73
Parcel (APN):		Low Flow Threshold:	0.1Q2
BMP Name:	BMP #2 (Basin C)	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
2.1	6662.17	D	Flat	Landscape	0.1	0.13	0.1083	0.078	87	72	52
2.2	27813.29	D	Flat	Concrete	1.0	0.13	0.1083	0.078	3616	3012	2169
Total BMP Area	34475.46							Minimum BMP Size	3702.33591	3084	2221
								Proposed BMP Size*	2218.81	1109	1331
								Soil Matrix Depth	18.00	in	
								Minimum Ponding Depth	16.68	in	
								Maximum Ponding Depth	15.03	in	
								Selected Ponding Depth	6.00	in	

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BMP Sizing Spreadsheet V1.04		
Project Name:	y Meadows Drive Overcr	Hydrologic Unit:	Penasquitos
Project Applicant:	T.Y. Lin International	Rain Gauge:	Oceanside
Jurisdiction:	County of San Diego	Total Project Area:	116883.73
Parcel (APN):		Low Flow Threshold:	0.1Q2
BMP Name	BMP #2 (Basin C)	BMP Type:	Bioretention

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q$_2$ (cfs)	Orifice Area (in2)
		Soil Type	Cover	Slope				
2.1	Oceanside	D	Scrub	Flat	0.175	0.153	0.003	0.07
2.2	Oceanside	D	Scrub	Flat	0.175	0.639	0.011	0.27

0.014	0.34	0.66
Tot. Allowable Orifice Flow (cfs)	Tot. Allowable Orifice Area (in2)	Max Orifice Diameter (in)

0.008	0.20	0.50
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	38.3

BMP Sizing Spreadsheet V1.04		
Project Name:	orrey Meadows Drive Overcrossin	Hydrologic Unit:	Penasquitos
Project Applicant:	T.Y. Lin International	Rain Gauge:	Oceanside
Jurisdiction:	County of San Diego	Total Project Area:	116883.73
Parcel (APN):		Low Flow Threshold:	0.1Q2
BMP Name:	BMP #3 (Basin D)	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
3.1	8191.52	D	Flat	Landscape	0.1	0.13	0.1083	0.078	106	89	64
3.2	13579.29	D	Flat	Concrete	1.0	0.13	0.1083	0.078	1765	1471	1059
Total BMP Area	21770.81							Minimum BMP Size	1871.79746	1559	1123
								Proposed BMP Size*	2987.61	1494	1793
								Soil Matrix Depth	18.00	in	
								Minimum Ponding Depth	6.26	in	
								Maximum Ponding Depth	11.16	in	
								Selected Ponding Depth	6.00	in	

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		BMP Sizing Spreadsheet V1.04		
Project Name:	y Meadows Drive Overcr	Hydrologic Unit:		Penasquitos
Project Applicant:	T.Y. Lin International	Rain Gauge:		Oceanside
Jurisdiction:	County of San Diego	Total Project Area:		116883.73
Parcel (APN):		Low Flow Threshold:		0.1Q2
BMP Name	BMP #3 (Basin D)	BMP Type:		Bioretention

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q₂ (cfs)	Orifice Area (in2)
		Soil Type	Cover	Slope				
3.1	Oceanside	D	Scrub	Flat	0.175	0.188	0.003	0.08
3.2	Oceanside	D	Scrub	Flat	0.175	0.312	0.005	0.13

0.009	0.21	0.52
Tot. Allowable Orifice Flow (cfs)	Tot. Allowable Orifice Area (in2)	Max Orifice Diameter (in)

0.008	0.20	0.50
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	51.6

BMP Sizing Spreadsheet V1.04		
Project Name:	Torrey Meadows Drive Overcrossing	Hydrologic Unit:	Penasquitos
Project Applicant:	T.Y. Lin International	Rain Gauge:	Oceanside
Jurisdiction:	County of San Diego	Total Project Area:	116883.73
Parcel (APN):		Low Flow Threshold:	0.1Q2
BMP Name:	BMP #4 (Basin E)	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
4.1	7638.55	D	Flat	Landscape	0.1	0.13	0.1083	0.078	99	83	60
4.2	13147.43	D	Flat	Concrete	1.0	0.13	0.1083	0.078	1709	1424	1025
Total BMP Area	20785.98							Minimum BMP Size	1808.46705	1507	1085
								Proposed BMP Size*	2427.08	1214	1456
								Soil Matrix Depth	18.00	in	
								Minimum Ponding Depth	7.45	in	
								Maximum Ponding Depth	13.74	in	
								Selected Ponding Depth	6.00	in	

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			BMP Sizing Spreadsheet V1.04					
	Project Name:		y Meadows Drive Overcr	Hydrologic Unit:		Penasquitos		
	Project Applicant:		T.Y. Lin International	Rain Gauge:		Oceanside		
	Jurisdiction:		County of San Diego	Total Project Area:		116883.73		
	Parcel (APN):			Low Flow Threshold:		0.1Q2		
	BMP Name		BMP #4 (Basin E)	BMP Type:		Bioretention		

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q$_2$ (cfs)	Orifice Area (in2)
		Soil Type	Cover	Slope				
4.1	Oceanside	D	Scrub	Flat	0.175	0.175	0.003	0.07
4.2	Oceanside	D	Scrub	Flat	0.175	0.302	0.005	0.13

0.008	0.20	0.51
Tot. Allowable Orifice Flow (cfs)	Tot. Allowable Orifice Area (in2)	Max Orifice Diameter (in)

0.008	0.20	0.50
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	41.9

Appendix J

Simple Sizing Method for Biofiltration BMPs

DMA 1

	Simple Sizing Method for Biofiltration BMPs	Worksheet B-5.1 Model BMP Design Manual January 2015	
1	Remaining DCV after implementing retention BMPs	2413.73	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	0	inches
7	Assumed surface area of the biofiltration BMP		sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	0	cubic-feet
10	DCV that requires biofiltration [Line 1 -Line 9]	2413.725	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6	inches
12	Media Thickness [18 inches minimum]	24	inches
13	Aggregate Storage above underdrain invert (12 inches typical)- use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 +(Line 12 x Line 14) + (Line 13 x Line 15)]	70.8	inches
19	Total Depth Treated [Line 17 + Line 18]	100.8	inches
Option 1-Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	3620.588	cubic-feet
21	Required Footprint [Line 20/Line 19] x 12	431.0224	sq-ft
Option 2-Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	1810.294	cubic-feet
23	Required Footprint [Line 22/Line 18] x 12	306.8295	sq-ft
Footprint of the BMP			
24	Impervious area draining to the BMP	25650.66	sq-ft
25	Footprint of the BMP = Minimum (Line 21, Line 23, 3% of Line 24)	306.8295	sq-ft

DMA 2

Simple Sizing Method for Biofiltration BMPs	Worksheet B-5.1 Model BMP Design Manual January 2015		
1 Remaining DCV after implementing retention BMPs		1661.21	cubic-feet
Partial Retention			
2 Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible		0	in/hr
3 Allowable drawdown time for aggregate storage below the underdrain		36	hours
4 Depth of runoff that can be infiltrated [Line 2 x Line 3]		0	inches
5 Aggregate pore space		0.4	in/in
6 Required depth of gravel below the underdrain [Line 4/ Line 5]		0	inches
7 Assumed surface area of the biofiltration BMP			sq-ft
8 Media retained pore space		0.1	in/in
9 Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7		0	cubic-feet
10 DCV that requires biofiltration [Line 1 -Line 9]		1661.215	cubic-feet
BMP Parameters			
11 Surface Ponding [6 inch minimum, 12 inch maximum]		6	inches
12 Media Thickness [18 inches minimum]		18	inches
13 Aggregate Storage above underdrain invert (12 inches typical)- use 0 inches for sizing if the aggregate is not over the entire bottom surface area		12	inches
14 Media available pore space		0.2	in/in
15 Media filtration rate to be used for sizing		5	in/hr
Baseline Calculations			
16 Allowable Routing Time for sizing		6	hours
17 Depth filtered during storm [Line 15 x Line 16]		30	inches
18 Depth of Detention Storage [Line 11 +(Line 12 x Line 14) + (Line 13 x Line 15)]		69.6	inches
19 Total Depth Treated [Line 17 + Line 18]		99.6	inches
Option 1-Biofilter 1.5 times the DCV			
20 Required biofiltered volume [1.5 x Line 10]		2491.822	cubic-feet
21 Required Footprint [Line 20/Line 19] x 12		300.2196	sq-ft
Option 2-Store 0.75 of remaining DCV in pores and ponding			
22 Required Storage (surface + pores) Volume [0.75 x Line 10]		1245.911	cubic-feet
23 Required Footprint [Line 22/Line 18] x 12		214.8123	sq-ft
Footprint of the BMP			
24 Impervious area draining to the BMP		27813.29	sq-ft
25 Footprint of the BMP = Minimum (Line 21, Line 23, 3% of Line 24)		214.81	sq-ft

DMA 3

Simple Sizing Method for Biofiltration BMPs	Worksheet B-5.1 Model BMP Design Manual January 2015		
1	Remaining DCV after implementing retention BMPs	1014.83	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	0	inches
7	Assumed surface area of the biofiltration BMP		sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	0	cubic-feet
10	DCV that requires biofiltration [Line 1 -Line 9]	1014.825	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical)- use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 +(Line 12 x Line 14) + (Line 13 x Line 15)]	69.6	inches
19	Total Depth Treated [Line 17 + Line 18]	99.6	inches
Option 1-Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	1522.238	cubic-feet
21	Required Footprint [Line 20/Line 19] x 12	183.4021	sq-ft
Option 2-Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	761.1188	cubic-feet
23	Required Footprint [Line 22/Line 18] x 12	131.2274	sq-ft
Footprint of the BMP			
24	Impervious area draining to the BMP	13579.29	sq-ft
25	Footprint of the BMP = Minimum (Line 21, Line 23, 3% of Line 24)	131.23	sq-ft

DMA 4

	Simple Sizing Method for Biofiltration BMPs	Worksheet B-5.1 Model BMP Design Manual January 2015	
1	Remaining DCV after implementing retention BMPs	973.94	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	0	inches
7	Assumed surface area of the biofiltration BMP		sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	0	cubic-feet
10	DCV that requires biofiltration [Line 1 -Line 9]	973.9421	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical)- use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 +(Line 12 x Line 14) + (Line 13 x Line 15)]	69.6	inches
19	Total Depth Treated [Line 17 + Line 18]	99.6	inches
Option 1-Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	1460.913	cubic-feet
21	Required Footprint [Line 20/Line 19] x 12	176.0136	sq-ft
Option 2-Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	730.4566	cubic-feet
23	Required Footprint [Line 22/Line 18] x 12	125.9408	sq-ft
Footprint of the BMP			
24	Impervious area draining to the BMP	13147.43	sq-ft
25	Footprint of the BMP = Minimum (Line 21, Line 23, 3% of Line 24)	125.94	sq-ft

Appendix K

BMP Inspection, Operation and Maintenance Plan

PERMANENT BMP INSPECTION, OPERATION, AND MAINTENANCE REQUIREMENTS:

BMP	ROUTINE ACTION	MAINTENANCE INDICATOR	MAINTENANCE ACTIVITY	FREQUENCY	RESPONSIBLE PARTY
Bioretention	Inspection of bioretention facilities	Visual observation for evidence of erosion, standing water, trash and debris, sediment, clogging, and condition of vegetation.	Remove sediment, trash and debris to prevent clogging and standing water. Prune and weed excessive vegetation. Repair bioretention basin to ensure proper function.	2/year. Prior to the start and at the end of the wet season.	Owner

BMP: Bioretention Area MAINTENANCE ACTIVITIES														
ROUTINE ACTION	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	Frequency (# of times per year)	Hours per Event	Average Labor Crew Size	Avg. (Pro-Rated) Labor Rate/Hr. ($)	Equipment	Equipment Cost/Hour ($)	Materials & Incidentals Cost or Disposal Cost/Event ($)	Total cost per visit ($)	Total cost per year ($)
Vegetation Management for Aesthetics (optional)	Average vegetation height greater than 12-inches, emergence of trees or woody vegetation,	Visual observation and random measurements through out the side slope area	Annually, prior to start of wet season	Cut vegetation to an average height of 6-inches and remove trimmings. Remove any trees, or woody vegetation.	1.0	2.0	2	$ 74.97	Utility Truck	$ 14.39	$ 50.00	$ 379	$ 379
Soil Repair	Evidence of erosion	Visual observation	Annually, prior to start of wet season	Reseed/revegetate barren spots prior to wet season.	1.0	4.0	2	$ 74.97	Utility Truck	$ 14.39	$ 150.00	$ 807	$ 807
Standing Water	Standing water for more than 96 hrs	Visual observation	Annually, 96 hours after a target storm (0.60 in) event	Drain facility. Corrective action prior to wet season. Consult engineers if immediate solution is not evident.	1.0	1.0	2	$ 74.97	Utility Truck	$ 14.39		$ 164	$ 164
Trash and Debris	Trash and Debris present	Visual observation	Annually, prior to start of wet season	Remove and dispose of trash and debris	1.0	2.0	2	$ 74.97	Utility Truck	$ 14.39		$ 329	$ 329
Sediment Management	Sediment depth exceeds 10% of the facility design	Measure depth at apparent maximum and minimum accumulation of sediment. Calculate average depth	Annually, prior to start of wet season	Remove and properly dispose of sediment. Regrade if necessary. (expected every 2 years)	0.5	8.0	2	$ 74.97	Utility Truck, 10-15 yd Truck, Backhoe	$ 56.02	$ 400.00	$ 2,048	$ 1,024
Underdrains	Evidence of Clogging	Visual Observation	Annually, prior to start of wet season	Corrective action prior to wet season. Consult engineers if immediate solution is not evident.	1.0	0.5	2	$ 74.97	Utility Truck	$ 14.39		$ 82	$ 82
General Maintenance Inspection	Inlet structures, outlet structures, side slopes or other features damaged, significant erosion, burrows, emergence of trees or woody vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Annually, prior to start of wet season	Corrective action prior to wet season. Consult engineers if immediate solution is not evident.	1.0	1.0	2	$ 74.97	Utility Truck	$ 14.39		$ 164	$ 164
Reporting					1.0	3.0	1	$ 74.97				$ 225	$ 225
Average Annual Total					32.0								$ 3,174

Small Bioretention (500 sf)	32.0		$ 3,174
Medium Bioretention (2000 sf)	44.0		$ 4,078
Large Bioretention (4000 sf)	68.0		$ 5,877

Labor Rate	$74.97/hr

Equipment	Equipment Cost
Utility Truck	$14.39/hr
10-15 yd truck	$28.27/hr
Backhoe	$13.36/hr
Vactor	$62.70/hr
Sweeper	$123.26/hr

Appendix L

Drainage Study

Torrey Meadows Drive

DRAFT Drainage Study

August 2015

Prepared by:
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404 Camino Del Rio South, Suite 700
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City of San Diego
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San Diego, Ca 92101

Caltrans District 11
4050 Taylor Street
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Jeff Burdick, P.E. REGISTERED CIVIL ENGINEER	**DATE**

DRAFT Drainage Study for the Torrey Meadows Drive Overcrossing
8/17/15
Page i of iv

Table of Contents

LIST OF APPENDICES

ABBREVIATIONS

ac	Acre(s)
ac-ft	Acre feet
cfs	Cubic feet per second
CY	Cubic yard(s)
ft	Feet
in	Inch(es)
in/hr	Inch(es) per hour
min	Minute(s)
SF	Square feet

ACRONYMS

A	Drainage Area
C	Runoff Coefficient
cfs	Cubic feet per second
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	FEMA Flood Insurance Rate Maps
FS	Finished Surface
HGL	Hydraulic Grade Line
HSG	Hydrologic Soil Groups
I	Rainfall Intensity
MODRAT	Modified Rational Method
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
P_{24}	24-Hour Precipitation
Q	Discharge / Runoff
RCP	Reinforced Concrete Pipe
ROW	Right-of-way
SCS	Soil Conservation Service
T_c	Time of Concentration
TC	Top of Curb
USDOT	United States Department of Transportation
USLE	Universal Soil Loss Equation
V	Volume

1. INTRODUCTION

1.1 Study Overview and Purpose

Project Purpose and Description

The City of San Diego, in cooperation with the California Department of Transportation (Caltrans) District 11 and Kilroy Realty, is evaluating alternatives to connect segments of Torrey Meadows Drive to the north and south of State Route 56 (SR-56) with a bridge over the highway. The project proposes to construct a bridge overcrossing SR-56 0.5 miles west of Camino del Sur (PM 6.12) in the Torrey Highlands community of San Diego.

The purpose of the project is to connect the divided community of Torrey Highlands, which is currently bisected by SR-56. In addition, the execution of this project would physically integrate Torrey Highlands to the greater Rancho Peñasquitos and Santaluz communities north of SR-56. The proposed bridge would provide residents an alternative way of entering and leaving their cul-de-sac community.

Purpose of Study
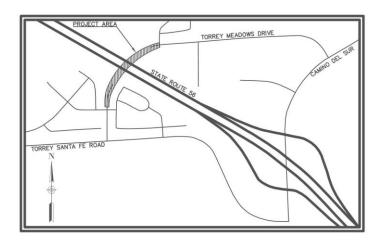
The objectives of this drainage study are as follows:

- To quantify the magnitude and frequency of flows from tributary areas including new systems for off-site and on-site flows.
- Ensure the design storm is conveyed without causing objectionable backwater or tailwater, damage to surrounding properties, excessive flow velocities, excessive scour, impacts to traffic, hydroplaning effects, or flooding of other facilities.

1.2 Location

The project is located in San Diego County in the City of San Diego on SR-56 0.5 miles feet west of Camino del Sur (PM 6.12) in the Torrey Highlands community.

Figure 1: Location Map

1.3 Existing Site Description

Torrey Meadows Drive is a collector street located in a mixed-use development overlooking State Route 56. Currently, Torrey Meadows Drive is 40' wide with on-street parking allowed along the entirety of both segments. Torrey Meadows Drive is on relatively flat terrain and is located 35 feet above SR-56, forming a depression between both segments. The gap between the north and south segments of Torrey Meadows Drive is traversed by SR-56, the SR-56 Bike Trail, a drainage ditch, and two slopes with grades steeper than 4:1. North of SR-56, Torrey Meadows Drive can only be accessed through Camino Del Sur and Via Sabbia. Similarly, south of SR-56, Torrey Meadows Drive is only accessible via Torrey Santa Fe Road. At this moment, there are no signalized intersections within the project limits, or within immediate proximity to the site.

1.4 Hydrologic Setting

The project is located within an area designated by the San Diego Regional Water Quality Control Board as the Peñasquitos Hydrologic Unit, in the Miramar Reservoir Hydrologic Area, identified as Hydrologic Sub-Area 906.10. More specifically, the project is located within the Carmel Valley-Poway Creek Watershed. The watershed encompassing the project area drains into McGonigle Canyon Creek, a tributary of Poway Creek, which discharges directly into the Pacific Ocean.

Runoff from local streets is conveyed by curb and gutter to numerous storm drain inlets which ultimately discharge into McGonigle Canyon Creek. Prior to discharge into McGonigle Canyon Creek, storm water is treated in a series of Vortechnics hydrodynamic separator treatment facilities.

Runoff in State Route 56 is conveyed by concrete and grass lined drainage swales into grated inlets along the shoulders of the highway. The grated inlets connect to storm drains that flow under SR-56 to a concrete-lined drainage ditch that runs along the centerline of the roadway. Finally, runoff collected in the drainage ditch is flows west along the median to its final discharge point at McGonigle Canyon.

1.5 FEMA Flood Plain Information

The FEMA Flood Insurance Rate Maps (FIRM) show that the project area lies in Zone X (See **Appendix A**). Zone X delineates areas of 0.2% annual chance flood, areas of 1% annual chance flood with average depths of less than one foot, or with drainage areas less than one square mile.

2. METHODOLOGY

2.1 Compliance with Regulations
All rainfall, storm runoff, storm drain capacity calculations, and detention calculations comply with the criteria for design outlined in the latest version of the Caltrans' Highway Design Manual (HDM).

2.2 Hydrologic Criteria

Existing Conditions
Due to the recent development of the Torrey Highlands property, the Shaw Properties, the LMXU property, and the recent construction of SR-56, the existing hydrology within the project area is well documented. The existing hydrology studies prepared for the associated developments are intended to facilitate full build-out conditions, and the existing drainage facilities were designed to convey the 100-year storm event. Therefore, limited existing drainage condition calculations were performed, and 100-year storm event peak discharges were determined from the associated drainage studies and as-builts. The existing drainage studies have been reviewed and incorporated into this study. The as-built information showing the existing 100-year storm event peak discharges are attached in **Appendix B**.

Design Storm

The HDM separates runoff into two categories: roadway drainage and cross drainage. Roadway drainage, consisting of storm water collected, conveyed and removed from the traveled way, shoulders and adjacent regions, is facilitated by inlets, asphalt dikes, curb and gutters, overside drains and roadside ditches. These drainage structures are designed for the 25-year storm event with allowable water spread less than the shoulder width. Cross drainage, which describes storm water transferred from one side of a roadway to the other, is conveyed through cross culverts. The designs storm for cross drainage are typically the 10-year and 100-year events.

The design storms analyzed for this study were the 25-year frequency storm event for roadway drainage and the 100-year frequency storm event for sizing of drainage systems.

Time of Concentration
The time of concentration (T_C) is the time it takes for rain in the most hydrologically remote part of the watershed to reach the outlet. It is the cumulative sum of travel times required for sheet flow, shallow concentrated flow and channel flow. The recommended minimum time of concentration is 5 minutes.

Sheet Flow
As described in Section 816.6 of the HDM, sheet flow is flow of uniform depth over plane surfaces and usually occurs for some distance after rain falls on the ground. The maximum flow depth is usually less than 0.8 inches - 1.2 inches. For unpaved areas, sheet flow normally exists for a distance less than 80 feet - 100 feet. An upper limit of 300 feet is recommended for paved areas. Travel time for sheet flow can be estimated using the Kinematic Wave Solution:

$$T_{t(sh)} = \frac{0.42 * L^{4/5} * n^{4/5}}{P_2^{1/2} * S^{2/5}}$$

Where: $T_{t(sh)}$ = Sheet flow travel time in minutes
L = Length of flow path length in feet
n = Manning's roughness coefficient (HDM Table 816.6A)
P_2 = 2-year, 24-hour rainfall depth in inches (NOAA Atlas 14, Volume 6, V2)
S = Slope of flow path in ft/ft

Shallow Concentrated Flow
As described in Section 816.6 of the HDM, shallow concentrated flow occurs after short distances when sheet flow tends to concentrate in rills and gullies. At this point, the Upland Method is typically used when calculating velocity for shallow concentrated flow. Average velocities for the Upland Method can be taken directly from HDM Figure 816.6 or may be calculated from the following equation:

$$V = 3.28 * k * S^{1/2}$$

Where: V = Velocity in ft/sec
k = Intercept Coefficient (HDM Table 816.6B)
S = Slope of flow path in ft/ft

Travel time can be calculated from the following equation:

$$T_{t(sc)} = \frac{L}{60 * V}$$

Where: $T_{t(sc)}$ = Shallow concentrated flow travel time in minutes
V = Velocity in ft/sec
L = Length of flow path length in feet

Channel Flow
Channel Flow travel times can be estimated using the Manning Equation if the channel characteristics and geometry are known.

$$V = \frac{1.486 * R^{2/3} * S^{1/2}}{n}$$

Where: V = Mean velocity in ft/sec
n = Manning's roughness coefficient (HDM Table 864.3A)
S = Slope of flow path in ft/ft
R = Hydraulic Radius (feet) which is equivalent to A/WP
      A = Cross-sectional area (sqft)
      WP = Wetted perimeter (feet)

Travel time for channel flow can be calculated as follows:

$$T_{t(ch)} = \frac{L}{60 * V}$$

Where:

$T_{t(ch)}$ = Channel Flow travel time in minutes
V = Velocity in ft/sec
L = Length of flow path length in feet

Peak Discharge

The Rational Method was utilized to estimate the peak discharge (Q) for all design flows. The Rational Method was selected since all drainage areas are substantially smaller than 300 acres. According to the HDM, the Rational Method incorporates the following formula:

$$Q = C * i * A$$

Where:

Q = Design discharge in cubic feet per second
C = Coefficient of runoff
i = Rainfall intensity in inches per hour for the selected storm frequency
A = Area in acres

Runoff coefficients (C) for permeable areas were developed from HDM figure 819.2A. Runoff coefficients (C) for impermeable areas were developed from HDM table 819.2B.

The project is approximately located at latitude/longitude: 32.9656°/-117.1658°. The IDF curves were produced using NOAA Atlas 14, Volume 6, Version 2. The curves are included in Figure 2 and the formulas are as follows:

$$i_{(10)} = 0.681 * (T_c/60)^{-0.612}$$

$$i_{(25)} = 0.836 * (T_c/60)^{-0.610}$$

$$i_{(100)} = 1.054 * (T_c/60)^{-0.600}$$
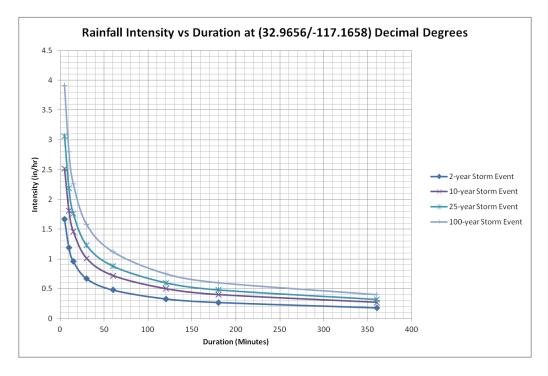
Figure 2: Storm IDF Curves

Rainfall Intensity vs Duration at (32.9656/-117.1658) Decimal Degrees

Legend:
- 2-year Storm Event
- 10-year Storm Event
- 25-year Storm Event
- 100-year Storm Event

(X-axis: Duration (Minutes); Y-axis: Intensity (in/hr))

2.3 Hydraulic Calculations

All hydraulic calculations in this study were determined using the methodology presented in the Caltrans HDM and the FHWA Urban Drainage Design Manual, Hydraulic Engineering Circular Number 22 (HEC-22), Third Edition. All calculations and software outputs are included in **Appendix C**.

Storm Drain Calculations
Storm drain calculations were completed using StormCAD V8i (SELECT series 2) developed by Bentley.

Inlet Capacity and Gutter Flow
Inlet capacity and gutter flow calculations were determined using FlowMaster V8i (SELECTseries1) software developed by Bentley. This software performs calculations based on Chapter 4 of HEC-22.

Open Channels
Open Channel flow calculations were determined using FlowMaster V8i (SELECTseries1) software developed by Bentley. This software performs calculations based on Chapter 4 of HEC-22. HDM table 866.2 was used to determine freeboard requirements.

2.4 Biofiltration Systems Analysis
The proposed improvements will increase the total impervious area for the project site. The County of San Diego's Hydromodification Determination matrix requires hydromodification and water quality be incorporated with the proposed improvements. According to the calculations for

the project site, the storm water runoff can be treated in biofiltration facilities onsite. The County of San Diego's BMP sizing calculator was utilized for sizing the proposed biofiltration basins. Additional analysis for the hydromodification and water quality treatment is provided in the Water Quality Technical Report (WQTR).

3.   EXISTING DRAINAGE CONDITIONS

Due to the recent development of the Torrey Highlands property, the Shaw Properties, the LMXU Property, and the recent construction of SR-56, the existing hydrology within the project area is well documented. The existing hydrology studies prepared for the associated developments are intended to facilitate full build-out conditions, and the existing drainage facilities were designed to convey the 100-year storm event. Therefore, limited existing drainage condition calculations were performed, and 100-year storm event peak discharges were determined from the associated drainage studies and as-builts. The existing drainage studies are located in the project files and the as-built information showing the 100-year storm event peak discharges are attached in **Appendix B**.

The entire project lies within four basins that ultimately discharge into different locations along McGonigle Canyon Creek. McGonigle Canyon Creek drains into Poway Creek, which eventually discharges into the Pacific Ocean. Existing onsite drainage facilities include inlets, brow ditches, reinforced concrete storm drains (RCP), concrete lined channels, and Vortechnics storm water treatment facilities.

South of SR-56

Existing Basin 1, located south of SR-56, receives runoff from Torrey Meadows Drive and the Shaw Property Unit 2 Development. Runoff from Torrey Meadows Drive is conveyed in concrete curb and gutter to a curb inlet located in the cul-de-sac at the terminus of Torrey Meadows Drive. The Shaw Property Unit 2 drains to a series of curb inlets, 18" RCP and 24" RCP storm drain pipes, which ultimately converge with the drainage of Torrey Meadows Drive. A Vortechnics hydrodynamic separator treats the runoff at the point where the Shaw Property Unit 2 and Torrey Meadows Drive runoff converge. The treated runoff is then conveyed in an 18"x36" reinforced concrete box (RCB) culvert and discharged into a concrete lined brow ditch. The brow ditch runs northwesterly to McGonigle Canyon Creek where the system ultimately discharges. According to the Shaw Property Unit 2 Hydrology Study, prepared by Hunsaker & Associates dated January 20, 2003, the 100-year storm event peak discharge for Basin 1 is 15.13 cubic feet per second (cfs).

North of SR-56

Existing Basin 2, located north of SR-56, receives runoff from the Shaw Property Unit 1 Development. The Shaw Property Unit 1 drains to a series of curb inlets, 18" RCP and 24" RCP storm drain pipes. Prior to discharge into McGonigal Canyon Creek, runoff is treated in a Vortechnics hydrodynamic separator located at the intersection of Via Ambrosa and Torrey Meadows Drive. According to the Shaw Property Unit 1 Hydrology Study, prepared by Hunsaker & Associates dated January 15, 2003, the 100-year storm event peak discharge for Basin 2 is 13.33 cfs.

Existing Basin 3, located north of SR-56, receives runoff from Torrey Meadows Drive, the Shaw Property Unit 1, and the LMXU Property. Runoff from Torrey Meadows Drive flows to the east

and is conveyed in concrete curb and gutter to curb inlets located near the intersection of Via Sabbia and Torrey Meadows Drive. The Shaw Property Unit 1 and the LMXU property drain to a series of curb inlets, 18" RCP, 30" RCP and 42" RCP storm drain pipes along Via Sabbia. Prior to discharge into McGonigle Canyon Creek, runoff is treated in a Vortechnics hydrodynamic separator located to the east of the intersection of Via Sabbia and Torrey Meadows Drive. According to the LMXU As-Builts, prepared by Hunsaker & Associates dated June 16, 2003, the 100-year storm event peak discharge for Basin 3 is 104.82 cfs.

SR-56
Existing Basin 4 receives runoff from SR-56 and the SR-56 bike path. Runoff generally flows from east to west and is conveyed along the shoulder of SR-56 and in a series of concrete lined channels in the median of SR-56. The runoff is collected in grate inlets and is eventually discharged to McGonigle Canyon Creek to the west. This watershed is not impacted by the proposed project and therefore no calculations or analysis were performed.

4. PROPOSED DRAINAGE CONDITIONS
The proposed drainage system has been designed to maintain a spread width less than the shoulder width of 8 feet and maximize the use of the existing drainage system. The overall existing drainage patterns are maintained, where possible. Storm water quality treatment and detention basins have been included in the design in addition to the Vortechnics hydrodynamic separators that treat the water prior to discharge.

South of SR-56
The proposed drainage system number 1 consists of modifying the existing drainage system south of SR-56 to capture the additional flows from Torrey Meadows Drive. Roadway runoff from Torrey Meadows Drive sheet flows into the curb and gutter and is conveyed to curb inlets at the low point near station 9+83. The inlets connect to 18" and 24" RCP storm drains that eventually connect to the existing system. In addition, there are curb cut outs on both sides of the roadway to capture runoff from Torrey Meadows Drive, which is treated by biofiltration basins in the parkway area to satisfy the County of San Diego's hydromodification requirements. Peak flows to the existing system have been increased by 3.22 cfs for the 100-year storm event. Analysis of the existing system has shown that there is sufficient capacity to handle the additional flow. Detailed drainage calculations can be found in **Appendix C**. Draft drainage design plans can be found in **Appendix D**.

North of SR-56
The proposed drainage system numbers 3 and 4 consists of modifying the existing drainage system north of SR-56 to capture the additional flows from Torrey Meadows Drive. Roadway runoff from Torrey Meadows Drive sheet flows into the curb and gutter and is conveyed to on-grade curb inlets at stations 15+25 and 17+25. The inlets connect to 18" and 24" RCP storm drains that eventually connect to the existing system. In addition, there are curb cut outs on both sides of the roadway to capture runoff from Torrey Meadows Drive, which is treated by biofiltration basins in the parkway area to satisfy the County of San Diego's hydromodification requirements. Peak flows to the existing system have been increased by 3.27 cfs for the 100-year storm event. Analysis of the existing system has shown that there is sufficient capacity to handle the additional flow. Detailed drainage calculations can be found in **Appendix C**. Draft drainage design plans can be found in **Appendix D**.

SR-56

There are minimal impacts to the existing drainage on SR-56. Improvements to the drainage system on SR-56 include reconstructing a drainage channel that will be removed during construction of the structure foundations. The channel will be reconstructed in-kind. The proposed project will reduce the tributary area to the SR-56, therefore this system was not analyzed.

5. CONCLUSION

The proposed drainage system has been designed to maintain spread widths within the shoulder for the 25-year storm and sized to convey the 100-year storm. In addition, drainage improvements have been designed to meet the County of San Diego's hydromodification requirements. Modifications to the existing drainage system to accommodate the roadway improvements and bridge construction consist of concrete channels, inlets, RCP storm drains and biofiltration basins. The overall existing drainage patterns are maintained. The project leads to an overall increase in 25-year and 100-year peak due to an increase in impervious surface area. The increase in peak flow will be retained onsite using biofiltration basins meeting the County of San Diego's Model BMP Design Manual requirements.

6. REFERENCES

1. Urban Drainage Design Manual Hydraulic Engineering Circular No. 22, U.S. Department of Transportation, Federal Highway Association, August 2001.

2. FlowMaster V8i (SELECTseries 1) [08.11.01.03], Bentley Systems, Inc., November 2009.

3. StormCAD V8i (SELECTseries 2) [08.11.02.35], Haestad Methods Solution Center, May 2010.

4. Highway Design Manual, California Department of Transportation, March 2014.

5. Model BMP Design Manual San Diego Region, County of San Diego, Public DRAFT January 2015.

APPENDIX A

**VICINITY MAP
AND FEMA FIRMETTE**

McGonigle Canyon

Torrey Santa Fe Road

Deer Canyon

Proposed Project Location

Torrey Meadows Dr.

56

Torrey Meadows Drive

Shopping Center

Camino del Sur

Westview High School

Carmel Mountain Road

Project Vicinity Map

MAP SCALE 1" = 1000'

0 500 1,000 1,500 2,000 FEET

PANEL 1335G

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 3 WEST AND TOWNSHIP 14 SOUTH, RANGE 3 WEST AND THE RANCHO SAN DIEGUITO LAND GRANT AND THE RANCHO SAN DIEGUITO LAND GRANT AND THE RANCHO LOS PENASQUITOS LAND GRANT.

CITY OF SAN DIEGO
060295

ZONE X

ZONE A

ZONE A

14

Canyon

Creek

onigle

ance Program at 1-800-638-6620.

CARMEL VALLEY RD
BLACK MTN RD
MONA LN
DC1174
MARKER RD
KERRY LN
HEATHERLY LN
TORREY DEL MAR DR
MCGONIGLE TRL
COLLI
11

TORREY MEADOWS DR

CANYON DR
VIA MESA DR
VIA MESA DR
MESA CREST PL
TORREY MESA CT
SIERRA
MESA CT
ARROYO GRANDE RD
SANTA FE RD
TORREY
SHERBOURNE LN
CARIBOU CT
VIA RIVERA
HEALIS PL
COOPER CANYON RD
GANTABERRA CT
COPPERWIND LN
PRIMROSE LN
VIA SANTILLANA

Private Rd

56

56

ENDER WAY
NCHO DEL ACACIA WAY
NTA FE
R
CLAR
AIKES CT

FIRM
FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY,
CALIFORNIA
AND INCORPORATED AREAS

PANEL 1335 OF 2375
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO COUNTY	060284	1335	G
SAN DIEGO, CITY OF	060295	1335	G

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1335G

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

APPENDIX B

**EXISTING CONDITION HYDROLOGIC
ANALYSES, AS-BUILTS, AND MAP**

EXISTING HYDROLOGY MAP

CITY R/W
TCE
CALTRANS R/W
TORREY MEADOWS DR
3.01
2.0S
SHAW PROPERTY - UNIT 1
VIA SABBIA
3.02
LXMU PROPERTY
3.0S
WB STATE ROUTE - 56
EB STATE ROUTE - 56
4
CALTRANS R/W
CALTRANS R/W
CITY R/W
1.01
TCE
1.0S
CALTRANS R/W
VIA SAN LORENZA
SHAW PROPERTY - UNIT 2
PRIMROSE LN
TORREY MEADOWS DR
HEALIS PL
TORREY SANTA FE RD

N

1" = 80'

LEGEND

— Drainage Basin Boundary
— Flow Path
— Right of Way
— Existing Drainage Systems
← Flow Direction

Drainage Basins

FLOW RATES FOR EXISTING CONDITIONS

Watershed No.	Drainage Areas		Q(100)	Notes
	(sq ft)	(acres)	cfs	
1.01	58279	1.338	3.060	Q100 from As-Built Plan 32139
1.OS	-	-	12.660	Q100 from As-Built Plan 32139
2.OS	-	-	13.330	Q100 from As-Built Plan 31814
3.OS	-	-	76.290	Q100 from As-Built Plan 31817
3.01	45899	1.054	5.200	Q100 from As-Built Plan 31817
3.02	119922	2.753	8.320	Q100 from As-Built Plan 31817

STORM LINE "A" (PVT)

STORM LINE "A-1" (PVT)

STORM LINE "B-1" (PVT)

24" RCP ~ 237.61 LF @ -0.64%
Q100=13.33 CFS, V100=6.09 FPS

PROFILE SCALES	
HORIZ. :	1"=40'
VERT. :	1"=8'

STORM LINE "A", "A-1" & "B-1"

CENTERLINE DATA

	BEARING/DELTA	RADIUS	LENGTH	REMARKS
1	N 4°42'32" E		58.56'	
2	42°41'06"	500.00'	372.50'	

(PRIVATE) STORM DRAIN DATA

	BEARING/DELTA	RADIUS	LENGTH	REMARKS
1	N 34°26'05" E		31.27'	18" RCP 1350-D
2	N 27°17'10" E		77.79'	18" RCP 1350-D
3	61°19'20"	22.50'	24.21'	18" RCP 1350-D*
4	N 88°56'30" E		2.74'	18" RCP 1350-D
5	N 1°03'30" W		26.50'	18" RCP 1350-D
6	N 88°56'30" E		40.02'	18" RCP 1350-D
7	N 1°03'30" W		11.06'	18" RCP 1350-D*
8	12°13'49"	45.00'	9.61'	18" RCP 1350-D*
9	N 1°17'19" W		75.52'	18" RCP 1350-D
10	N 82°19'16" E		11.34'	18" RCP 1350-D
11	N 82°19'16" E		32.97'	18" RCP 1350-D
12	N 8°58'33" W		26.68'	18" RCP 1350-D*
13	28°21'45"	480.00'	237.61'	24" RCP 1350-D

* 4' LENGTHS 5' BEVEL BOTH ENDS
** 8' LENGTHS 5' BEVEL BOTH ENDS
# WATER TIGHT JOINTS

SHAW PROPERTY

PROFILE: STORM LINE A-1

PROFILE: STORM LINE C-1

PROFILE: STORM LINE B-1

PROFILE: STORM LINE D-1

FINISHED SURFACE OVER STORM DRAIN

42" RCP = 38.09 LF @ 1.00%
Q100=104.82 CFS, V100=11.80 FPS

37.06 LF = 18" RCP
@ 1.00%
Q100=6.40 CFS,
V100=3.24 FPS

19.25 LF = 18" RCP
@ 1.00%
Q100=11.19 CFS,
V100=6.33 FPS

ORIGINAL GROUND OVER STORM DRAIN

PROPOSED GRADE OVER STORM DRAIN

45.05 LF = 42" RCP @ 1.33%
Q100=84.61 CFS, V100=8.79 FPS
WATER TIGHT JOINTS

367.33 LF = 42" RCP @ 1.00%
Q100=89.64 CFS, V100=9.32 FPS

59.07 LF = 30" RCP @ 1.00%
Q100=17.06 CFS, V100=3.48 FPS
WATER TIGHT JOINTS

52.90 LF = 42" RCP @ 2.89%
Q100=84.61 CFS, V100=10.03 FPS
WATER TIGHT JOINTS

HGL

38.75 LF = 18" RCP @ 2.10%
Q100=5.20 CFS, V100=2.94 FPS
WATER TIGHT JOINTS

6" RCLN

PROFILE SCALES
HORIZ. : 1"=40'
VERT. : 1"=8'

24+00 25+00 26+00 27+00 28+00 50+00 51+00 30+00 31+00 32+00

PARCEL 2
PARCEL MAP NO. 8133

PARCEL 1
PARCEL MAP NO. 8133

PARCEL 2
PARCEL MAP NO. 8133

SEE EMRA 420256-5
FOR PRIVATE WATER QUALITY
TREATMENT UNIT IN PUBLIC
RIGHT OF WAY

FOR STORM DRAIN IMPROVEMENTS
SEE DRAWING NO. 32073-D

TEMPORARY CHAIN LINK FENCE

SUBDIVISION BOUNDARY

VORTECHNICS MODEL 9000

42" RCP SD

18" RCP SD

LINE B-1

LINE C-1

CL TYPE "S-2" INLET
L=8'

RIGHT OF WAY

FOR SURFACE IMPROVEMENTS
SEE DWG NO. 31957-D

TORREY MEADOWS DRIVE

LINE A-1

30" RCP SD

CL TYPE "S-2" INLET, L=8'

RIGHT OF WAY

VIA SABBIA

LOT 1
MAP NO. 14593

STORM DRAIN "LINE A-1, B-1, C-1 & D-1"

STORM DRAIN DATA

	BEARING/DELTA	RADIUS	LENGTH	REMARKS
1	N 0°30'08" E		45.05'	42" RCP SD 1350-D
2	N 79°23'38" E		48.58'	42" RCP SD 1350-D
3	N 88°23'38" E		4.32'	42" RCP SD 1350-D
4	N 88°23'38" E		367.33'	42" RCP SD 1350-D
5	N 88°23'38" E		59.07'	30" RCP SD 1350-D
6	N 7°36'22" W		38.75'	18" RCP SD 1350-D
7	N 7°36'22" W		37.06'	18" RCP SD 1350-D
8	N 7°36'22" W		19.25'	18" RCP SD 1350-D
9	N 7°36'22" W		38.09'	42" RCP SD 1350-D *WATER TIGHT JOINTS

NOTE: FOR IMPROVEMENT PLANS
SEE DWG NO. 32009-D

NOTE: THE PRECISE LOCATION OF
SUBDRAINS SHALL BE ACCURATELY
LOCATED ON FINAL AS-GRADED PLANS

40 0 40 80 120 160
SCALE 1"=40'

HUNSAKER & ASSOCIATES
SAN DIEGO, INC.

PLANNING   10179 Huennekens Street
ENGINEERING   San Diego, Ca 92121
SURVEYING   PH858558-4500 FX858558-1414

PLANS PREPARED UNDER THE SUPERVISION OF

RAYMOND L. MARTIN RCE 48670   DATE

PRIVATE CONTRACT
STORM DRAIN PLANS FOR:

LMXU PROPERTY
PARCEL 1, PARCEL MAP NO. 18926

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING AND DEVELOPMENT DEPARTMENT
SHEET 45 OF 67 SHEETS

T.M. 99-0518
W.O. 420256

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	H&A			
AS-BUILT	H&A			

1928-6279
SAD AS COOR.

288-1719
LAMBERT COORDINATES

31817-45-D

AS BUILT

PROFILE SCALES
HORIZ. : 1"=40'
VERT. : 1"=8'

STORM LINE "J"

STORM LINE "J-2"

STORM LINE "J-1"

ORIGINAL GROUND AT CENTERLINE

PROPOSED GRADE AT CENTERLINE

PROPOSED GRADE OVER STORM DRAIN

STORM LINE "J" "J-1" & "J-2"

SECTION A-A
NOT TO SCALE

MODIFIED B CLEANOUT DETAIL (PVT)
NOT TO SCALE

DIVERSION WEIR
FLOW IN
RIM
LUG BYPASS PIPE FROM VORTECHNICS SYSTEM*
FLOW OUT
STORM DRAIN ENTERING CLEANOUT*
BYPASS PIPE TO VORTECHNICS SYSTEM*
STORM DRAIN EXITING CLEANOUT*
*SEE ABOVE PROFILES FOR PIPE SIZES AND INVERT ELEVATIONS

VORTECHNICS MODEL 1000

PRIVATE STORM DRAIN DATA

	BEARING/DELTA	RADIUS	LENGTH	REMARKS
1	N 67°40'48" W		32.62'	18"H X 36"W RCB
2	6°21'58"		5.00'	18"H X 36"W RCB
3	10°27'53"	45.00'	8.22'	24" RCP 1350-D
4	N 85°08'46" W		75.60'	24" RCP 1350-D
5	N 48°02'34" W		40.50'	18" RCP 1350-D
6	N 76°51'43" W		39.11'	18" RCP 1350-D
7	N 60°57'31" W		54.75'	18" RCP 1350-D
8	N 60°57'31" W		54.68'	18" RCP 1350-D
9	N 29°02'29" E		22.25'	18" RCP 1350-D
10	N 26°26'51" E		35.26'	18" RCP 1350-D

* 4' OR 8' LENGTHS WITH 5' BEVEL ON BOTH ENDS
** WATER TIGHT JOINTS

*FOR ADDITIONAL DETAIL SEE STD DWG. D-25

CADIZ
SANTILLANA

SEE ENCROACHMENT REMOVAL AGREEMENT DOC NO 420761-2 FOR PRIVATE STORM DRAIN IN PUBLIC RIGHT OF WAY

20' STORM DRAIN EASEMENT

SPLASH WALL PER DETAIL SHEET 3

SEE ENCROACHMENT REMOVAL AGREEMENT DOCUMENT NO. 420761-4 FOR PRIVATE IMPROVEMENTS IN PROPOSED GENERAL UTILITY EASEMENT

STORM LINE "J-2"
STORM LINE "G" (SEE SHEET 9)

PRIVATE CONTRACT
PLANS FOR THE GRADING OF:

SHAW PROPERTY UNIT 2

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING AND DEVELOPMENT DEPARTMENT

T.M. 99-0518
W.O. NO. 420761
SHEET 10 OF 28 SHEETS

32139-10-D

PLANS PREPARED UNDER THE SUPERVISION OF:
RAYMOND L. MARTIN RCE 48670

SHAW PROPERTY

R:\0095\REng\Shaw Unit 2\GRD\Rough Grd\RG PH 2 SHT 10.dwg[1275]Feb-07-2003: 08:32

APPENDIX C

PROPOSED CONDITION
HYDROLOGIC ANALYSES AND MAP

PROPOSED HYDROLOGY MAP

FLOW RATES FOR PROPOSED CONDITIONS

Watershed No.	Drainage Areas		Sheet Flow								Shallow Concentrated Flow					Channel Flow									Total Time of Concentration	Design Time of Concentration	Runoff Coefficient C	C(2)	C(10)	C(25)	C(100)	Q(2)	Q(10)	Q(25)	Q(100)	Water Quality Storm
			L	n	i(2)	i(10)	i(25)	i(100)	S	Tt	L	S	K	V	Tt	L	Channel Section	S	n	A	WP	R	V	Tt	Tc											
	(sq ft)	(acres)	(ft)		(in/hr)	(in/hr)	(in/hr)	(in/hr)	(ft/ft)	(min)	(ft)	(%)	(ft/s)	(ft/s)	(min)	(ft)		(ft/ft)		(sq ft)	(ft)	(ft)	(ft/s)	(min)	(minutes)	(minutes)						cfs	cfs	cfs	cfs	cfs
1.01	7244.06	0.166	143	0.016	1.8	3.1	3.8	4.7	0.020	2.86				-	0.00	63	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	0.26	3.1	5.0	0.93	0.93	0.93	1.00	1.00	0.285	0.483	0.633	0.778	0.0310
1.02	1432.04	0.033	27	0.016	1.8	3.1	3.8	4.7	0.020	0.76				-	0.00	59	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	0.25	1.0	5.0	0.95	0.95	0.95	1.00	1.00	0.057	0.097	0.125	0.154	0.0062
1.03	1504.68	0.035	23	0.040	1.8	3.1	3.8	4.7	0.020	1.40				-	0.00	67	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	0.28	1.7	5.0	0.95	0.95	0.95	1.00	1.00	0.060	0.102	0.131	0.162	0.0066
1.04	1492.81	0.034	22	0.016	1.8	3.1	3.8	4.7	0.020	0.64				-	0.00	69	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	0.29	0.9	5.0	0.95	0.95	0.95	1.00	1.00	0.060	0.101	0.130	0.160	0.0065
1.05	1376.46	0.032	23	0.016	1.8	3.1	3.8	4.7	0.020	0.67				-	0.00	59	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	0.25	0.9	5.0	0.95	0.95	0.95	1.00	1.00	0.055	0.094	0.120	0.148	0.0060
1.06	1321.77	0.030	20	0.040	1.8	3.1	3.8	4.7	0.020	1.23				-	0.00	65	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	0.28	1.5	5.0	0.95	0.95	0.95	1.00	1.00	0.053	0.090	0.115	0.142	0.0058
1.07	8984.11	0.206	21	0.040	1.8	3.1	3.8	4.7	0.020	1.29				-	0.00	273	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	1.15	2.4	5.0	0.95	0.95	0.95	1.00	1.00	0.361	0.611	0.785	0.965	0.0392
1.08	1856.42	0.043	12	0.016	1.8	3.1	3.8	4.7	0.020	0.40					0.00	85	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.33	0.7	5.0	0.34	0.34	0.34	0.38	0.43	0.027	0.046	0.061	0.086	0.0029
1.09	1733.78	0.040	9	0.016	1.8	3.1	3.8	4.7	0.020	0.32					0.00	76	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.30	0.6	5.0	0.33	0.33	0.33	0.36	0.41	0.024	0.041	0.055	0.076	0.0026
1.10	2859.35	0.066	11	0.040	1.8	3.1	3.8	4.7	0.020	0.79					0.00	98	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.38	1.2	5.0	0.29	0.29	0.29	0.32	0.36	0.035	0.059	0.079	0.111	0.0038
1.11	9002.06	0.207	38	0.040	1.8	3.1	3.8	4.7	0.020	2.08					0.00	140	Biofiltration 2	0.036	0.030	73.500	33.16	2.217	15.955	0.15	2.2	5.0	0.24	0.24	0.24	0.26	0.30	0.092	0.155	0.208	0.291	0.0100
1.12	361.739	0.008	2	0.016	1.8	3.1	3.8	4.7	0.020	0.08					0.00	71	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.28	0.4	5.0	0.15	0.15	0.15	0.17	0.19	0.002	0.004	0.005	0.007	0.0002
1.13	358.081	0.008	2	0.016	1.8	3.1	3.8	4.7	0.020	0.10					0.00	45	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.18	0.3	5.0	0.15	0.15	0.15	0.17	0.19	0.002	0.004	0.005	0.007	0.0002
1.14	145.91	0.003	2	0.040	1.8	3.1	3.8	4.7	0.020	0.23					0.00	30	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.12	0.4	5.0	0.15	0.15	0.15	0.17	0.19	0.001	0.002	0.002	0.003	0.0001
1.15	178.23	0.004	6	0.040	1.8	3.1	3.8	4.7	0.020	0.44					0.00	19	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.08	0.5	5.0	0.63	0.63	0.63	0.69	0.79	0.005	0.008	0.011	0.015	0.0005
1.16	9189.83	0.211	30	0.030	1.8	3.1	3.8	4.7	0.020	1.34					0.00	325	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	1.37	2.7	5.0	0.95	0.95	0.95	1.00	1.00	0.368	0.623	0.803	0.988	0.0400
1.17	1367.68	0.031	28	0.016	1.8	3.1	3.8	4.7	0.020	0.77					0.00	53	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	0.22	1.0	5.0	0.95	0.95	0.95	1.00	1.00	0.055	0.093	0.119	0.147	0.0060
1.18	1448.46	0.033	22	0.016	1.8	3.1	3.8	4.7	0.020	0.66					0.00	62	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	0.26	0.9	5.0	0.95	0.95	0.95	1.00	1.00	0.058	0.098	0.126	0.156	0.0063
1.19	1426.15	0.033	22	0.040	1.8	3.1	3.8	4.7	0.020	1.35					0.00	61	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	0.26	1.6	5.0	0.95	0.95	0.95	1.00	1.00	0.057	0.097	0.125	0.153	0.0062
1.20	1462.33	0.034	23	0.030	1.8	3.1	3.8	4.7	0.020	1.10					0.00	67	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	0.28	1.4	5.0	0.95	0.95	0.95	1.00	1.00	0.059	0.099	0.128	0.157	0.0064
1.21	10385	0.238	20	0.016	1.8	3.1	3.8	4.7	0.020	0.58					0.00	277	Curb & Gutter	0.036	0.013	0.170	2.18	0.078	3.956	1.17	1.7	5.0	0.95	0.95	0.95	1.00	1.00	0.417	0.706	0.907	1.116	0.0453
1.22	979.257	0.022	7	0.016	1.8	3.1	3.8	4.7	0.020	0.24					0.00	60	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.23	0.5	5.0	0.40	0.40	0.40	0.44	0.50	0.016	0.028	0.037	0.052	0.0018
1.23	1417.12	0.033	5	0.040	1.8	3.1	3.8	4.7	0.020	0.41					0.00	81	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.32	0.7	5.0	0.37	0.37	0.37	0.41	0.47	0.022	0.038	0.051	0.071	0.0024
1.24	1654.16	0.038	6	0.030	1.8	3.1	3.8	4.7	0.020	0.38					0.00	78	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.30	0.7	5.0	0.33	0.33	0.33	0.37	0.42	0.023	0.040	0.053	0.074	0.0025
1.25	2169.93	0.050	10	0.016	1.8	3.1	3.8	4.7	0.020	0.33					0.00	93	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.36	0.7	5.0	0.32	0.32	0.32	0.36	0.40	0.030	0.050	0.067	0.094	0.0032
1.26	2445.41	0.056	18	0.040	1.8	3.1	3.8	4.7	0.020	1.12					0.00	88	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.34	1.5	5.0	0.44	0.44	0.44	0.48	0.55	0.046	0.077	0.104	0.145	0.0049
1.27	530.128	0.012	16	0.013	1.8	3.1	3.8	4.7	0.020	0.43					0.00	21	Biofiltration 1	0.036	0.030	1.000	3.24	0.309	4.290	0.08	0.5	5.0	0.33	0.33	0.33	0.36	0.41	0.007	0.013	0.017	0.024	0.0008
2.01	6136.83	0.141	22	0.016	1.8	3.1	3.8	4.7	0.020	0.63					0.00	173	Curb & Gutter	0.015	0.013	0.170	2.18	0.078	2.557	1.12	1.8	5.0	0.79	0.79	0.79	0.87	0.98	0.204	0.346	0.464	0.649	0.0222
2.02	1425.67	0.033	23	0.016	1.8	3.1	3.8	4.7	0.020	0.66					0.00	63	Curb & Gutter	0.015	0.013	0.170	2.18	0.078	2.557	0.41	1.1	5.0	0.95	0.95	0.95	1.00	1.00	0.057	0.097	0.125	0.153	0.0062
2.03	666.582	0.015	25	0.016	1.8	3.1	3.8	4.7	0.020	0.71					0.00	28	Curb & Gutter	0.015	0.013	0.170	2.18	0.078	2.557	0.18	0.9	5.0	0.95	0.95	0.95	1.00	1.00	0.027	0.045	0.058	0.072	0.0029
2.04	2707.53	0.062	25	0.016	1.8	3.1	3.8	4.7	0.020	0.71					0.00	117	Curb & Gutter	0.015	0.013	0.170	2.18	0.078	2.557	0.76	1.5	5.0	0.95	0.95	0.95	1.00	1.00	0.109	0.184	0.236	0.291	0.0118
2.05	1485.92	0.034	28	0.040	1.8	3.1	3.8	4.7	0.020	1.64					0.00	52	Curb & Gutter	0.017	0.013	0.170	2.18	0.078	2.746	0.32	2.0	5.0	0.95	0.95	0.95	1.00	1.00	0.060	0.101	0.130	0.160	0.0065
2.06	2274.68	0.052	22	0.016	1.8	3.1	3.8	4.7	0.020	0.63					0.00	69	Biofiltration 3	0.017	0.030	5.000	7.47	0.669	4.985	0.23	0.9	5.0	0.30	0.30	0.30	0.33	0.38	0.029	0.049	0.066	0.093	0.0032
2.07	1341.53	0.031	15	0.040	1.8	3.1	3.8	4.7	0.020	0.97					0.00	52	Biofiltration 3	0.017	0.030	5.000	7.47	0.669	4.985	0.17	1.1	5.0	0.30	0.30	0.30	0.34	0.38	0.017	0.029	0.039	0.055	0.0019
2.08	3151.92	0.072	12	0.040	1.8	3.1	3.8	4.7	0.020	0.84					0.00	124	Biofiltration 3	0.017	0.030	5.000	7.47	0.669	4.985	0.42	1.3	5.0	0.32	0.32	0.32	0.35	0.40	0.042	0.071	0.096	0.134	0.0046
2.09	1208.86	0.028	11	0.016	1.8	3.1	3.8	4.7	0.020	0.37					0.00	50	Biofiltration 3	0.017	0.030	5.000	7.47	0.669	4.985	0.17	0.5	5.0	0.33	0.33	0.33	0.36	0.41	0.017	0.028	0.038	0.053	0.0018
2.10	7421.15	0.170	21	0.040	1.8	3.1	3.8	4.7	0.020	1.31					0.00	206	Curb & Gutter	0.017	0.013	0.170	2.18	0.078	2.746	1.25	2.6	5.0	0.75	0.75	0.75	0.83	0.94	0.236	0.400	0.537	0.751	0.0257
2.11	745.042	0.017	25	0.040	1.8	3.1	3.8	4.7	0.020	1.49					0.00	27	Curb & Gutter	0.017	0.013	0.170	2.18	0.078	2.746	0.16	1.7	5.0	0.95	0.95	0.95	1.00	1.00	0.030	0.051	0.065	0.080	0.0032
2.12	643.426	0.015	25	0.016	1.8	3.1	3.8	4.7	0.020	0.71					0.00	25	Curb & Gutter	0.017	0.013	0.170	2.18	0.078	2.746	0.15	0.9	5.0	0.95	0.95	0.95	1.00	1.00	0.026	0.044	0.056	0.069	0.0028
2.13	2610.42	0.060	25	0.016	1.8	3.1	3.8	4.7	0.020	0.71					0.00	107	Curb & Gutter	0.017	0.013	0.170	2.18	0.078	2.746	0.65	1.4	5.0	0.95	0.95	0.95	1.00	1.00	0.105	0.177	0.228	0.281	0.0114
2.14	1434	0.033	29	0.040	1.8	3.1	3.8	4.7	0.020	1.64					0.00	46	Curb & Gutter	0.017	0.013	0.170	2.18	0.078	2.746	0.28	1.9	5.0	0.95	0.95	0.95	1.00	1.00	0.058	0.097	0.125	0.154	0.0063
2.15	1607.62	0.037	24	0.016	1.8	3.1	3.8	4.7	0.020	0.68					0.00	54	Biofiltration 3	0.017	0.030	5.000	7.47	0.669	4.985	0.18	0.9	5.0	0.30	0.30	0.30	0.33	0.38	0.021	0.035	0.047	0.066	0.0022
2.16	1087.81	0.025	12	0.016	1.8	3.1	3.8	4.7	0.020	0.39					0.00	48	Biofiltration 3	0.017	0.030	5.000	7.47	0.669	4.985	0.16	0.6	5.0	0.31	0.31	0.31	0.35	0.39	0.014	0.024	0.033	0.046	0.0016
2.17	2890.53	0.066	12	0.040	1.8	3.1	3.8	4.7	0.020	0.85					0.00	115	Biofiltration 3	0.017	0.030	5.000	7.47	0.669	4.985	0.38	1.2	5.0	0.31	0.31	0.31	0.34	0.39	0.038	0.065	0.087	0.122	0.0042
2.18	1054.22	0.024	8	0.040	1.8	3.1	3.8	4.7	0.020	0.62					0.00	47	Biofiltration 3	0.017	0.030	5.000	7.47	0.669	4.985	0.16	0.8	5.0	0.32	0.32	0.32	0.35	0.40	0.014	0.024	0.032	0.045	0.0015
3.01	605.043	0.014	27	0.016	1.8	3.1	3.8	4.7	0.020	0.76					0.00	20	Curb & Gutter	0.017	0.013	0.170	2.18	0.078	2.746	0.12	0.9	5.0	0.95	0.95	0.95	1.00	1.00	0.024	0.041	0.053	0.065	0.0026
3.02	766.236	0.018	10	0.016	1.8	3.1	3.8	4.7	0.020	0.34					0.00	36	Biofiltration 3	0.017	0.030	5.000	7.47	0.669	4.985	0.12	0.5	5.0	0.33	0.33	0.33	0.36	0.41	0.011	0.018	0.024	0.034	0.0012
3.03	589.685	0.014	27	0.040	1.8	3.1	3.8	4.7	0.020	1.57					0.00	19	Curb & Gutter	0.017	0.013	0.170	2.18	0.078	2.746	0.11	1.7	5.0	0.95	0.95	0.95	1.00	1.00	0.024	0.040	0.051	0.063	0.0026
3.04	702.076	0.016	12	0.016	1.8	3.1	3.8	4.7	0.020	0.40					0.00	35	Biofiltration 3	0.017	0.030	5.000	7.47	0.669	4.985	0.12	0.5	5.0	0.36	0.36	0.36	0.39	0.45	0.011	0.018	0.024	0.034	0.0011
3.05	25483.2	0.585	28	0.016	2.396	3.1	3.8	4.7	0.020	0.77					0.00	624	Curb & Gutter	0.017	0.013	0.170	2.18	0.078	2.746	3.79	4.6	5.0	0.70	0.70	0.70	0.77	0.88	0.754	1.276	1.714	2.396	0.0819
3.06	108884	2.500	12	0.040	1.8	3.1	3.8	4.7	0.020	0.82					0.00	609	Curb & Gutter	0.017	0.013	0.170	2.18	0.078	2.746	3.70	4.5	5.0	0.70	0.70	0.70	0.77	0.88	3.221	5.453	7.322	10.238	0.3499
1.0S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								12.660	
2.0S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								13.330	
3.0S	-	-	-	-	76.290	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								76.290	

FLOW RATES FOR PROPOSED CONDITIONS

Watershed No.	Drainage Areas		Sheet Flow								Shallow Concentrated Flow						Channel Flow									Total Time of Concentration	Design Time of Concentration	Runoff Coefficient C	C(2)	C(10)	C(25)	C(100)	Q(2)	Q(10)	Q(25)	Q(100)	Water Quality Storm
			L	n	i(2)	i(10)	i(25)	i(100)	S	Tt	L	S	K	V	Tt	L	Channel Section	S	n	A	WP	R	V	Tt	Tc	Tc										
	(sq ft)	(acres)	(ft)		(in/hr)	(in/hr)	(in/hr)	(in/hr)	(ft/ft)	(min)	(ft)	(%)	(ft/s)	(ft/s)	(min)	(ft)		(ft/ft)		(sq ft)	(ft)	(ft)	(ft/s)	(min)	(minutes)	(minutes)						cfs	cfs	cfs	cfs	cfs

INTENSITY

$$i_{25} = 1.06\left(\frac{T_C}{60}\right)^{-.543}$$

$$i_{100} = 1.37\left(\frac{T_C}{60}\right)^{-.543}$$

i(25) =   Rainfall Intensity for 25 year storm (in/hr)

i(100) =   Rainfall Intensity for 100 year storm (in/hr)

SHEET FLOW

$$T_t = \frac{0.42\, L^{4/5} n^{4/5}}{P_2^{1/2} S^{2/5}}$$

T_t =   Time of travel (min)
L =   Length of flow path (ft)
n =   Roughness Coefficient
S =   Slope (ft/ft)
P_2 =   2-year, 24-hour rainfall depth (in)
    - NOAA Atlas 2, Vol XI

SHALLOW CONCENTRATED FLOW

$$T_t = \frac{L}{60\ V}$$

T_t =   Time of travel (min)
K =   Intercept Coefficient
    - HDM Table 816.6B
S =   Slope (percent)
V =   Velocity (ft/s)
L =   Length of flow path (ft)

TIME OF CONCENTRATION

Tc(25) =   Total time of Travel for 25 years storm
Tc(100) =   Total time of Travel for 100 years storm

CHANNEL FLOW

$$T_t = \frac{L}{60\ V}$$

T_t =   Time of travel (min)
n =   Roughness Coefficient
    - HDM Table 864.3A
S =   Slope (ft/ft)
A =   Cross sectional flow area (sq ft)
WP =   Wetted perimeter (ft)
R =   Hydraulic radius (ft/ft) $R = \dfrac{A}{WP}$
L =   Length of flow path (ft)
V =   Velocity (ft/s) $V = \dfrac{1.486}{n} R^{2/3} S^{1/2}$

DISCHARGE $Q = CiA$

C =   Standard Run-Off Coefficient   HDM Table 819.2B
C(25) =   25 Years Storm Run-Off Coefficient
C(100) =   100 Years Storm Run-Off Coefficient
Q(25) =   25 Years Storm Total Discharge
Q(100) =   100 Years Storm Total Discharge

WATER QUALITY STORM $Q = CiA$

Q =   Discharge (cfs)
C =   Runoff Coefficient   HDM Table 819.2B
i =   Rainfall Intensity (in/hr)
    - i(WQ) = 0.2 in/hr   Table 3.2-1Caltrans Treatment BMP Training Handout, Version 1.4.2, dated May 2003
A =   Tributary Area (acres)

EXISTING VS. PROPOSED FLOW RATES

Existing Watershed No.	Proposed Watershed No.	EXISTING Q(100)	PROPOSED Q(100)	Change in Q(100)
		cfs	cfs	cfs
1.00	1.00	15.720	18.944	3.224
2.00	2.00	13.330	16.603	3.273
3.00	3.00	89.810	89.121	-0.689
Total:		118.860	124.668	5.808

PROPOSED DRAINAGE ANALYSIS

#	Inlet/Drainage Unit	Design Storm	Q from watershed	Additional Q	Additional flow from:	Q Total	Q Bypass	Q Interecept	Slope	Road Cross Slope	Gutter Cross Slope	Spread	Geometry Notes:	Design Notes:
		yr	cfs	cfs		cfs	cfs	cfs	%	%	%	ft		
	1.01cc	25	0.6326			0.63	0.54	0.09	3.56%	2.00%	8.33%	2.74	1" Curb Cut Gutter Depression	On Grade
	1.02cc	25	0.1251	0.54	Bypass from 1.01cc	0.67	0.57	0.10	3.56%	2.00%	8.33%	2.88	1" Curb Cut Gutter Depression	On Grade
	1.03cc	25	0.1314	0.57	Bypass from 1.02cc	0.70	0.63	0.07	3.56%	2.00%	8.33%	2.99	1" Curb Cut Gutter Depression	On Grade
	1.04cc	25	0.1304	0.63	Bypass from 1.03cc	0.76	0.7	0.06	3.56%	2.00%	8.33%	3.2	1" Curb Cut Gutter Depression	On Grade
	1.05cc	25	0.1202	0.7	Bypass from 1.04cc	0.82	0.71	0.11	3.56%	2.00%	8.33%	3.39	1" Curb Cut Gutter Depression	On Grade
	1.06cc	25	0.1154	0.71	Bypass from 1.05cc	0.83	0.72	0.11	3.56%	2.00%	8.33%	3.42	1" Curb Cut Gutter Depression	On Grade
	1.07a	25	0.7954	0.72	Bypass from 1.06cc	1.52	-	1.52	1.66%	2.00%	6.25%	3.21	Type B, 3" Depression	In Sag
	1.13ci	25	0.2007	-		0.20	0.02	0.18	3.56%	2.00%	8.33%	1.62	Type A Curb Inlet/Outlet	On Grade
	1.14ci	25	0.0073	0.02	Bypass from 1.13ci	0.03	0	0.03	3.56%	2.00%	8.33%	0.8	Type A Curb Inlet/Outlet	On Grade
	1.16cc	25	0.8026	-		0.80	0.69	0.11	3.56%	2.00%	8.33%	3.33	1" Curb Cut Gutter Depression	On Grade
	1.17cc	25	0.1194	0.69	Bypass from 1.16cc	0.81	0.7	0.11	3.56%	2.00%	8.33%	3.36	1" Curb Cut Gutter Depression	On Grade
	1.18cc	25	0.1265	0.7	Bypass from 1.17cc	0.83	0.72	0.11	3.56%	2.00%	8.33%	3.42	1" Curb Cut Gutter Depression	On Grade
	1.19cc	26	0.1245	0.72	Bypass from 1.18cc	0.84	0.73	0.11	3.56%	2.00%	8.33%	3.45	1" Curb Cut Gutter Depression	On Grade
	1.20cc	25	0.1277	0.73	Bypass from 1.19cc	0.86	0.75	0.11	3.56%	2.00%	8.33%	3.53	1" Curb Cut Gutter Depression	On Grade
	1.21c	25	0.9238	0.75	Bypass from 1.20cc	1.67	-	1.67	1.66%	2.00%	6.25%	3.33	Type B, 3" Depression	In Sag
	2.01cc	25	0.4644	-		0.46	0.36	0.10	1.73%	2.00%	8.33%	2.86	1" Curb Cut Gutter Depression	On Grade
	3d	25	0.1908	0.36	Bypass from 2.01cc	0.55	0.08	0.47	1.66%	2.00%	6.25%	3.95	Type B-1, L=7, 3" Depression	On Grade
	2.03cc	25	0.0582	0.08	Bypass from 3d	0.14	0.09	0.05	1.73%	2.00%	8.33%	1.18	1" Curb Cut Gutter Depression	On Grade
	2.04cc	25	0.2365	0.09	Bypass from 2.03cc	0.33	0.25	0.08	1.73%	2.00%	8.33%	2.04	1" Curb Cut Gutter Depression	On Grade
	4a	25	0.3276	0.25	Bypass from 2.04cc	0.58	0.09	0.49	1.66%	2.00%	6.25%	4.06	Type B-1, L=7, 3" Depression	On Grade
	3.01cc	25	0.0528	0.09	Bypass from 4a	0.14	0.09	0.05	1.73%	2.00%	8.33%	1.18	1" Curb Cut Gutter Depression	On Grade
	2.10cc	25	0.5373	-		0.54	0.43	0.11	1.73%	2.00%	8.33%	3.26	1" Curb Cut Gutter Depression	On Grade
	3b	25	0.1120	0.43	Bypass from 2.10cc	0.54	0.08	0.46	1.66%	2.00%	6.25%	3.90	Type B-1, L=7, 3" Depression	On Grade
	2.12cc	25	0.0562	0.08	Bypass from 3b	0.14	0.09	0.05	1.73%	2.00%	8.33%	1.18	1" Curb Cut Gutter Depression	On Grade
	2.13cc	25	0.2280	0.09	Bypass from 2.12cc	0.32	0.24	0.08	1.73%	2.00%	8.33%	1.96	1" Curb Cut Gutter Depression	On Grade
	4e	25	0.3013	0.24	Bypass from 2.13cc	0.54	0.08	0.46	1.66%	2.00%	6.25%	3.90	Type B-1, L=7, 3" Depression	On Grade
	3.03cc	25	0.0515	0.08	Bypass from 4e	0.13	0.09	0.04	1.73%	2.00%	8.33%	1.00	1" Curb Cut Gutter Depression	On Grade
	1.01cc	100	0.7785			0.78	0.67	0.11	3.56%	2.00%	8.33%	3.26	1" Curb Cut Gutter Depression	On Grade
	1.02cc	100	0.1539	0.67	Bypass from 1.01cc	0.82	0.71	0.11	3.56%	2.00%	8.33%	3.39	1" Curb Cut Gutter Depression	On Grade
	1.03cc	100	0.1617	0.71	Bypass from 1.02cc	0.87	0.76	0.11	3.56%	2.00%	8.33%	3.54	1" Curb Cut Gutter Depression	On Grade
	1.04cc	100	0.1604	0.76	Bypass from 1.03cc	0.92	0.8	0.12	3.56%	2.00%	8.33%	3.69	1" Curb Cut Gutter Depression	On Grade
	1.05cc	100	0.1479	0.8	Bypass from 1.04cc	0.95	0.83	0.12	3.56%	2.00%	8.33%	3.77	1" Curb Cut Gutter Depression	On Grade
	1.06cc	100	0.1420	0.83	Bypass from 1.05cc	0.97	0.85	0.12	3.56%	2.00%	8.33%	3.82	1" Curb Cut Gutter Depression	On Grade
	1.07a	100	0.9655	0.85	Bypass from 1.06cc	1.82	-	1.82	1.66%	2.00%	6.25%	3.45	Type B, 3" Depression	In Sag
	1.13ci	100	0.2807	-		0.28	0.05	0.23	3.56%	2.00%	8.33%	1.84	Type A Curb Inlet/Outlet	On Grade
	1.14ci	100	0.0102	0.05	Bypass from 1.13ci	0.06	0	0.06	3.56%	2.00%	8.33%	1.03	Type A Curb Inlet/Outlet	On Grade
	1.16cc	100	0.9876	-		0.99	0.87	0.12	3.56%	2.00%	8.33%	3.88	1" Curb Cut Gutter Depression	On Grade
	1.17cc	100	0.1470	0.87	Bypass from 1.16cc	1.02	0.9	0.12	3.56%	2.00%	8.33%	3.95	1" Curb Cut Gutter Depression	On Grade
	1.18cc	100	0.1557	0.9	Bypass from 1.17cc	1.06	0.94	0.12	3.56%	2.00%	8.33%	4.05	1" Curb Cut Gutter Depression	On Grade
	1.19cc	100	0.1533	0.94	Bypass from 1.18cc	1.09	0.96	0.13	3.56%	2.00%	8.33%	4.13	1" Curb Cut Gutter Depression	On Grade

	1.20cc	100	0.1571	0.96	Bypass from 1.19cc	1.12	0.99	0.13	3.56%	2.00%	8.33%	4.21	1" Curb Cut Gutter Depression		On Grade
	1.21c	100	1.1396	0.99	Bypass from 1.20cc	2.13	-	2.13	1.66%	2.00%	6.25%	3.65	Type B, 3" Depression		In Sag
	2.01cc	100	0.6493	-		0.65	0.53	0.12	1.73%	2.00%	8.33%	3.73	1" Curb Cut Gutter Depression		On Grade
	3d	100	0.2459	0.53	Bypass from 2.01cc	0.78	0.05	0.73	1.66%	2.00%	6.25%	4.08	Type B-1, L=7, 3" Depression		On Grade
	2.03cc	100	0.0716	0.05	Bypass from 3d	0.12	0.08	0.04	1.73%	2.00%	8.33%	1.12	1" Curb Cut Gutter Depression		On Grade
	2.04cc	100	0.2910	0.08	Bypass from 2.03cc	0.37	0.28	0.09	1.73%	2.00%	8.33%	2.32	1" Curb Cut Gutter Depression		On Grade
	4a	100	0.3022	0.28	Bypass from 2.04cc	0.58	0.02	0.56	1.66%	2.00%	6.25%	3.29	Type B-1, L=7, 3" Depression		On Grade
	3.01cc	100	0.0650	0.02	Bypass from 4a	0.09	0.05	0.04	1.73%	2.00%	8.33%	1.00	1" Curb Cut Gutter Depression		On Grade
	2.10cc	100	0.7513	-		0.75	0.63	0.12	1.73%	2.00%	8.33%	4.11	1" Curb Cut Gutter Depression		On Grade
	3b	100	0.1456	0.63	Bypass from 2.10cc	0.78	0.05	0.73	1.66%	2.00%	6.25%	4.08	Type B-1, L=7, 3" Depression		On Grade
	2.12cc	100	0.0691	0.05	Bypass from 3b	0.12	0.08	0.04	1.73%	2.00%	8.33%	1.12	1" Curb Cut Gutter Depression		On Grade
	2.13cc	100	0.2805	0.08	Bypass from 2.12cc	0.36	0.27	0.09	1.73%	2.00%	8.33%	2.25	1" Curb Cut Gutter Depression		On Grade
	4e	100	0.4003	0.27	Bypass from 2.13cc	0.67	0.03	0.64	1.66%	2.00%	6.25%	3.67	Type B-1, L=7, 3" Depression		On Grade
	3.03cc	100	0.0634	0.03	Bypass from 4e	0.09	0.06	0.03	1.73%	2.00%	8.33%	0.87	1" Curb Cut Gutter Depression		On Grade

Worksheet for Curb Inlet On Grade - 1.01cc_25

Project Description

Solve For   Efficiency

Input Data

Discharge	0.63	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	15.13	%
Intercepted Flow	0.10	ft³/s
Bypass Flow	0.54	ft³/s
Spread	2.74	ft
Depth	0.15	ft
Flow Area	0.15	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.32	ft/s
Equivalent Cross Slope	0.07743	ft/ft
Length Factor	0.09	
Total Interception Length	11.48	ft

Worksheet for Curb Inlet On Grade -1.02cc_25

Project Description

Solve For	Efficiency

Input Data

Discharge	0.67	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	14.73	%
Intercepted Flow	0.10	ft³/s
Bypass Flow	0.57	ft³/s
Spread	2.88	ft
Depth	0.15	ft
Flow Area	0.15	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.34	ft/s
Equivalent Cross Slope	0.07691	ft/ft
Length Factor	0.08	
Total Interception Length	11.80	ft

Worksheet for Curb Inlet On Grade -1.03cc_25

Project Description

Solve For   Efficiency

Input Data

Discharge	0.70	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	14.42	%
Intercepted Flow	0.10	ft³/s
Bypass Flow	0.60	ft³/s
Spread	2.99	ft
Depth	0.15	ft
Flow Area	0.16	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.35	ft/s
Equivalent Cross Slope	0.07647	ft/ft
Length Factor	0.08	
Total Interception Length	12.06	ft

Worksheet for Curb Inlet On Grade -1.04cc_25

Project Description

Solve For	Efficiency

Input Data

Discharge	0.76	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	13.85	%
Intercepted Flow	0.11	ft³/s
Bypass Flow	0.65	ft³/s
Spread	3.20	ft
Depth	0.16	ft
Flow Area	0.17	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.38	ft/s
Equivalent Cross Slope	0.07558	ft/ft
Length Factor	0.08	
Total Interception Length	12.58	ft

Worksheet for Curb Inlet On Grade -1.05cc_25

Project Description

Solve For	Efficiency

Input Data

Discharge	0.82	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	13.34	%
Intercepted Flow	0.11	ft³/s
Bypass Flow	0.71	ft³/s
Spread	3.39	ft
Depth	0.16	ft
Flow Area	0.19	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.40	ft/s
Equivalent Cross Slope	0.07468	ft/ft
Length Factor	0.08	
Total Interception Length	13.08	ft

Worksheet for Curb Inlet On Grade -1.06cc_25

Project Description

Solve For	Efficiency

Input Data

Discharge	0.83	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	13.26	%
Intercepted Flow	0.11	ft³/s
Bypass Flow	0.72	ft³/s
Spread	3.42	ft
Depth	0.16	ft
Flow Area	0.19	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.41	ft/s
Equivalent Cross Slope	0.07453	ft/ft
Length Factor	0.08	
Total Interception Length	13.16	ft

Worksheet for Inlet1.07a_25

Project Description

Solve For   Spread

Input Data

Discharge		1.52	ft³/s
Gutter Width		1.50	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.02	ft/ft
Local Depression		3.00	in
Local Depression Width		7.00	ft
Grate Width		1.50	ft
Grate Length		2.95	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%
Curb Opening Length		84.00	in
Opening Height		5.00	in
Curb Throat Type	Horizontal		
Throat Incline Angle		90.00	degrees

Options

Calculation Option   Use Both

Results

Spread	3.21	ft
Depth	0.06	ft
Gutter Depression	0.06	ft
Total Depression	0.31	ft
Open Grate Area	1.99	ft²
Active Grate Weir Length	4.45	ft

Worksheet for Curb Inlet/outlet On Grade -1.13ci_25

Project Description

Solve For	Efficiency

Input Data

Discharge	0.20	ft³/s
Slope	0.03600	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.05	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	36.00	in
Local Depression	3.00	in
Local Depression Width	1.00	ft

Results

Efficiency	87.96	%
Intercepted Flow	0.18	ft³/s
Bypass Flow	0.02	ft³/s
Spread	1.62	ft
Depth	0.08	ft
Flow Area	0.07	ft²
Gutter Depression	0.08	ft
Total Depression	0.33	ft
Velocity	3.04	ft/s
Equivalent Cross Slope	0.17500	ft/ft
Length Factor	0.69	
Total Interception Length	4.34	ft

Worksheet for Curb Inlet/outlet On Grade -1.14ci_25

Project Description

Solve For   Efficiency

Input Data

Discharge	0.03	ft³/s
Slope	0.03600	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.05	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	36.00	in
Local Depression	3.00	in
Local Depression Width	1.00	ft

Results

Efficiency	100.00	%
Intercepted Flow	0.03	ft³/s
Bypass Flow	0.00	ft³/s
Spread	0.80	ft
Depth	0.04	ft
Flow Area	0.02	ft²
Gutter Depression	0.08	ft
Total Depression	0.33	ft
Velocity	1.89	ft/s
Equivalent Cross Slope	0.17500	ft/ft
Length Factor	1.53	
Total Interception Length	1.96	ft

Worksheet for Curb Inlet On Grade -1.16cc_25

Project Description

Solve For   Efficiency

Input Data

Discharge	0.80	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	13.51	%
Intercepted Flow	0.11	ft³/s
Bypass Flow	0.69	ft³/s
Spread	3.33	ft
Depth	0.16	ft
Flow Area	0.18	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.39	ft/s
Equivalent Cross Slope	0.07498	ft/ft
Length Factor	0.08	
Total Interception Length	12.91	ft

Worksheet for Curb Inlet On Grade -1.17cc_25

Project Description

Solve For   Efficiency

Input Data

Discharge	0.81	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	13.42	%
Intercepted Flow	0.11	ft³/s
Bypass Flow	0.70	ft³/s
Spread	3.36	ft
Depth	0.16	ft
Flow Area	0.18	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.40	ft/s
Equivalent Cross Slope	0.07483	ft/ft
Length Factor	0.08	
Total Interception Length	13.00	ft

Worksheet for Curb Inlet On Grade -1.18cc_25

Project Description

Solve For   Efficiency

Input Data

Discharge	0.83	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	13.26	%
Intercepted Flow	0.11	ft³/s
Bypass Flow	0.72	ft³/s
Spread	3.42	ft
Depth	0.16	ft
Flow Area	0.19	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.41	ft/s
Equivalent Cross Slope	0.07453	ft/ft
Length Factor	0.08	
Total Interception Length	13.16	ft

Worksheet for Curb Inlet On Grade -1.19cc_25

Project Description

Solve For	Efficiency

Input Data

Discharge	0.84	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	13.18	%
Intercepted Flow	0.11	ft³/s
Bypass Flow	0.73	ft³/s
Spread	3.45	ft
Depth	0.16	ft
Flow Area	0.19	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.41	ft/s
Equivalent Cross Slope	0.07438	ft/ft
Length Factor	0.08	
Total Interception Length	13.24	ft

Worksheet for Curb Inlet On Grade -1.20cc_25

Project Description

Solve For   Efficiency

Input Data

Discharge	0.86	ft³/s
Slope	0.03560	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	13.06	%
Intercepted Flow	0.11	ft³/s
Bypass Flow	0.75	ft³/s
Spread	3.53	ft
Depth	0.17	ft
Flow Area	0.20	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.40	ft/s
Equivalent Cross Slope	0.07401	ft/ft
Length Factor	0.07	
Total Interception Length	13.37	ft

Worksheet for Inlet1.21c_25

Project Description

Solve For   Spread

Input Data

Discharge	1.67	ft³/s
Gutter Width	1.50	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Local Depression	3.00	in
Local Depression Width	7.00	ft
Grate Width	1.50	ft
Grate Length	2.95	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	84.00	in
Opening Height	5.00	in
Curb Throat Type	Horizontal	
Throat Incline Angle	90.00	degrees

Options

Calculation Option   Use Both

Results

Spread	3.33	ft
Depth	0.08	ft
Gutter Depression	0.06	ft
Total Depression	0.31	ft
Open Grate Area	1.99	ft²
Active Grate Weir Length	4.45	ft

Worksheet for Curb Inlet On Grade -2.01cc_25

Project Description

Solve For   Efficiency

Input Data

Discharge	0.46	ft³/s
Slope	0.01730	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	21.15	%
Intercepted Flow	0.10	ft³/s
Bypass Flow	0.36	ft³/s
Spread	2.86	ft
Depth	0.15	ft
Flow Area	0.15	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	3.01	ft/s
Equivalent Cross Slope	0.07700	ft/ft
Length Factor	0.12	
Total Interception Length	8.08	ft

Worksheet for Inlet 3d_25

Project Description

Solve For	Efficiency

Input Data

Discharge	0.55	ft³/s
Slope	0.01660	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	3.00	in
Local Depression Width	7.00	ft
Grate Width	1.50	ft
Grate Length	2.95	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	5.00	in

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	84.80	%
Intercepted Flow	0.47	ft³/s
Bypass Flow	0.08	ft³/s
Spread	3.95	ft
Depth	0.14	ft
Flow Area	0.20	ft²
Gutter Depression	0.06	ft
Total Depression	0.31	ft
Velocity	2.70	ft/s
Splash Over Velocity	6.93	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.05	
Grate Flow Ratio	0.84	
Equivalent Cross Slope	0.05764	ft/ft
Active Grate Length	1.48	ft
Length Factor	0.00	
Total Interception Length	10.24	ft

Worksheet for Curb Inlet On Grade -2.03cc_25

Project Description

Solve For	Efficiency

Input Data

Discharge	0.14	ft³/s
Slope	0.01730	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	34.23	%
Intercepted Flow	0.05	ft³/s
Bypass Flow	0.09	ft³/s
Spread	1.18	ft
Depth	0.10	ft
Flow Area	0.06	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	2.40	ft/s
Equivalent Cross Slope	0.07943	ft/ft
Length Factor	0.21	
Total Interception Length	4.81	ft

Worksheet for Curb Inlet On Grade -2.04cc_25

Project Description

Solve For   Efficiency

Input Data

Discharge	0.33	ft³/s
Slope	0.01730	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	24.50	%
Intercepted Flow	0.08	ft³/s
Bypass Flow	0.25	ft³/s
Spread	2.04	ft
Depth	0.14	ft
Flow Area	0.11	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	2.93	ft/s
Equivalent Cross Slope	0.07914	ft/ft
Length Factor	0.14	
Total Interception Length	6.92	ft

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Worksheet for Curb Inlet On Grade -2.10cc_25

Project Description

Solve For	Efficiency

Input Data

Discharge	0.54	ft³/s
Slope	0.01730	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	19.59	%
Intercepted Flow	0.11	ft³/s
Bypass Flow	0.43	ft³/s
Spread	3.26	ft
Depth	0.16	ft
Flow Area	0.18	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	3.04	ft/s
Equivalent Cross Slope	0.07530	ft/ft
Length Factor	0.11	
Total Interception Length	8.76	ft

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Worksheet for Curb Inlet On Grade -2.13cc_25

Project Description

Solve For	Efficiency

Input Data

Discharge	0.32	ft³/s
Slope	0.01730	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	24.82	%
Intercepted Flow	0.08	ft³/s
Bypass Flow	0.24	ft³/s
Spread	1.96	ft
Depth	0.13	ft
Flow Area	0.11	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	2.91	ft/s
Equivalent Cross Slope	0.07923	ft/ft
Length Factor	0.15	
Total Interception Length	6.82	ft

Worksheet for Curb Inlet On Grade -3.01cc_25

Project Description

Solve For   Efficiency

Input Data

Discharge	0.14	ft³/s
Slope	0.01730	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	34.23	%
Intercepted Flow	0.05	ft³/s
Bypass Flow	0.09	ft³/s
Spread	1.18	ft
Depth	0.10	ft
Flow Area	0.06	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	2.40	ft/s
Equivalent Cross Slope	0.07943	ft/ft
Length Factor	0.21	
Total Interception Length	4.81	ft

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Worksheet for Curb Inlet On Grade - 3.03cc_25

Project Description

Solve For   Efficiency

Input Data

Discharge	0.13	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	28.80	%
Intercepted Flow	0.04	ft³/s
Bypass Flow	0.09	ft³/s
Spread	1.00	ft
Depth	0.08	ft
Flow Area	0.04	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	3.10	ft/s
Equivalent Cross Slope	0.07943	ft/ft
Length Factor	0.17	
Total Interception Length	5.81	ft

Worksheet for Inlet 4e_25

Project Description

Solve For	Efficiency

Input Data

Discharge	0.54	ft³/s
Slope	0.01660	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	3.00	in
Local Depression Width	7.00	ft
Grate Width	1.50	ft
Grate Length	2.95	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	5.00	in

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	85.19	%
Intercepted Flow	0.46	ft³/s
Bypass Flow	0.08	ft³/s
Spread	3.90	ft
Depth	0.14	ft
Flow Area	0.20	ft²
Gutter Depression	0.06	ft
Total Depression	0.31	ft
Velocity	2.70	ft/s
Splash Over Velocity	6.93	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.05	
Grate Flow Ratio	0.84	
Equivalent Cross Slope	0.05782	ft/ft
Active Grate Length	1.48	ft
Length Factor	0.00	
Total Interception Length	10.14	ft

Worksheet for Inlet 4a_25

Project Description

Solve For	Efficiency

Input Data

Discharge	0.58	ft³/s
Slope	0.01660	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	3.00	in
Local Depression Width	7.00	ft
Grate Width	1.50	ft
Grate Length	2.95	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	5.00	in

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	83.64	%
Intercepted Flow	0.49	ft³/s
Bypass Flow	0.09	ft³/s
Spread	4.06	ft
Depth	0.15	ft
Flow Area	0.21	ft²
Gutter Depression	0.06	ft
Total Depression	0.31	ft
Velocity	2.72	ft/s
Splash Over Velocity	6.93	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.05	
Grate Flow Ratio	0.83	
Equivalent Cross Slope	0.05709	ft/ft
Active Grate Length	1.48	ft
Length Factor	0.00	
Total Interception Length	10.53	ft

Worksheet for Curb Inlet On Grade - 1.01cc_100

Project Description

Solve For   Efficiency

Input Data

Discharge	0.78	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	13.68	%
Intercepted Flow	0.11	ft³/s
Bypass Flow	0.67	ft³/s
Spread	3.26	ft
Depth	0.16	ft
Flow Area	0.18	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.39	ft/s
Equivalent Cross Slope	0.07528	ft/ft
Length Factor	0.08	
Total Interception Length	12.75	ft

Worksheet for Curb Inlet On Grade -1.02cc_100

Project Description

Solve For	Efficiency

Input Data

Discharge	0.82	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	13.34	%
Intercepted Flow	0.11	ft³/s
Bypass Flow	0.71	ft³/s
Spread	3.39	ft
Depth	0.16	ft
Flow Area	0.19	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.40	ft/s
Equivalent Cross Slope	0.07468	ft/ft
Length Factor	0.08	
Total Interception Length	13.08	ft

Worksheet for Curb Inlet On Grade -1.03cc_100

Project Description

Solve For   Efficiency

Input Data

Discharge	0.87	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	12.95	%
Intercepted Flow	0.11	ft³/s
Bypass Flow	0.76	ft³/s
Spread	3.54	ft
Depth	0.17	ft
Flow Area	0.20	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.42	ft/s
Equivalent Cross Slope	0.07394	ft/ft
Length Factor	0.07	
Total Interception Length	13.49	ft

Worksheet for Curb Inlet On Grade -1.04cc_100

Project Description

Solve For	Efficiency

Input Data

Discharge	0.92	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	12.58	%
Intercepted Flow	0.12	ft³/s
Bypass Flow	0.80	ft³/s
Spread	3.69	ft
Depth	0.17	ft
Flow Area	0.21	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.44	ft/s
Equivalent Cross Slope	0.07321	ft/ft
Length Factor	0.07	
Total Interception Length	13.89	ft

Worksheet for Curb Inlet On Grade -1.05cc_100

Project Description

Solve For   Efficiency

Input Data

Discharge	0.95	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	12.38	%
Intercepted Flow	0.12	ft³/s
Bypass Flow	0.83	ft³/s
Spread	3.77	ft
Depth	0.17	ft
Flow Area	0.21	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.45	ft/s
Equivalent Cross Slope	0.07277	ft/ft
Length Factor	0.07	
Total Interception Length	14.13	ft

Worksheet for Curb Inlet On Grade -1.06cc_100

Project Description

Solve For	Efficiency

Input Data

Discharge	0.97	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	12.24	%
Intercepted Flow	0.12	ft³/s
Bypass Flow	0.85	ft³/s
Spread	3.82	ft
Depth	0.17	ft
Flow Area	0.22	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.46	ft/s
Equivalent Cross Slope	0.07249	ft/ft
Length Factor	0.07	
Total Interception Length	14.29	ft

Worksheet for Inlet1.07a_100

Project Description

Solve For   Spread

Input Data

Discharge		1.82	ft³/s
Gutter Width		1.50	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.02	ft/ft
Local Depression		3.00	in
Local Depression Width		7.00	ft
Grate Width		1.50	ft
Grate Length		2.95	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%
Curb Opening Length		84.00	in
Opening Height		5.00	in
Curb Throat Type	Horizontal		
Throat Incline Angle		90.00	degrees

Options

Calculation Option   Use Both

Results

Spread	3.45	ft
Depth	0.09	ft
Gutter Depression	0.06	ft
Total Depression	0.31	ft
Open Grate Area	1.99	ft²
Active Grate Weir Length	4.45	ft

Worksheet for Curb Inlet/outlet On Grade -1.13ci_100

Project Description

Solve For	Efficiency

Input Data

Discharge	0.28	ft³/s
Slope	0.03600	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.05	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	36.00	in
Local Depression	3.00	in
Local Depression Width	1.00	ft

Results

Efficiency	80.82	%
Intercepted Flow	0.23	ft³/s
Bypass Flow	0.05	ft³/s
Spread	1.84	ft
Depth	0.09	ft
Flow Area	0.08	ft²
Gutter Depression	0.08	ft
Total Depression	0.33	ft
Velocity	3.31	ft/s
Equivalent Cross Slope	0.17500	ft/ft
Length Factor	0.60	
Total Interception Length	5.00	ft

Worksheet for Curb Inlet/outlet On Grade -1.14ci_100

Project Description

Solve For   Efficiency

Input Data

Discharge	0.06	ft³/s
Slope	0.03600	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.05	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	36.00	in
Local Depression	3.00	in
Local Depression Width	1.00	ft

Results

Efficiency	100.00	%
Intercepted Flow	0.06	ft³/s
Bypass Flow	0.00	ft³/s
Spread	1.03	ft
Depth	0.05	ft
Flow Area	0.03	ft²
Gutter Depression	0.08	ft
Total Depression	0.33	ft
Velocity	2.25	ft/s
Equivalent Cross Slope	0.17500	ft/ft
Length Factor	1.15	
Total Interception Length	2.62	ft

Worksheet for Curb Inlet On Grade -1.16cc_100

Project Description

Solve For	Efficiency

Input Data

Discharge	0.99	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	12.12	%
Intercepted Flow	0.12	ft³/s
Bypass Flow	0.87	ft³/s
Spread	3.88	ft
Depth	0.17	ft
Flow Area	0.22	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.47	ft/s
Equivalent Cross Slope	0.07221	ft/ft
Length Factor	0.07	
Total Interception Length	14.44	ft

Worksheet for Curb Inlet On Grade -1.17cc_100

Project Description

Solve For	Efficiency

Input Data

Discharge	1.02	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	11.93	%
Intercepted Flow	0.12	ft³/s
Bypass Flow	0.90	ft³/s
Spread	3.95	ft
Depth	0.17	ft
Flow Area	0.23	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.48	ft/s
Equivalent Cross Slope	0.07179	ft/ft
Length Factor	0.07	
Total Interception Length	14.68	ft

Worksheet for Curb Inlet On Grade -1.18cc_100

Project Description

Solve For	Efficiency

Input Data

Discharge	1.06	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	11.69	%
Intercepted Flow	0.12	ft³/s
Bypass Flow	0.94	ft³/s
Spread	4.05	ft
Depth	0.18	ft
Flow Area	0.24	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.50	ft/s
Equivalent Cross Slope	0.07125	ft/ft
Length Factor	0.07	
Total Interception Length	14.98	ft

Worksheet for Curb Inlet On Grade -1.19cc_100

Project Description

Solve For	Efficiency

Input Data

Discharge	1.09	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	11.52	%
Intercepted Flow	0.13	ft³/s
Bypass Flow	0.96	ft³/s
Spread	4.13	ft
Depth	0.18	ft
Flow Area	0.24	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.51	ft/s
Equivalent Cross Slope	0.07085	ft/ft
Length Factor	0.07	
Total Interception Length	15.21	ft

Worksheet for Curb Inlet On Grade -1.20cc_100

Project Description

Solve For   Efficiency

Input Data

Discharge	1.12	ft³/s
Slope	0.03560	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	11.39	%
Intercepted Flow	0.13	ft³/s
Bypass Flow	0.99	ft³/s
Spread	4.21	ft
Depth	0.18	ft
Flow Area	0.25	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	4.50	ft/s
Equivalent Cross Slope	0.07037	ft/ft
Length Factor	0.06	
Total Interception Length	15.40	ft

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Worksheet for Inlet1.21c_100

Project Description

Solve For	Spread

Input Data

Discharge	2.13	ft³/s
Gutter Width	1.50	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Local Depression	3.00	in
Local Depression Width	7.00	ft
Grate Width	1.50	ft
Grate Length	2.95	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	84.00	in
Opening Height	5.00	in
Curb Throat Type	Horizontal	
Throat Incline Angle	90.00	degrees

Options

Calculation Option	Use Both

Results

Spread	3.65	ft
Depth	0.11	ft
Gutter Depression	0.06	ft
Total Depression	0.31	ft
Open Grate Area	1.99	ft²
Active Grate Weir Length	4.45	ft

Worksheet for Curb Inlet On Grade -2.01cc_100

Project Description

Solve For   Efficiency

Input Data

Discharge	0.65	ft³/s
Slope	0.01730	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	17.86	%
Intercepted Flow	0.12	ft³/s
Bypass Flow	0.53	ft³/s
Spread	3.73	ft
Depth	0.17	ft
Flow Area	0.21	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	3.08	ft/s
Equivalent Cross Slope	0.07295	ft/ft
Length Factor	0.10	
Total Interception Length	9.66	ft

Worksheet for Inlet 3d_100

Project Description

Solve For   Efficiency

Input Data

Discharge	0.78	ft³/s
Slope	0.01660	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	3.00	in
Local Depression Width	7.00	ft
Grate Width	2.00	ft
Grate Length	2.95	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	5.00	in

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	92.97	%
Intercepted Flow	0.73	ft³/s
Bypass Flow	0.05	ft³/s
Spread	4.08	ft
Depth	0.17	ft
Flow Area	0.25	ft²
Gutter Depression	0.09	ft
Total Depression	0.34	ft
Velocity	3.10	ft/s
Splash Over Velocity	6.93	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.04	
Grate Flow Ratio	0.93	
Equivalent Cross Slope	0.06435	ft/ft
Active Grate Length	1.48	ft
Length Factor	0.00	
Total Interception Length	11.10	ft

Worksheet for Curb Inlet On Grade -2.03cc_100

Project Description

Solve For   Efficiency

Input Data

Discharge	0.12	ft³/s
Slope	0.01730	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	36.29	%
Intercepted Flow	0.04	ft³/s
Bypass Flow	0.08	ft³/s
Spread	1.12	ft
Depth	0.09	ft
Flow Area	0.05	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	2.31	ft/s
Equivalent Cross Slope	0.07943	ft/ft
Length Factor	0.22	
Total Interception Length	4.51	ft

Worksheet for Curb Inlet On Grade -2.04cc_100

Project Description

Solve For   Efficiency

Input Data

Discharge	0.37	ft³/s
Slope	0.01730	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	23.34	%
Intercepted Flow	0.09	ft³/s
Bypass Flow	0.28	ft³/s
Spread	2.32	ft
Depth	0.14	ft
Flow Area	0.13	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	2.96	ft/s
Equivalent Cross Slope	0.07864	ft/ft
Length Factor	0.14	
Total Interception Length	7.29	ft

Worksheet for Curb Inlet On Grade -2.10cc_100

Project Description

Solve For   Efficiency

Input Data

Discharge	0.75	ft³/s
Slope	0.01730	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	16.60	%
Intercepted Flow	0.12	ft³/s
Bypass Flow	0.63	ft³/s
Spread	4.11	ft
Depth	0.18	ft
Flow Area	0.24	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	3.13	ft/s
Equivalent Cross Slope	0.07095	ft/ft
Length Factor	0.10	
Total Interception Length	10.43	ft

Worksheet for Inlet 3b_100

Project Description

Solve For	Efficiency

Input Data

Discharge	0.78	ft³/s
Slope	0.01660	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	3.00	in
Local Depression Width	7.00	ft
Grate Width	2.00	ft
Grate Length	2.95	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	5.00	in

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	92.97	%
Intercepted Flow	0.73	ft³/s
Bypass Flow	0.05	ft³/s
Spread	4.08	ft
Depth	0.17	ft
Flow Area	0.25	ft²
Gutter Depression	0.09	ft
Total Depression	0.34	ft
Velocity	3.10	ft/s
Splash Over Velocity	6.93	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.04	
Grate Flow Ratio	0.93	
Equivalent Cross Slope	0.06435	ft/ft
Active Grate Length	1.48	ft
Length Factor	0.00	
Total Interception Length	11.10	ft

Worksheet for Curb Inlet On Grade -2.12cc_100

Project Description

Solve For	Efficiency

Input Data

Discharge	0.12	ft³/s
Slope	0.01730	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	36.29	%
Intercepted Flow	0.04	ft³/s
Bypass Flow	0.08	ft³/s
Spread	1.12	ft
Depth	0.09	ft
Flow Area	0.05	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	2.31	ft/s
Equivalent Cross Slope	0.07943	ft/ft
Length Factor	0.22	
Total Interception Length	4.51	ft

Worksheet for Curb Inlet On Grade -3.01cc_100

Project Description

Solve For   Efficiency

Input Data

Discharge	0.09	ft³/s
Slope	0.01730	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	40.42	%
Intercepted Flow	0.04	ft³/s
Bypass Flow	0.05	ft³/s
Spread	1.00	ft
Depth	0.08	ft
Flow Area	0.04	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	2.15	ft/s
Equivalent Cross Slope	0.07943	ft/ft
Length Factor	0.25	
Total Interception Length	4.00	ft

Worksheet for Inlet 4e_100

Project Description

Solve For   Efficiency

Input Data

Discharge	0.67	ft³/s
Slope	0.01660	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	3.00	in
Local Depression Width	7.00	ft
Grate Width	2.00	ft
Grate Length	2.95	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	5.00	in

Options

Calculation Option   Use Both
Grate Flow Option   Exclude None

Results

Efficiency	95.43	%
Intercepted Flow	0.64	ft³/s
Bypass Flow	0.03	ft³/s
Spread	3.67	ft
Depth	0.16	ft
Flow Area	0.22	ft²
Gutter Depression	0.09	ft
Total Depression	0.34	ft
Velocity	3.05	ft/s
Splash Over Velocity	6.93	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.04	
Grate Flow Ratio	0.95	
Equivalent Cross Slope	0.06558	ft/ft
Active Grate Length	1.48	ft
Length Factor	0.00	
Total Interception Length	10.30	ft

Worksheet for Curb Inlet On Grade - 3.03cc_100

Project Description

Solve For	Efficiency

Input Data

Discharge	0.09	ft³/s
Slope	0.03600	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Curb Opening Length	12.00	in
Local Depression	1.00	in
Local Depression Width	3.00	ft

Results

Efficiency	33.18	%
Intercepted Flow	0.03	ft³/s
Bypass Flow	0.06	ft³/s
Spread	0.87	ft
Depth	0.07	ft
Flow Area	0.03	ft²
Gutter Depression	0.09	ft
Total Depression	0.18	ft
Velocity	2.83	ft/s
Equivalent Cross Slope	0.07943	ft/ft
Length Factor	0.20	
Total Interception Length	4.98	ft

Worksheet for Inlet 4a_100

Project Description
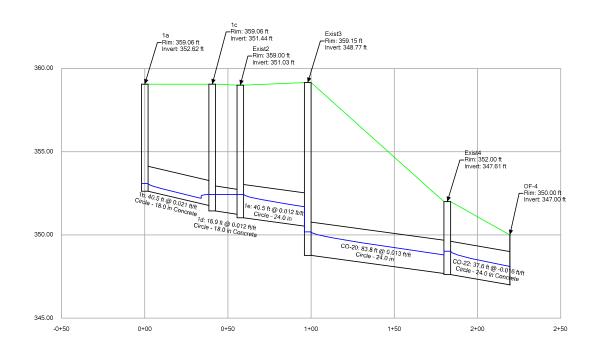
Solve For	Efficiency

Input Data

Discharge	0.58	ft³/s
Slope	0.01660	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	3.00	in
Local Depression Width	7.00	ft
Grate Width	2.00	ft
Grate Length	2.95	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	5.00	in

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results
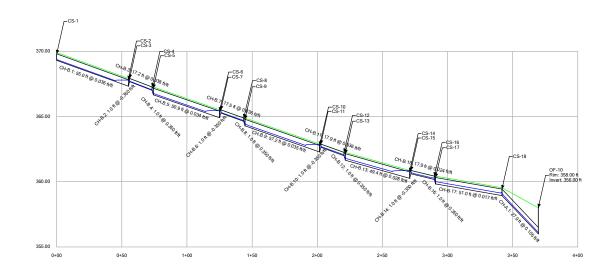
Efficiency	97.34	%
Intercepted Flow	0.56	ft³/s
Bypass Flow	0.02	ft³/s
Spread	3.29	ft
Depth	0.15	ft
Flow Area	0.19	ft²
Gutter Depression	0.09	ft
Total Depression	0.34	ft
Velocity	3.00	ft/s
Splash Over Velocity	6.93	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.04	
Grate Flow Ratio	0.97	
Equivalent Cross Slope	0.06653	ft/ft
Active Grate Length	1.48	ft
Length Factor	0.00	
Total Interception Length	9.61	ft

Profile Report
Engineering Profile - Profile - 1 (1118_TMD_Drainage_25yr.stsw)

1a
Rim: 359.06 ft
Invert: 352.62 ft

1c
Rim: 359.06 ft
Invert: 351.44 ft

Exist2
Rim: 359.00 ft
Invert: 351.03 ft

Exist3
Rim: 359.15 ft
Invert: 348.77 ft

Exist4
Rim: 352.00 ft
Invert: 347.61 ft

OF-4
Rim: 350.00 ft
Invert: 347.00 ft

1b: 40.5 ft @ 0.021 ft/ft
Circle - 18.0 in Concrete

1d: 16.9 ft @ 0.012 ft/ft
Circle - 18.0 in Concrete

1e: 40.5 ft @ 0.012 ft/ft
Circle - 24.0 in

CO-20: 83.8 ft @ 0.013 ft/ft
Circle - 24.0 in

CO-22: 37.6 ft @ -0.016 ft/ft
Circle - 24.0 in Concrete

Elevation (ft)

Station (ft)

1118_TMD_Drainage_25yr.stsw
8/20/2015

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Profile Report
Engineering Profile - Profile - 2 (1118_TMD_Drainage_25yr.stsw)

1118_TMD_Drainage_25yr.stsw
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Profile Report
Engineering Profile - Profile - 3 (1118_TMD_Drainage_25yr.stsw)

CS-19

CS-20

Exist3
Rim: 359.15 ft
Invert: 348.77 ft

360.00

CH-B.18: 39.2 ft @ 0.008 ft/ft

CH-B.19: 4.7 ft @ 0.070 ft/ft

355.00

Elevation (ft)

350.00

345.00

0+00

0+50

Station (ft)

1118_TMD_Drainage_25yr.stsw
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Profile Report
Engineering Profile - Profile - 4 (1118_TMD_Drainage_25yr.stsw)

Profile Report
Engineering Profile - Profile - 5 (1118_TMD_Drainage_25yr.stsw)

CS-39

3d
Rim: 359.03 ft
Invert: 340.47 ft

CH-D.1: 63.2 ft @ 0.020 ft/ft

360.00

355.00

350.00

Elevation (ft)

345.00

340.00

0+00   0+50   1+00

Station (ft)

Profile Report
Engineering Profile - Profile - 6 (1118_TMD_Drainage_25yr.stsw)

CS-40

4a
Rim: 355.59 ft
Invert: 344.43 ft

CH-D.2: 205.0 ft @ 0.018 ft/ft

Elevation (ft)

360.00

355.00

350.00

345.00

340.00

0+00   0+50   1+00   1+50   2+00   2+50

Station (ft)

1118_TMD_Drainage_25yr.stsw
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Profile Report
Engineering Profile - Profile - 7 (1118_TMD_Drainage_25yr.stsw)

CS-41

3b
Rim: 358.47 ft
Invert: 341.87 ft

CH-E 1: 39.5 ft @ 0.026 ft/ft

Elevation (ft)

360.00

355.00

350.00

345.00

340.00

0+00   0+50

Station (ft)

1118_TMD_Drainage_25yr.stsw
8/20/2015

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Profile Report
Engineering Profile - Profile - 8 (1118_TMD_Drainage_25yr.stsw)

CS-42

4e
Rim: 355.59 ft
Invert: 344.86 ft

CH-E.2: 184.1 ft @ 0.020 ft/ft

Elevation (ft)

360.00
355.00
350.00
345.00
340.00

0+00   0+50   1+00   1+50   2+00

Station (ft)

1118_TMD_Drainage_25yr.stsw
8/20/2015

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Profile Report
Engineering Profile - Profile - 9 (1118_TMD_Drainage_25yr.stsw)

Profile Report
Engineering Profile - Profile - 10 (1118_TMD_Drainage_25yr.stsw)

Elevation (ft)

360.00

355.00

350.00

345.00

340.00

-0+50   0+00   0+50

Station (ft)

4a
Rim: 355.59 ft
Invert: 344.43 ft

4c
Rim: 355.19 ft
Invert: 343.49 ft

4e
Rim: 355.59 ft
Invert: 344.86 ft

4f: 3.8 ft @ 0.061 ft/ft
Circle - 18.0 in

4b: 43.3 ft @ 0.018 ft/ft
Circle - 18.0 in Concrete

1118_TMD_Drainage_25yr.stsw
8/20/2015

Bentley Systems, Inc. Haestad Methods Solution
Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

Bentley StormCAD V8i (SELECTseries 4)
[08.11.04.54]
Page 1 of 1

Profile Report
Engineering Profile - Profile - 1 (1118_TMD_Drainage_100yr.stsw)

Profile Report
Engineering Profile - Profile - 2 (1118_TMD_Drainage_100yr.stsw)

Profile Report
Engineering Profile - Profile - 3 (1118_TMD_Drainage_100yr.stsw)

CS-19

CS-20
Exist3
Rim: 359.15 ft
Invert: 348.77 ft

360.00

CH-B.18: 39.2 ft @ 0.008 ft/ft

CH-B.19: 4.7 ft @ 0.070 ft/ft

Elevation (ft)

355.00

350.00

345.00

0+00

0+50

Station (ft)

Profile Report
Engineering Profile - Profile - 4 (1118_TMD_Drainage_100yr.stsw)

Profile Report
Engineering Profile - Profile - 5 (1118_TMD_Drainage_100yr.stsw)

CS-39

3d
Rim: 359.03 ft
Invert: 340.47 ft

CH-D.1: 63.2 ft @ 0.020 ft/ft

360.00

355.00

350.00

345.00

340.00

Elevation (ft)

0+00   0+50   1+00

Station (ft)

1118_TMD_Drainage_100yr.stsw
8/20/2015

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Bentley StormCAD V8i (SELECTseries 4)
[08.11.04.54]
Page 1 of 1

Profile Report

Engineering Profile - Profile - 6 (1118_TMD_Drainage_100yr.stsw)

CS-40

4a
Rim: 355.59 ft
Invert: 344.43 ft

CH-D.2: 205.0 ft @ 0.018 ft/ft

Elevation (ft)

360.00

355.00

350.00

345.00

340.00

0+00   0+50   1+00   1+50   2+00   2+50

Station (ft)

1118_TMD_Drainage_100yr.stsw
8/20/2015

Bentley Systems, Inc. Haestad Methods Solution
Center
27 Siemon Company Drive Suite 200 W
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Bentley StormCAD V8i (SELECTseries 4)
[08.11.04.54]
Page 1 of 1

Profile Report
Engineering Profile - Profile - 7 (1118_TMD_Drainage_100yr.stsw)

CS-41

3b
Rim: 358.47 ft
Invert: 341.87 ft

CH-E.1: 39.5 ft @ 0.026 ft/ft

360.00

355.00

350.00

345.00

340.00

Elevation (ft)

0+00   0+50

Station (ft)

Profile Report
Engineering Profile - Profile - 8 (1118_TMD_Drainage_100yr.stsw)

CS-42

4e
Rim: 355.59 ft
Invert: 344.86 ft

CH-E.2: 184.1 ft @ 0.020 ft/ft

Elevation (ft)

360.00

355.00

350.00

345.00

340.00

0+00   0+50   1+00   1+50   2+00

Station (ft)

1118_TMD_Drainage_100yr.stsw
8/20/2015

Bentley Systems, Inc. Haestad Methods Solution
Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

Bentley StormCAD V8i (SELECTseries 4)
[08.11.04.54]
Page 1 of 1

Profile Report
Engineering Profile - Profile - 9 (1118_TMD_Drainage_100yr.stsw)

1118_TMD_Drainage_100yr.stsw
8/20/2015

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

Bentley StormCAD V8i (SELECTseries 4)
[08.11.04.54]
Page 1 of 1

Profile Report
Engineering Profile - Profile - 10 (1118_TMD_Drainage_100yr.stsw)

1118_TMD_Drainage_100yr.stsw
8/20/2015

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

Bentley StormCAD V8i (SELECTseries 4)
[08.11.04.54]
Page 1 of 1

APPENDIX D

PROPOSED DRAINAGE PLANS

NOTES:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

GENERAL NOTES:

1. VERIFY THE EXISTENCE AND HORIZONTAL/VERTICAL LOCATION OF ALL UTILITIES WITHIN THE PROJECT AREA THAT MAY CONFLICT WITH THE PROPOSED CONSTRUCTION. VERIFY THAT ANY UTILITIES SHOWN TO BE RELOCATED BY OTHERS HAVE BEEN RELOCATED AND ARE NO LONGER IN CONFLICT. IMMEDIATELY NOTIFY THE ENGINEER OF ANY REMAINING UTILITY CONFLICTS PRIOR TO THE START OF ANY DEMOLITION WORK.

2. CONTRACTOR TO SURVEY THE INVERTS AT ALL STORM DRAIN CONNECTIONS & NOTIFY ENGINEER IMMEDIATELY OF ANY CONFLICTS PRIOR TO CONSTRUCTION.

LEGEND:

Ⓧ DRAINAGE SYSTEM No.

Ⓧ DRAINAGE UNIT

"SR-56" LINE

CALTRANS R/W

REMOVE Exist 18" RCP ⓗ
REMOVE Exist INLET ⓘ

ⓖ Exist TYPE B-8 INLET (MOD)
ⓐ TYPE B INLET
ⓑ 18" RCP

CALTRANS R/W

ⓐ MOD. TYPE A DRAINAGE DITCH SEE DD SHEETS

ⓔ 24" RCP W/ Conc COLLAR
ⓓ TYPE B-1 INLET L=7' (MOD)

TCE

ⓗ Exist 24" RCP

ⓐ TYPE B-1 INLET L=7' (MOD)
ⓑ 18" RCP

"TMD" LINE

SR-56 BIKE PATH

EASTBOUND SR-56

WESTBOUND SR-56

SUNSHINE PATH

ⓒ TYPE A CLEANUP/CLEANOUT

CITY R/W

24" RCP ⓒ
TYPE B-1 INLET ⓑ
24" RCP W/ Conc COLLAR ⓐ

CALTRANS R/W

24" RCP W/ CONC COLLAR ⓕ
Exist TYPE B INLET (MOD) ⓔ

18" RCP W/ CONC COLLAR ⓓ

TYPE B INLET ⓒ

CALTRANS R/W

24" RCP W/ Conc COLLAR ⓖ
18" RCP ⓕ
TYPE B-1 INLET L=7' (MOD) ⓔ
24" RCP W/ Conc COLLAR ⓓ

CITY R/W

PRIMROSE LN.

TORREY MEADOWS DRIVE

VIA AMBROSA

TCE
CITY R/W
CITY R/W
TCE

ACCURATE FOR DRAINAGE WORK ONLY.

DRAINAGE PLAN

SCALE: 1" = 50'

D-1

LAST REVISION 08-20-15 | DATE PLOTTED => 8/20/2015 | TIME PLOTTED => 3:08:24 PM

BORDER LAST REVISED 7/2/2010

USERNAME => sjohnson1
DGN FILE => 1118_iq01.dgn

RELATIVE BORDER SCALE IS IN INCHES
0 1 2 3

UNIT XXXX

PROJECT NUMBER & PHASE

11140000491

REGISTERED CIVIL ENGINEER   DATE

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

JEFFREY J. BURDICK
No. C75396
Exp. 12/31/15
CIVIL

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH
SUITE 700
SAN DIEGO, CA 92108

CITY OF SAN DIEGO
525 B STREET
SUITE 750
SAN DIEGO, CA 92101

90° CONTINUES TO 1b

RIM ELEV=359.06
TYPE B INLET
H=6.44

22.25' LT "TMD"
9+83.20

OG
FG

22.25' Rt "TMD"

RIM ELEV=359.06
TYPE B INLET
H=7.29

8in PVC
FL=353.00

INSTALL 0.5"
FLOW CONTROL ORIFICE

FL
352.62

FL
351.77

18in x 40.50 RCP
S=2.10%

PROPOSED 16" WATER
IE 348.30

DRAINAGE SYSTEM No. 1a

96° CONTINUES TO 1C

RIM ELEV=359.06
TYPE B INLET
H=7.29

22.25' Rt "TMD"
9+83.20

FG
OG

22.24' Rt "TMD"
9+61.58

8in PVC
FL=355.50

8in PVC
FL=355.00

INSTALL 0.5"
FLOW CONTROL ORIFICE

INSTALL 0.5"
FLOW CONTROL ORIFICE

FL
351.44

FL
(351.24)

CONC. COLLAR

18in x 16.91 RCP
S=1.18%

DRAINAGE SYSTEM No. 1b

e Exist TYPE B INLET

22.24' Rt "TMD"
9+61.58

g Exist TYPE B-8 (MOD) INLET
FG

OG

8in PVC
FL=355.50

8in PVC
FL=352.23

FL
(351.36)

INSTALL 0.5"
FLOW CONTROL ORIFICE

FL
(351.03)

CONC. COLLAR

PROPOSED 16" WATER
IE 348.19

FL
(349.03)

INSTALL 0.5"
FLOW CONTROL ORIFICE

Exist 24 in RCP

FL
(350.53)

CONC. COLLAR

24in x 40.53 RCP
S=1.23%

FL
(347.94)

FL
(347.87)

FL
(347.26)

Exist 18in H x 36in W RCB

DRAINAGE SYSTEM No. 1c

1a 1b 1c

DRAINAGE PROFILES

SCALE: Horiz 1"=10'
Vert 1"=10'

DP-1

REVISED BY
DATE REVISED
SHANNON JOHNSON
JEFFREY BURDICK
CALCULATED-DESIGNED BY
CHECKED BY
CONSULTANT FUNCTIONAL SUPERVISOR
CLARK FERNON

LAST REVISION DATE PLOTTED => 8/20/2015
08-20-15 TIME PLOTTED => 3:09:14 PM

BORDER LAST REVISED 7/2/2010

USERNAME => sjohnson1
DGN FILE => 1118_ib01.dgn

RELATIVE BORDER SCALE IS IN INCHES
0   1   2   3

UNIT XXXX

PROJECT NUMBER & PHASE

11140000491

REGISTERED CIVIL ENGINEER   DATE

JEFFREY J. BURDICK
No. C75396
Exp. 12/31/15
CIVIL

PLANS APPROVAL DATE

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T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH
SUITE 700
SAN DIEGO, CA 92108

CITY OF SAN DIEGO
525 B STREET
SUITE 750
SAN DIEGO, CA 92101

RIM ELEV=358.47
TYPE B-1 INLET (L=7) (b)
H=16.60

PROPOSED 16" WATER
IE 355.30

22.89' Rt "TMD"
15+23.48

RIM ELEV=359.03
TYPE B-1 INLET (L=7) (d)
H=18.56

22.83' Lt "TMD"
15+23.39

FG
OG

8in PVC
FL=351.09

8in PVC
FL=354.00

8in PVC
FL=355.15

INSTALL 0.5"
FLOW CONTROL ORIFICE

8in PVC
FL=351.08

Conc COLLAR

INSTALL 0.5"
FLOW CONTROL ORIFICE

(c) 24in x 41.77' RCP
S= 2.56%

Conc COLLAR

Exist 24in RCP
(S=0.64%)

FL
342.44

24in x 35.00' RCP W/ Conc COLLAR (a)
S= 0.64%

FL
341.87

FL
342.21

FL
340.80

FL
340.47

FL
338.88

Exist 24in RCP
(S=-26.11%)

24in x 5.00' RCP W/ Conc COLLAR (e)
S= 31.8%

DRAINAGE SYSTEM No. ⟨3⟩

RIM ELEV=355.74'
TYPE B-1 INLET (L=7) (a)
H=11.16

27.25' Lt "TMD"
17+25.00

RIM ELEV=355.25'
TYPE A CLEANOUT (c)
H=11.76

20.00' Rt "TMD"
17+25.00

27.25' Rt "TMD"
17+25.00

(e) RIM ELEV=355.66'
TYPE B-1 INLET (L=7)
H=11.73

OG
FG

(b) 18in x 43.26' RCP
S= 1.80%

INSTALL 0.5"
FLOW CONTROL ORIFICE

(2) 8in PVC
FL=350.60

(2) 8in PVC
FL=350.98

INSTALL 0.5"
FLOW CONTROL ORIFICE

FL
344.43

FL
343.65

FL
343.86

(f) 18in x 3.75' RCP
S= 5.60%

FL
343.65

DRAINAGE SYSTEM No. ⟨4⟩

⟨3⟩ ⟨4⟩

DRAINAGE PROFILES

SCALE: Horiz 1"=10'
Vert 1"=10'

DP-2

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans®

REVISED BY
DATE REVISED

SHANNON JOHNSON
JEFFREY BURDICK

CALCULATED-DESIGNED BY
CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR
CLARK FERNON

BORDER LAST REVISED 7/2/2010

USERNAME => sjohnson1
DGN FILE => 1118_ib02.dgn

RELATIVE BORDER SCALE
IS IN INCHES

0   1   2   3

UNIT XXXX

PROJECT NUMBER & PHASE

11140000491

LAST REVISION DATE PLOTTED => 8/20/2015
08-20-15 TIME PLOTTED => 3:09:56 PM

REGISTERED CIVIL ENGINEER   DATE

JEFFREY
J. BURDICK
No. C75396
Exp. 12/31/15
CIVIL

PLANS APPROVAL DATE

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T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH
SUITE 700
SAN DIEGO, CA 92108

CITY OF SAN DIEGO
525 B STREET
SUITE 750
SAN DIEGO, CA 92101

Exist TYPE B-1 INLET

Exist TYPE A-8 CLEANOUT

20.00' Rt "TMD"
17+25.00

c RIM ELEV=355.25'
TYPE A CLEANOUT
H=11.76

OG
FG

Conc COLLAR

Conc COLLAR

Exist 18in RCP

Exist 24in RCP

FL
(344.55)

FL
(344.40)

FL
(343.81)

FL
(343.56)

24in × 6.00' RCP
S=0.64%

g

FL
343.52

FL
343.49

d 24in × 6.00' RCP
S=0.64%

FL
(343.45)

h Exist 24in RCP

360
350
340
330
320

360
350
340
330
320

DRAINAGE SYSTEM No. 4

4

DRAINAGE PROFILES

SCALE: Horiz 1"=10'
         Vert 1"=10'

DP-3

BORDER LAST REVISED 7/2/2010

USERNAME => sjohnson1
DGN FILE => 1118_ib03.dgn

RELATIVE BORDER SCALE
IS IN INCHES
0 1 2 3

UNIT XXXX

PROJECT NUMBER & PHASE

11140000491

LAST REVISION DATE PLOTTED => 8/20/2015
08-20-15 TIME PLOTTED => 3:10:40 PM

APPENDIX E

PROPOSED PRELIMINARY HYDRO MODIFICATION AND TREATMENT CONTROL BMP MAP

TYPICAL SECTION FOR TYPE B INLET (MOD) OPENING

3.0'
BASIN

1.0'

FL

FL

FL

EXIST TYPE B INLET (MOD)

8" PERFORATED UNDERDRAIN WRAPPED IN FILTER FABRIC

8" PVC CAP

EXIST TYPE B INLET (MOD)

8" PERFORATED UNDERDRAIN WRAPPED IN FILTER FABRIC

PROP. 18" RCP

PROP. 18" RCP

EXIST TYPE B INLET (MOD)

GENERAL NOTES:

1. VERIFY THE EXISTENCE AND HORIZONTAL/VERTICAL LOCATION OF ALL UTILITIES WITHIN THE PROJECT AREA THAT MAY CONFLICT WITH THE PROPOSED CONSTRUCTION. VERIFY THAT ANY UTILITIES SHOWN TO BE RELOCATED BY OTHERS HAVE BEEN RELOCATED AND ARE NO LONGER IN CONFLICT. IMMEDIATELY NOTIFY THE ENGINEER OF ANY REMAINING UTILITY CONFLICTS PRIOR TO THE START OF ANY DEMOLITION WORK.

2. CONTRACTOR TO SURVEY THE INVERTS AT ALL STORM DRAIN CONNECTIONS & NOTIFY ENGINEER IMMEDIATELY OF ANY CONFLICTS PRIOR TO CONSTRUCTION.

3. THESE PLANS ARE ACCURATE FOR DRAINAGE IMPROVEMENTS ONLY.

4. SEE LANDSCAPE AND IRRIGATION PLANS FOR THE RECONFIGURATION AND/OR REMOVAL OF EXISTING IRRIGATION SYSTEM(S) IN THE PROPOSED BIORETENTION BASIN AREAS.

CONSTRUCTION NOTES:

(1) INSTALL CURB INLET TYPE B PER CSDSD SDD-116

(2) INSTALL 8" PERFORATED PVC STORM DRAIN PER DETAIL

(3) INSTALL CURB CUTS PER DETAIL

48.06' Lt "TMD" 9+03.57
IE 352.55
ANGLE POINT, 22.5° ELBOW

BIOFILTRATION BASIN A

52.89' Lt "TMD" 8+50.67
IE 352.84

18.50' Lt "TMD" 8+56.19

57.68' Lt "TMD" 8+24.26
IE 353.00

22.50' Lt "TMD" 8+52.89
IE 356.27

22.50' Lt "TMD" 8+34.59
IE 356.91

18.50' Lt "TMD" 7+92.77

22.50' Lt "TMD" 7+87.32
IE 358.56

22.50' Lt "TMD" 7+68.95
IE 359.20

BIOFILTRATION BASIN B

18.50' Lt "TMD" 7+21.25

22.50' Lt "TMD" 7+14.17
IE 361.10

22.50' Lt "TMD" 6+95.88
IE 361.74

18.50' Lt "TMD" 6+50.17

22.50' Lt "TMD" 6+47.15
IE 363.44

22.50' Lt "TMD" 6+28.81
IE 364.08

22.90' Lt "TMD" 5+76.21
IE 365.91

19.19' Lt "TMD" 5+81.84

22.50' Lt "TMD" 9+80.69
IE 353.00

22.50' Lt "TMD" 9+63.61
IE 352.24

25.68' Lt "TMD" 9+57.52
IE 352.24

22.50' Lt "TMD" 9+01.70
IE 354.58

22.50' Lt "TMD" 9+19.00
IE 353.97

25.20' Lt "TMD" 9+58.94
IE 352.50

18.50' Lt "TMD" 9+69.34

18.50' Rt "TMD" 8+68.72

22.50' Rt "TMD" 9+58.84
IE 355.00

22.50' Rt "TMD" 9+63.71
IE 355.00

22.50' Rt "TMD" 9+80.69
IE 355.50

22.50' Rt "TMD" 7+90.37
IE 359.74

22.50' Rt "TMD" 8+65.11
IE 357.64

22.50' Rt "TMD" 7+70.32
IE 360.30

22.50' Rt "TMD" 8+45.45
IE 358.19

18.50' Rt "TMD" 7+92.77

18.50' Rt "TMD" 7+21.25

22.50' Rt "TMD" 7+18.67
IE 361.75

22.50' Rt "TMD" 6+98.39
IE 362.32

BIOFILTRATION BASIN C

18.50' Rt "TMD" 6+50.17

22.50' Rt "TMD" 6+44.52
IE 363.83

22.50' Rt "TMD" 6+24.60
IE 364.39

18.54' Rt "TMD" 5+81.84

21.82' Rt "TMD" 5+75.88
IE 365.76

IE 352.55

IE 356.50

DRAINAGE DETAILS
SCALE: 1"=20'

DD-1

7.0' BASIN
3.0'
FL

TYPE B-1 CURB INLET (MOD)

8" PERFORATED UNDERDRAIN WRAPPED IN FILTER FABRIC

PROP. 18" RCP

TYPICAL SECTION FOR TYPE B-1 INLET (MOD) OPENING

FL

TYPE B-1 CURB INLET (MOD)

8" PERFORATED UNDERDRAIN WRAPPED IN FILTER FABRIC

8" PVC CAP

PROP. 18" RCP

GENERAL NOTES:

1. VERIFY THE EXISTENCE AND HORIZONTAL/VERTICAL LOCATION OF ALL UTILITIES WITHIN THE PROJECT AREA THAT MAY CONFLICT WITH THE PROPOSED CONSTRUCTION. VERIFY THAT ANY UTILITIES SHOWN TO BE RELOCATED BY OTHERS HAVE BEEN RELOCATED AND ARE NO LONGER IN CONFLICT. IMMEDIATELY NOTIFY THE ENGINEER OF ANY REMAINING UTILITY CONFLICTS PRIOR TO THE START OF ANY DEMOLITION WORK.

2. CONTRACTOR TO SURVEY THE INVERTS AT ALL STORM DRAIN CONNECTIONS & NOTIFY ENGINEER IMMEDIATELY OF ANY CONFLICTS PRIOR TO CONSTRUCTION.

3. THESE PLANS ARE ACCURATE FOR DRAINAGE IMPROVEMENTS ONLY.

4. SEE LANDSCAPE AND IRRIGATION PLANS FOR THE RECONFIGURATION AND/OR REMOVAL OF EXISTING IRRIGATION SYSTEM(S) IN THE PROPOSED BIORETENTION BASIN AREAS.

CONSTRUCTION NOTES:

1. INSTALL CURB INLET TYPE B PER CSDSD SDD-116

2. INSTALL 8" PERFORATED PVC STORM DRAIN PER DETAIL

3. INSTALL CURB CUTS PER DETAIL

16.03' Lt "TMD" 15+09.91
IE 355.28
ANGLE POINT

23.78' Lt "TMD" 15+20.93
IE 355.15

24.14' Lt "TMD" 14+64.69
IE 355.75

23.89' Lt "TMD" 15+25.71
IE 351.08

18.50' Lt "TMD" 14+50.96

25.93' Lt "TMD" 15+37.57
IE 351.20
ANGLE POINT

19.80' Lt "TMD" 15+52.05

27.55' Lt "TMD" 16+02.04
IE 351.88
HIGH POINT

BIOFILTRATION BASIN D

18.50' Rt "TMD" 14+85.31

22.70' Lt "TMD" 16+67.55

29.95' Lt "TMD" 17+06.34
IE 350.78
ANGLE POINT

28.25' Lt "TMD" 17+22.62
IE 350.60

28.26' Lt "TMD" 17+27.36
IE 350.60

30.41' Lt "TMD" 17+50.43
IE 350.85
ANGLE POINT

25.00' Rt "TMD" 14+82.12
IE 355.50

25.20' Rt "TMD" 15+07.29
IE 354.53
ANGLE POINT

23.60' Rt "TMD" 15+20.77
IE 354.00

23.74' Rt "TMD" 15+25.71
IE 351.09

28.24' Rt "TMD" 16+17.67
IE 351.96
HIGH POINT

25.98' Rt "TMD" 15+35.86
IE 351.19
ANGLE POINT

BIOFILTRATION BASIN E

30.34' Lt "TMD" 17+69.43
IE 351.05

19.92' Rt "TMD" 15+52.05

23.11' Rt "TMD" 16+67.55

30.50' Rt "TMD" 17+11.15
IE 351.08
ANGLE POINT

23.50' Lt "TMD" 17+35.80

28.02' Rt "TMD" 17+21.84
IE 350.98

27.83' Rt "TMD" 17+27.13
IE 350.98

24.00' Rt "TMD" 17+33.48

30.50' Rt "TMD" 17+39.15
IE 351.10
ANGLE POINT

30.50' Rt "TMD" 17+54.71
IE 351.25

DRAINAGE DETAILS
SCALE: 1"=20'

DD-2