CLIMATE ACTION PLAN
CONSISTENCY CHECKLIST INTRODUCTION

In December 2015, the City adopted a Climate Action Plan (CAP) that outlines the actions that City will undertake to achieve its proportional share of State greenhouse gas (GHG) emission reductions. The purpose of the Climate Action Plan Consistency Checklist (Checklist) is to, in conjunction with the CAP, provide a streamlined review process for proposed new development projects that are subject to discretionary review and trigger environmental review pursuant to the California Environmental Quality Act (CEQA).[1]

Analysis of GHG emissions and potential climate change impacts from new development is required under CEQA. The CAP is a plan for the reduction of GHG emissions in accordance with CEQA Guidelines Section 15183.5. Pursuant to CEQA Guidelines Sections 15064(h)(3), 15130(d), and 15183(b), a project's incremental contribution to a cumulative GHG emissions effect may be determined not to be cumulatively considerable if it complies with the requirements of the CAP.

This Checklist is part of the CAP and contains measures that are required to be implemented on a project-by-project basis to ensure that the specified emissions targets identified in the CAP are achieved. Implementation of these measures would ensure that new development is consistent with the CAP's assumptions for relevant CAP strategies toward achieving the identified GHG reduction targets. Projects that are consistent with the CAP as determined through the use of this Checklist may rely on the CAP for the cumulative impacts analysis of GHG emissions. Projects that are not consistent with the CAP must prepare a comprehensive project-specific analysis of GHG emissions, including quantification of existing and projected GHG emissions and incorporation of the measures in this Checklist to the extent feasible. Cumulative GHG impacts would be significant for any project that is not consistent with the CAP.

The Checklist may be updated to incorporate new GHG reduction techniques or to comply with later amendments to the CAP or local, State, or federal law.

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[1] Certain projects seeking ministerial approval may be required to complete the Checklist. For example, projects in a Community Plan Implementation Overlay Zone may be required to use the Checklist to qualify for ministerial level review. See Supplemental Development Regulations in the project's community plan to determine applicability.

City Council Approved July 12, 2016
Revised June 2017

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CAP CONSISTENCY CHECKLIST SUBMITTAL APPLICATION

- The Checklist is required only for projects subject to CEQA review.[2]
- If required, the Checklist must be included in the project submittal package. Application submittal procedures can be found in Chapter 11: Land Development Procedures of the City's Municipal Code.
- The requirements in the Checklist will be included in the project's conditions of approval.
- The applicant must provide an explanation of how the proposed project will implement the requirements described herein to the satisfaction of the Planning Department.

Application Information

Contact Information

Project No./Name: Kroc Sports and Wellness Center

Property Address: University Ave. San Diego CA

Applicant Name/Co.: Harry Dirks

Contact Phone: 858 456 7560 Contact Email: hjdirks@sbcglobal.net

Was a consultant retained to complete this checklist? ☒ Yes ☐ No If Yes, complete the following

Consultant Name: Kenneth Smith Contact Phone: 619 444 2482 ext 221

Company Name: Kenneth D. Smith Architect & Assoc., I Contact Email: ksmith@kdsarch.com

Project Information

1. What is the size of the project (acres)? 12.32 AC
2. Identify all applicable proposed land uses:
   - ☐ Residential (indicate # of single-family units):
   - ☐ Residential (indicate # of multi-family units):
   - ☒ Commercial (total square footage): 73,409 Square Feet
   - ☐ Industrial (total square footage):
   - ☐ Other (describe):
3. Is the project or a portion of the project located in a Transit Priority Area? ☒ Yes ☐ No
4. Provide a brief description of the project proposed:

This project is a in fill of an existing project. The project consit of a single buildking that houses a parking garage, play care center, wellness center and a deck that will be primarily used for a soccer arena. The total area shown above includes the outdoor deck which will primarily be used for soccer.

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[2] Certain projects seeking ministerial approval may be required to complete the Checklist. For example, projects in a Community Plan Implementation Overlay Zone may be required to use the Checklist to qualify for ministerial level review. See Supplemental Development Regulations in the project's community plan to determine applicability.

CAP CONSISTENCY CHECKLIST QUESTIONS

Step 1: Land Use Consistency

The first step in determining CAP consistency for discretionary development projects is to assess the project's consistency with the growth projections used in the development of the CAP. This section allows the City to determine a project's consistency with the land use assumptions used in the CAP.

Step 1: Land Use Consistency		
Checklist Item (Check the appropriate box and provide explanation and supporting documentation for your answer)	Yes	No
A. Is the proposed project consistent with the existing General Plan and Community Plan land use and zoning designations?;[3] <u>OR</u>, B. If the proposed project is not consistent with the existing land use plan and zoning designations, and includes a land use plan and/or zoning designation amendment, would the proposed amendment result in an increased density within a Transit Priority Area (TPA)[4] and implement CAP Strategy 3 actions, as determined in Step 3 to the satisfaction of the Development Services Department?; <u>OR</u>, C. If the proposed project is not consistent with the existing land use plan and zoning designations, does the project include a land use plan and/or zoning designation amendment that would result in an equivalent or less GHG-intensive project when compared to the existing designations?	☑	☐
If "***Yes***," proceed to Step 2 of the Checklist. For question B above, complete Step 3. For question C above, provide estimated project emissions under both existing and proposed designation(s) for comparison. Compare the maximum buildout of the existing designation and the maximum buildout of the proposed designation. If "***No***," in accordance with the City's Significance Determination Thresholds, the project's GHG impact is significant. The project must nonetheless incorporate each of the measures identified in Step 2 to mitigate cumulative GHG emissions impacts unless the decision maker finds that a measure is infeasible in accordance with CEQA Guidelines Section 15091. Proceed and complete Step 2 of the Checklist.		

This is an existing facility with an approved CUP. This project is in conformance.

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[3] This question may also be answered in the affirmative if the project is consistent with SANDAG Series 12 growth projections, which were used to determine the CAP projections, as determined by the Planning Department.

[4] This category applies to all projects that answered in the affirmative to question 3 on the previous page: Is the project or a portion of the project located in a transit priority area.

Step 2: CAP Strategies Consistency

The second step of the CAP consistency review is to review and evaluate a project's consistency with the applicable strategies and actions of the CAP. Step 2 only applies to development projects that involve permits that would require a certificate of occupancy from the Building Official or projects comprised of one and two family dwellings or townhouses as defined in the California Residential Code and their accessory structures.[5] All other development projects that would not require a certificate of occupancy from the Building Official shall implement Best Management Practices for construction activities as set forth in the Greenbook (for public projects).

Step 2: CAP Strategies Consistency			
Checklist Item (Check the appropriate box and provide explanation for your answer)	Yes	No	N/A
Strategy 1: Energy & Water Efficient Buildings			
1. *Cool/Green Roofs*. • Would the project include roofing materials with a minimum 3-year aged solar reflection and thermal emittance or solar reflection index equal to or greater than the values specified in the voluntary measures under California Green Building Standards Code (Attachment A)?; OR • Would the project roof construction have a thermal mass over the roof membrane, including areas of vegetated (green) roofs, weighing at least 25 pounds per square foot as specified in the voluntary measures under California Green Building Standards Code?; OR • Would the project include a combination of the above two options? Check "N/A" only if the project does not include a roof component. The building has a flat roof. It will have a solar reflection index equal to or greater that the values specified in the voluntary measures.	☑	☐	☐

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[5] Actions that are not subject to Step 2 would include, for example: 1) discretionary map actions that do not propose specific development, 2) permits allowing wireless communication facilities, 3) special events permits, 4) use permits or other permits that do not result in the expansion or enlargement of a building (e.g., decks, garages, etc.), and 5) non-building infrastructure projects such as roads and pipelines. Because such actions would not result in new occupancy buildings from which GHG emissions reductions could be achieved, the items contained in Step 2 would not be applicable.

2. *Plumbing fixtures and fittings*

With respect to plumbing fixtures or fittings provided as part of the project, would those low-flow fixtures/appliances be consistent with each of the following:

Residential buildings:

- Kitchen faucets: maximum flow rate not to exceed 1.5 gallons per minute at 60 psi;
- Standard dishwashers: 4.25 gallons per cycle;
- Compact dishwashers: 3.5 gallons per cycle; and
- Clothes washers: water factor of 6 gallons per cubic feet of drum capacity?

Nonresidential buildings:

- Plumbing fixtures and fittings that do not exceed the maximum flow rate specified in Table A5.303.2.3.1 (voluntary measures) of the California Green Building Standards Code (See Attachment A); and
- Appliances and fixtures for commercial applications that meet the provisions of Section A5.303.3 (voluntary measures) of the California Green Building Standards Code (See Attachment A)?

Check "N/A" only if the project does not include any plumbing fixtures or fittings.

☑	☐	☐

plumbing fixtures and fittings will not exceed the maximum flow rate specified in Teble A5.303.2.1 (voluntary measures). There are no appliances.

Strategy 3: Bicycling, Walking, Transit & Land Use

3. *Electric Vehicle Charging*

- Multiple-family projects of 17 dwelling units or less: Would 3% of the total parking spaces required, or a minimum of one space, whichever is greater, be provided with a listed cabinet, box or enclosure connected to a conduit linking the parking spaces with the electrical service, in a manner approved by the building and safety official, to allow for the future installation of electric vehicle supply equipment to provide electric vehicle charging stations at such time as it is needed for use by residents?
- Multiple-family projects of more than 17 dwelling units: Of the total required listed cabinets, boxes or enclosures, would 50% have the necessary electric vehicle supply equipment installed to provide active electric vehicle charging stations ready for use by residents?
- Non-residential projects: Of the total required listed cabinets, boxes or enclosures, would 50% have the necessary electric vehicle supply equipment installed to provide active electric vehicle charging stations ready for use?

Check "N/A" only if the project is a single-family project or would not require the provision of listed cabinets, boxes, or enclosures connected to a conduit linking the parking spaces with electrical service, e.g., projects requiring fewer than 10 parking spaces.

Parking spaces on site equal to 50% of the required listed cabinets, boxes or enclosures will have the necessary vehicle supply equipment installed to provide active electrical vehicle charging stations ready to use. These parking spaces may not be in the parking garage.

☑ ☐ ☐

Strategy 3: Bicycling, Walking, Transit & Land Use
(Complete this section if project includes non-residential or mixed uses)

4. *Bicycle Parking Spaces*

Would the project provide more short- and long-term bicycle parking spaces than required in the City's Municipal Code (Chapter 14, Article 2, Division 5)?[6]

Check "N/A" only if the project is a residential project.

10 short term spaces provided, 7 required.
1 long term space provided.

☑ ☐ ☐

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[6] Non-portable bicycle corrals within 600 feet of project frontage can be counted towards the project's bicycle parking requirements.

5. *Shower facilities*

If the project includes nonresidential development that would accommodate over 10 tenant occupants (employees), would the project include changing/shower facilities in accordance with the voluntary measures under the California Green Building Standards Code as shown in the table below?

Number of Tenant Occupants (Employees)	Shower/Changing Facilities Required	Two-Tier (12" X 15" X 72") Personal Effects Lockers Required
0-10	0	0
11-50	1 shower stall	2
51-100	1 shower stall	3
101-200	1 shower stall	4
Over 200	1 shower stall plus 1 additional shower stall for each 200 additional tenant-occupants	1 two-tier locker plus 1 two-tier locker for each 50 additional tenant-occupants

Check "N/A" only if the project is a residential project, or if it does not include nonresidential development that would accommodate over 10 tenant occupants (employees).

Showers, changing rooms or area and lockers will be provided

☑ ☐ ☐

6. *Designated Parking Spaces*

If the project includes a nonresidential use in a TPA, would the project provide designated parking for a combination of low-emitting, fuel-efficient, and carpool/vanpool vehicles in accordance with the following table?

Number of Required Parking Spaces	Number of Designated Parking Spaces
0-9	0
10-25	2
26-50	4
51-75	6
76-100	9
101-150	11
151-200	18
201 and over	At least 10% of total

This measure does not cover electric vehicles. See Question 4 for electric vehicle parking requirements.

Note: Vehicles bearing Clean Air Vehicle stickers from expired HOV lane programs may be considered eligible for designated parking spaces. The required designated parking spaces are to be provided within the overall minimum parking requirement, not in addition to it.

Check "N/A" only if the project is a residential project, or if it does not include nonresidential use in a TPA.

☑ ☐ ☐

These parking spaces may not be in the parking garage. 11 spaces are designated.

7. *Transportation Demand Management Program*

If the project would accommodate over 50 tenant-occupants (employees), would it include a transportation demand management program that would be applicable to existing tenants and future tenants that includes:

At least one of the following components:

- Parking cash out program
- Parking management plan that includes charging employees market-rate for single-occupancy vehicle parking and providing reserved, discounted, or free spaces for registered carpools or vanpools
- Unbundled parking whereby parking spaces would be leased or sold separately from the rental or purchase fees for the development for the life of the development

And at least three of the following components:

- Commitment to maintaining an employer network in the SANDAG iCommute program and promoting its RideMatcher service to tenants/employees
- On-site carsharing vehicle(s) or bikesharing
- Flexible or alternative work hours
- Telework program
- Transit, carpool, and vanpool subsidies
- Pre-tax deduction for transit or vanpool fares and bicycle commute costs
- Access to services that reduce the need to drive, such as cafes, commercial stores, banks, post offices, restaurants, gyms, or childcare, either onsite or within 1,320 feet (1/4 mile) of the structure/use?

Check "N/A" only if the project is a residential project or if it would not accommodate over 50 tenant-occupants (employees).

☐ ☐ ☑

Step 3: Project CAP Conformance Evaluation (if applicable)

The third step of the CAP consistency review only applies if Step 1 is answered in the affirmative under option B. The purpose of this step is to determine whether a project that is located in a TPA but that includes a land use plan and/or zoning designation amendment is nevertheless consistent with the assumptions in the CAP because it would implement CAP Strategy 3 actions. In general, a project that would result in a reduction in density inside a TPA would not be consistent with Strategy 3.The following questions must each be answered in the affirmative and fully explained.

1. **Would the proposed project implement the General Plan's City of Villages strategy in an identified Transit Priority Area (TPA) that will result in an increase in the capacity for transit-supportive residential and/or employment densities?**

   Considerations for this question:
   - Does the proposed land use and zoning designation associated with the project provide capacity for transit-supportive residential densities within the TPA?
   - Is the project site suitable to accommodate mixed-use village development, as defined in the General Plan, within the TPA?
   - Does the land use and zoning associated with the project increase the capacity for transit-supportive employment intensities within the TPA?

2. **Would the proposed project implement the General Plan's Mobility Element in Transit Priority Areas to increase the use of transit?**

   Considerations for this question:
   - Does the proposed project support/incorporate identified transit routes and stops/stations?
   - Does the project include transit priority measures?

3. **Would the proposed project implement pedestrian improvements in Transit Priority Areas to increase walking opportunities?**

   Considerations for this question:
   - Does the proposed project circulation system provide multiple and direct pedestrian connections and accessibility to local activity centers (such as transit stations, schools, shopping centers, and libraries)?
   - Does the proposed project urban design include features for walkability to promote a transit supportive environment?

4. **Would the proposed project implement the City of San Diego's Bicycle Master Plan to increase bicycling opportunities?**

   Considerations for this question:
   - Does the proposed project circulation system include bicycle improvements consistent with the Bicycle Master Plan?
   - Does the overall project circulation system provide a balanced, multimodal, "complete streets" approach to accommodate mobility needs of all users?

5. **Would the proposed project incorporate implementation mechanisms that support Transit Oriented Development?**

   Considerations for this question:
   - Does the proposed project include new or expanded urban public spaces such as plazas, pocket parks, or urban greens in the TPA?
   - Does the land use and zoning associated with the proposed project increase the potential for jobs within the TPA?
   - Do the zoning/implementing regulations associated with the proposed project support the efficient use of parking through mechanisms such as: shared parking, parking districts, unbundled parking, reduced parking, paid or time-limited parking, etc.?

6. **Would the proposed project implement the Urban Forest Management Plan to increase urban tree canopy coverage?**

   Considerations for this question:
   - Does the proposed project provide at least three different species for the primary, secondary and accent trees in order to accommodate varying parkway widths?
   - Does the proposed project include policies or strategies for preserving existing trees?
   - Does the proposed project incorporate tree planting that will contribute to the City's 20% urban canopy tree coverage goal?

CLIMATE ACTION PLAN CONSISTENCY CHECKLIST
ATTACHMENT A

This attachment provides performance standards for applicable Climate Action Pan (CAP) Consistency Checklist measures.

Table 1 Roof Design Values for Question 1: Cool/Green Roofs supporting Strategy 1: Energy & Water Efficient Buildings of the Climate Action Plan

Land Use Type	Roof Slope	Minimum 3-Year Aged Solar Reflectance	Thermal Emittance	Solar Reflective Index
Low-Rise Residential	≤ 2:12	0.55	0.75	64
	> 2:12	0.20	0.75	16
High-Rise Residential Buildings, Hotels and Motels	≤ 2:12	0.55	0.75	64
	> 2:12	0.20	0.75	16
Non-Residential	≤ 2:12	0.55	0.75	64
	> 2:12	0.20	0.75	16

Source: Adapted from the California Green Building Standards Code (CALGreen) Tier 1 residential and non-residential voluntary measures shown in Tables A4.106.5.1 and A5.106.11.2.2, respectively. Roof installation and verification shall occur in accordance with the CALGreen Code.

CALGreen does not include recommended values for low-rise residential buildings with roof slopes of ≤ 2:12 for San Diego's climate zones (7 and 10). Therefore, the values for climate zone 15 that covers Imperial County are adapted here.

Solar Reflectance Index (SRI) equal to or greater than the values specified in this table may be used as an alternative to compliance with the aged solar reflectance values and thermal emittance.

Table 2 **Fixture Flow Rates for Non-Residential Buildings related to Question 2: Plumbing Fixtures and Fittings supporting Strategy 1: Energy & Water Efficient Buildings of the Climate Action Plan**

Fixture Type	Maximum Flow Rate
Showerheads	1.8 gpm @ 80 psi
Lavatory Faucets	0.35 gpm @60 psi
Kitchen Faucets	1.6 gpm @ 60 psi
Wash Fountains	1.6 [rim space(in.)/20 gpm @ 60 psi]
Metering Faucets	0.18 gallons/cycle
Metering Faucets for Wash Fountains	0.18 [rim space(in.)/20 gpm @ 60 psi]
Gravity Tank-type Water Closets	1.12 gallons/flush
Flushometer Tank Water Closets	1.12 gallons/flush
Flushometer Valve Water Closets	1.12 gallons/flush
Electromechanical Hydraulic Water Closets	1.12 gallons/flush
Urinals	0.5 gallons/flush

Source: Adapted from the California Green Building Standards Code (CALGreen) Tier 1 non-residential voluntary measures shown in Tables A5.303.2.3.1 and A5.106.11.2.2, respectively. See the California Plumbing Code for definitions of each fixture type.

Where complying faucets are unavailable, aerators rated at 0.35 gpm or other means may be used to achieve reduction.

Acronyms:
gpm = gallons per minute
psi = pounds per square inch (unit of pressure)
in. = inch

Table 3 **Standards for Appliances and Fixtures for Commercial Application related to Question 2: Plumbing Fixtures and Fittings supporting Strategy 1: Energy & Water Efficient Buildings of the Climate Action Plan**

Appliance/Fixture Type	Standard	
Clothes Washers	Maximum Water Factor (WF) that will reduce the use of water by 10 percent below the California Energy Commissions' WF standards for commercial clothes washers located in Title 20 of the *California Code of Regulations.*	
Conveyor-type Dishwashers	0.70 maximum gallons per rack (2.6 L) (High-Temperature)	0.62 maximum gallons per rack (4.4 L) (Chemical)
Door-type Dishwashers	0.95 maximum gallons per rack (3.6 L) (High-Temperature)	1.16 maximum gallons per rack (2.6 L) (Chemical)
Undercounter-type Dishwashers	0.90 maximum gallons per rack (3.4 L) (High-Temperature)	0.98 maximum gallons per rack (3.7 L) (Chemical)
Combination Ovens	Consume no more than 10 gallons per hour (38 L/h) in the full operational mode.	
Commercial Pre-rinse Spray Valves (manufactured on or after January 1, 2006)	Function at equal to or less than 1.6 gallons per minute (0.10 L/s) at 60 psi (414 kPa) and • Be capable of cleaning 60 plates in an average time of not more than 30 seconds per plate. • Be equipped with an integral automatic shutoff. • Operate at static pressure of at least 30 psi (207 kPa) when designed for a flow rate of 1.3 gallons per minute (0.08 L/s) or less.	

Source: Adapted from the California Green Building Standards Code (CALGreen) Tier 1 non-residential voluntary measures shown in Section A5.303.3. See the California Plumbing Code for definitions of each appliance/fixture type.

Acronyms:
L = liter
L/h = liters per hour
L/s = liters per second
psi = pounds per square inch (unit of pressure)
kPa = kilopascal (unit of pressure)

GEOTECHNICAL INVESTIGATION

KROC II – WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

THE SALVATION ARMY
SAN DIEGO, CALIFORNIA

MAY 5, 2017
PROJECT NO. 06151-42-05

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. 06151-42-05
May 5, 2017

The Salvation Army
Ray and Joan Kroc Community Center
6845 University Avenue
San Diego, California 92115

Attention: Mr. Kevin Forrey

Subject: GEOTECHNICAL INVESTIGATION
KROC II – WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

Dear Mr. Forrey

In accordance with your request and authorization of our proposal (LG-16043, revised date August 29, 2016), we herein submit the results of our geotechnical investigation for the subject project. We performed our investigation to evaluate the underlying soil and geologic conditions and potential geologic hazards and to assist in the design of the proposed building and associated improvements.

The accompanying report presents the results of our study and conclusions and recommendations pertaining to the geotechnical aspects of the proposed project. The site is suitable for the proposed building and improvements provided the recommendations of this report are incorporated into the design and construction of the planned project.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Noel G. Borja
Senior Staff Engineer

Rodney C. Mikesell
GE 2533

Garry W. Cannon
CEG 2201
RCE 56468

RODNEY C. MIKESELL
No.2533

GARRY WELLS CANNON
NO. 2201

GARRY WELLS CANNON
No. C 056468

NGB:RCM:GWC:ejc

(1) Addressee
(3/del) REC Consultants, Inc.
Attention: Mr. Jason Evans

6960 Flanders Drive ■ San Diego, California 92121-2974 ■ Telephone 858.558.6900 ■ Fax 858.558.6159

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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the proposed new wellness center/gymnasium within The Salvation Army Ray and Joan Kroc Community Center located at 6845 University Avenue in San Diego, California (see Vicinity Map, Figure 1). The purpose of this geotechnical investigation is to evaluate the surface and subsurface soil conditions; general site geology; and to identify geotechnical constraints that may impact the planned improvements to the property. This report also provides grading and foundation recommendations, retaining wall design criteria, and storm water management recommendations.

To aid in preparing this report, we reviewed the as-graded report prepared by Geocon Incorporated titled *Final Report of Testing and Observation Services During Site Grading, The Salvation Army Ray and Joan Kroc Community Center, San Diego, California,* dated July 31, 2001 (Project No. 06151-42-04).

The field investigation consisted of drilling two, small-diameter borings to evaluate the underlying geologic conditions within the area of planned improvements and performing 5 infiltration tests for storm water management recommendations.

The locations of the small-diameter borings and infiltration tests are shown the *Geologic Map*, Figure 2, and on the *Geologic Cross-Sections*, Figure 3. The base map used for Figure 2 is an AutoCAD file provided by REC Consultants, Inc.. Logs of the exploratory borings and a detailed discussion of the field investigation are presented in Appendix A.

We performed laboratory tests on selected soil samples obtained during the field investigation to evaluate pertinent physical properties for engineering analyses and to assist in providing recommendations for site grading and foundation design criteria. Details of the laboratory testing and a summary of test results are presented in Appendix B.

The conclusions and recommendations presented herein are based on analyses of the data obtained from the field investigation, laboratory tests, and our experience with similar soil and geologic conditions.

2. SITE AND PROJECT DESCRIPTION

The proposed new wellness center/gymnasium is planned within the existing recreation/soccer field that is situated between the family enhancement/administration center building and the gymnasium. The site is bordered to the north by a parking lot, to the west by the gymnasium building, the east by the family enhancement/administration center building, and to the south by a natural hillside slope and residential properties. Existing grade slopes from east to west with elevations varying from approximately 385 feet Mean Sea Level (MSL) at the east end to approximately 375 feet MSL at the west end.

Based on our understanding of the project, proposed development will consist of constructing a new two-story, 19,000-square-foot wellness center/gymnasium. The center will include an on-grade parking level with a new sports field above the parking level. Cuts up to approximately 8 feet are planned at the east end and fills of approximately 3 feet at the west end to achieve finish pad grade. We expect the eastern building wall will also function as a retaining wall.

The above locations, site descriptions, and proposed development are based on our site reconnaissance, review of published geologic literature, field investigations, and discussions with the project civil engineer. If development plans differ from those described herein, Geocon Incorporated should be contacted for review of the plans and possible revisions to this report.

3. PREVIOUS GRADING

The overall community center was previously graded between June 2000 and July 2001. While previous grading resulted in complete removal of undocumented fill and replacement with compacted fill within building pads, the soccer field only received cuts within the undocumented fill to create a gently sloped sheet graded pad. A summary of previous grading for the community center is contained in the referenced Geocon July 2001 report.

4. SOIL AND GEOLOGIC CONDITIONS

Based on previous geotechnical studies performed for the overall community center, observations during previous grading, and exploratory borings performed for our recent field investigation, the property is underlain by undocumented fill overlying alluvium and bedrock soils consisting of the Stadium Conglomerate. Compacted fill placed during original grading of the overall community center is surrounds the site. A description of the surficial soils and bedrock unit are discussed below. The approximate occurrence and thickness of the units are shown on the Geologic Map (Figure 2) and Geologic Cross-Sections (Figure 3). We prepared the geologic cross-sections using information from previous grading and interpolation between exploratory borings; therefore, actual geologic conditions between the borings may vary from those illustrated.

4.1 Undocumented Fill (Qudf)

We encountered approximately 6 to 7 feet of undocumented fill in borings performed for this study. The fill generally consists of silty to clayey sand with gravel and cobble. Laboratory tests indicate the fill has a low expansion potential. The undocumented fill is not suitable for support of additional fill or settlement sensitive structures and should be completely removed and replaced as compacted fill.

4.2 Compacted Fill (Qcf)

Compacted fill placed during previous grading is present along the perimeter of the site. Geocon Incorporated performed observation and compaction testing during previous grading. A summary of grading and compaction test results are presented in Geocon's referenced July 2001 report.

4.3 Alluvium (Qal)

Alluvial soil was observed below the undocumented fill in the exploratory borings performed for this study. Additionally, based on elevations taken during previous grading at the bottom of removals for the adjacent family enhancement/administrative center building to the west, we expect alluvium extends to depths between 6 to 16 feet below current site elevations. The alluvium generally consists of stiff, moist, sandy clay with varying gravel and cobble content. The alluvium is not suitable for support of additional fill or settlement sensitive structures and will require complete removed and replacement as compacted fill.

4.4 Stadium Conglomerate (Tst)

We observed Stadium Conglomerate underlying the surficial deposits in both borings at a depth of approximately 9 feet. The Stadium Conglomerate consists of very dense, silty sand conglomerate. The Stadium Conglomerate can be cemented and may require heavy ripping/excavation effort. We encountered refusal to the drill auger at a depth of approximately 11 feet at both boring locations. The Stadium Conglomerate is suitable for support of structural fill soil and foundation loads.

5. GROUNDWATER

We did not encounter groundwater during drilling for this site investigation; however, groundwater was encountered perched on the underlying bedrock contact during previous grading. Additionally, borings performed recently for new improvements within the community center west of the site encountered groundwater at depths between 7 and 10 feet. Groundwater or seepage will likely be encountered near the bedrock contact during remedial grading. Groundwater management/dewatering will likely be required at the base of removals, especially if grading occurs during the rainy season or shortly after periods of rain.

It is not uncommon for seepage conditions to exist within the near surface elevations or develop where none previously existed. Seepage is dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

The City of San Diego (2008), Sheet 22 defines the site as Hazard Category 53: *Level or sloping terrain, unfavorable geologic structure, low to moderate risk*. Along the northern perimeter of the community center, Hazard Category 32 is mapped. Hazard Category 32 is defined under liquefaction as *Low Potential – fluctuating groundwater minor drainages*. It is our opinion the site has favorable geologic structure with respect to geologic hazards.

6.2 Faulting and Ground Rupture

The site is not located within a State of California Earthquake Fault Zone. Our review of USGS (2016), Kennedy & Tan (2008), and City of San Diego (2008) shows that there are no active, presumed-active, or inactive faults trending toward or transecting the site. The nearest active fault is the Newport-Inglewood/Rose Canyon Fault Zone, which is located approximately 4 miles west of the site. The risk associated with ground rupture hazard is low due to the absence of active faults on the property.

6.3 Seismicity

We performed a deterministic seismic hazard analysis using Risk Engineering (2015). Six known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. The nearest known active faults are the Newport-Inglewood/Rose Canyon Fault system, located approximately 7 miles west of the site and is the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood/Rose Canyon Fault Zone or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood Fault are 7.5 and 0.32g, respectively. Table 6.3.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for these and other faults in relationship to the site location. We used acceleration attenuation relationships developed by Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2007) NGA USGS 2008 acceleration-attenuation relationships in our analysis.

TABLE 6.3.1
DETERMINISTIC SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2007 (g)
Newport-Inglewood	7	7.5	0.28	0.26	0.32
Rose Canyon	7	6.9	0.23	0.24	0.25
Coronado Bank	19	7.4	0.16	0.12	0.14
Palos Verdes Connected	19	7.7	0.18	0.13	0.17
Elsinore	35	7.85	0.12	0.09	0.11
Earthquake Valley	40	6.8	0.07	0.05	0.04

It is our opinion the site could be subjected to moderate to severe ground shaking in the event of an earthquake along any of the faults listed on Table 6.3.1 or other faults in the southern California/ northern Baja California region. We do not consider the site to possess a greater risk than that of the surrounding developments.

We performed a probabilistic seismic hazard analysis for the site using Risk Engineering (2015). The computer program operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program accounts for earthquake magnitude as a function of fault rupture length, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 in the analysis. Table 6.3.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.3.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	**Peak Ground Acceleration**		
	Boore-Atkinson 2008 (g)	**Campbell-Bozorgnia 2008 (g)**	**Chiou-Youngs 2007 (g)**
2% in a 50 Year Period	0.37	0.37	0.42
5% in a 50 Year Period	0.26	0.26	0.28
10% in a 50 Year Period	0.19	0.19	0.20

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the 2016 California Building Code (CBC) guidelines or guidelines currently adopted by the City of San Diego.

6.4 Liquefaction

Based on observations during previous grading, and considering that the undocumented fill and alluvium within the building pad will be removed and replaced as compacted fill, the risk associated with liquefaction is low.

6.5 Landslides

We did not observe indications of landsliding or landslide deposits during this investigation. It is our opinion landslides are not present within the subject property or in an area that could affect the project. The risk associated with landslide hazard is low.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 From a geotechnical engineering standpoint, it is our opinion that the site is suitable for development of the proposed project provided the recommendations presented herein are implemented in design and construction of the project.

7.1.2 The site is underlain by undocumented fill and alluvium overlying the Stadium Conglomerate. Compacted fill exists along the perimeter of the site. The undocumented fill and alluvium is unsuitable for support of additional fill or proposed improvements and will require remedial grading consisting of complete removal and recompaction. The Stadium Conglomerate is suitable for support of the planned improvements.

7.1.3 The site is located approximately 7 miles from the nearest active fault, the Newport-Inglewood/Rose Canyon Fault Zone. It is our opinion that active or potentially active faults do not cross the site.

7.1.4 The risk associated with geologic hazards due to ground rupture, liquefaction, and landslides are low.

7.1.5 We did not encounter groundwater during our field investigation; however, seepage was observed during grading for the community center. Groundwater management/dewatering will likely be required at the base of removals, especially if grading occurs during the rainy season or shortly after periods of rain.

7.1.6 Subsurface conditions observed may be extrapolated to reflect general soil and geologic conditions; however, variations in subsurface conditions between exploratory borings should be expected.

7.1.7 With the exception of retaining wall drains, we do not expect other subdrains are required for this project.

7.2 Excavation and Soil Characteristics

7.2.1 Excavation of the undocumented fill and alluvium should be possible with moderate to heavy effort using conventional, heavy-duty equipment during grading and trenching operations. Excavations into the Stadium Conglomerate will likely require very heavy effort to excavate.

7.2.2 The soil encountered in our field investigation is considered to be both “non-expansive” (Expansion Index [EI] of 20 or less) and “expansive” (EI greater than 20) as defined by 2016 California Building Code (CBC) Section 1803.5.3. Table 7.2 presents soil classifications based on the expansion index.

TABLE 7.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	Expansion Classification	2016 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

7.2.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Appendix B presents the results from the laboratory water-soluble sulfate content tests. The test results indicate that on-site materials at the locations tested possess “Not Applicable” and “S0” sulfate exposure to concrete structures, as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19. The presence of water-soluble sulfates is not a visually discernible characteristic. Therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e. addition of fertilizers and other soil nutrients) may affect the concentration.

7.2.4 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, if improvements that could be susceptible to corrosion are planned, further evaluation by a corrosion engineer may be needed.

7.3 Temporary Excavations

7.3.1 It is the responsibility of the contractor to provide a safe excavation during the construction of the proposed project. Geocon Incorporated cannot be responsible for site safety and the stability of the proposed excavations.

7.3.2 Temporary slopes should be made in conformance with OSHA requirements. The undocumented and compacted fill can be considered Type B Soil (Type C where groundwater or seepage is encountered) in accordance with OSHA requirements. In general, no special shoring requirement will be necessary if temporary excavations will be less than 4 feet high. Temporary excavations greater than 4 feet high should be laid back at an appropriate inclination. Surcharge loads should not be permitted within a distance equal to the height of the excavation from the top of the excavation.

7.3.3 The top of the excavation should be at least 15 feet from the edge of the existing building foundations. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

7.4 Grading

7.4.1 All grading should be performed in accordance with the *Recommended Grading Specifications* contained in Appendix D. Where the recommendations of Appendix D conflict with this section of the report, the recommendations of this section take precedence.

7.4.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner or developer, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

7.4.3 Grading should be performed in conjunction with the observation and compaction testing services of Geocon Incorporated. Fill soil should be observed on a full-time basis during placement and tested to check in-place dry density and moisture content.

7.4.4 Site preparation should begin with removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soil to be used for fill is relatively free of organic matter. Deleterious material generated during stripping and/or site demolition should be exported from the site.

7.4.5 Abandoned utilities should be removed and the subsequent depressions and/or trenches backfilled with properly compacted fill as part of the remedial grading.

7.4.6 Undocumented fill and alluvium should be completely removed and replaced as compacted fill. The base of remedial excavations should extend to a horizontal distance beyond the building footprint of at least 5 feet, or a distance equal to the depth of the excavation, whichever is deeper. The actual extent of remedial grading should be evaluated in the field during grading by the geotechnical engineer and/or engineering geologist.

7.4.7 To enable removal of undocumented fill as recommended above, we expect portions of the existing surface improvements along the perimeter of the site will need to be removed.

Along the eastern side, removals will extend into the playground area. To protect the existing building, we recommend removals extend no closer 15 feet from the existing building foundation. Slot cut excavations or temporary shoring may be required along the eastern edge to limit impacts to existing improvements.

7.4.8 We expect groundwater will be encountered near the bottom of the remedial removals. Groundwater management will likely be required. Dewatering via a sump and pump and/or cutoff trenches to divert water will likely be required.

7.4.9 Prior to placing fill, the upper 12 inches at the base of removals should be scarified, moisture conditioned as necessary and recompacted. Soils derived from onsite excavations are suitable for reuse as fill if free from vegetation, debris and other deleterious material. Fill lifts should be no thicker than will allow for adequate bonding and compaction. Fill, backfill, and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of maximum dry density at or slightly above optimum moisture content, as determined in accordance with ASTM D 1557. Grading should be performed so that the upper 3 feet of soil below finish pad subgrade consist of soil with a *very low* to *low* expansive potential (EI of 50 or less).

7.4.10. Oversize rock greater than 12 inches should be placed at least 5 feet below finish pad grade or 3 feet below the deepest utility, whichever is greater. Rock greater than 6 inches should not be placed in the upper 3 feet below building pad grade. Oversize rock that cannot be placed as recommended should be exported off site.

7.4.11 Imported fill should consist of granular soil with a *very low* to *low* expansion potential (EI of 50 or less) that is free of deleterious material or stones larger than 3 inches and should be compacted as recommended above. Geocon Incorporated should be notified of the import soil source and should perform laboratory testing prior to its arrival at the site to evaluate its suitability as fill material.

7.5 Seismic Design Criteria

7.5.1 We used USGS (2017) to determine seismic design criteria. Table 7.4.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The building structure and improvements should be designed using a Site Class C. We evaluated the Site Class in accordance with Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10 based on our experience with the site subsurface soils and exploratory boring information. The values presented in Table 7.4.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 7.4.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	C	Table 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.907g	Figure 1613..3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.347g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.037	Table 1613.3.3(1)
Site Coefficient, F_V	1.453	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	0.940g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.504g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.627g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.336g	Section 1613.3.4 (Eqn 16-40)

7.5.2 Table 7.4.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 7.4.2
2016 CBC SITE ACCELERATION DESIGN PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.359g	Figure 22-7
Site Coefficient, F_{PGA}	1.041	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.374g	Section 11.8.3 (Eqn 11.8-1)

7.5.3 Conformance to the criteria in Tables 7.4.1 and 7.4.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

7.6 Foundation and Concrete Slabs-On-Grade Recommendations

7.6.1 The following foundation recommendations assume the proposed structure will be bear entirely on properly compacted fill and that the prevailing soil within 3 feet of pad grade will have an Expansion Index (EI) 50 or less. If soil with an Expansion Index greater than 50 is encountered or present within the upper 3 feet, foundation modifications may be necessary.

7.6.2 Foundations for the new structure should consist of continuous strip footings and/or isolated spread footings. Continuous footings should be at least 12 inches wide and extend at least 18 inches below lowest adjacent pad grade. Isolated spread footings should have a minimum width of 24 inches and should extend at least 18 inches below lowest adjacent pad grade. Steel reinforcement for continuous footings should consist of at least four, No. 5 steel, reinforcing bars placed horizontally in the footings, two near the top and two near the bottom. The project structural engineer should design the concrete reinforcement for the spread footings. A typical footing dimension detail depicting lowest adjacent grade is provided on Figure 4.

7.6.3 Foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load) for footings founded in properly compacted fill. The bearing pressure may be increased by 300 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable bearing pressure of 4,000 psf. The allowable bearing pressure may also be increased by up to one-third for transient loads such as those due to wind or seismic forces. We expect settlement due to footing loads conforming to the above recommended allowable soil bearing pressures are expected to be less than 1-inch total and ¾-inch differential over a span of 40 feet.

7.6.4 The minimum foundation dimensions and concrete reinforcement recommendations presented above are based on soil characteristics only and are not intended to replace reinforcement required for structural considerations.

7.6.5 The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is anticipated. As a minimum, wall footings should be deepened such that the bottom outside edge of the footing is at least seven feet from the face of slope when located adjacent and/or at the top of descending slopes.

7.6.6 Interior concrete slabs-on-grade should be at least 5 inches thick and reinforced with No. 3 bars placed 24 inches on center in both directions placed at the slab midpoint. The concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting planned loading. Thicker concrete slabs may be required for heavier loads.

7.6.7 The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams.

7.6.8 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.6.9 The project foundation engineer, architect, and/or developer should determine the thickness of bedding sand below the slab. Sand bedding thicknesses of 3 to 4 inches are typical in the Southern California area. Geocon should be contacted to provide recommendations if the bedding sand is thicker than 6 inches.

7.6.10 The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

7.6.11 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

7.6.12 Exterior slabs not subject to vehicle loads should be at least 4 inches thick and reinforced with 6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh where the slabs are underlain by low expansive soils. The mesh should be placed within the upper one-third of the slab. Proper mesh positioning is critical to future performance of the slabs. The contractor should take extra measures to provide proper mesh placement.

7.6.13 Prior to construction of slabs, the subgrade should be moisture conditioned to at least optimum moisture content and compacted to a dry density of at least 90 percent of the laboratory maximum dry density.

7.6.14 The recommendations of this report are intended to reduce the potential for cracking of slabs and foundations due to expansive soil (if present), differential settlement of fill soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.6.15 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute (ACI) when establishing crack-control spacing. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.

7.6.16 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.7 Retaining Walls

7.7.1 Retaining walls that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pcf. Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. These active pressures assume low expansive soil (Expansion Index less than 50) will be used as retaining wall backfill.

7.7.2 Where walls are restrained from movement at the top, an additional uniform pressure of 8H psf should be added to the active soil pressure where the wall possesses a height of 8 feet or less and 13H where the wall is greater than 8 feet.

7.7.3 Soil contemplated for use as retaining wall backfill, including import materials, should identified prior to backfill. At that time Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

7.7.4 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The wall designer should provide appropriate lateral deflection quantities for planned retaining walls structures, if applicable. These lateral values should be considered when planning types of improvements above retaining wall structures.

7.7.5 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI of less than 50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. Figure 5 presents a typical retaining wall drainage detail. If conditions different than those described are expected, Geocon Incorporated should be contacted for additional recommendations.

7.7.6 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the 2016 CBC. If the project possesses a seismic design category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 18.3.5.12 of the 2016 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 19H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.374g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

7.7.7 Foundation excavations should be observed by the geotechnical engineer (a representative of Geocon Incorporated) prior to the placement of reinforcing steel and concrete to observe that the exposed soil conditions are consistent with those anticipated and that they have been extended to the appropriate bearing strata. If unanticipated soil conditions are encountered, foundation modifications may be required.

7.8 Lateral Loading

7.8.1 To resist lateral loads, a passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot (pcf) should be used for design of footings or shear keys poured neat against compacted fill. The allowable passive pressure assumes a horizontal surface extending at least 5 feet or three times the height of the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance. Where walls are planned adjacent to and/or on descending slopes, a passive pressure of 150 pcf should be used in design.

7.8.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.35 should be used for design for footings founded in compacted fill or formational materials. The recommended passive pressure may be used concurrently with frictional resistance and may be increased by one-third for transient wind or seismic loading.

7.9 Storm Water Management

7.9.1 If storm water management devices are not properly designed and constructed, there is a risk for distress to improvements and property located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water being detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff into the subsurface occurs, downstream improvements may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

7.9.2 We performed an infiltration study on the property. A summary of our study and storm water management recommendations are provided in Appendix C. Based on the results of our study, infiltration is considered infeasible due to low infiltration rates, the presence of undocumented and compacted fill, and groundwater.

7.10 Site Drainage and Moisture Protection

7.10.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

7.10.2 In the case of basement walls or building walls retaining landscaping areas, a waterproofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

7.10.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.10.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.

7.11 Grading and Foundation Plan Review

7.11.1 Geocon Incorporated should review the grading and foundation plans for the project prior to final design submittal to determine if additional analysis and/or recommendations are required.

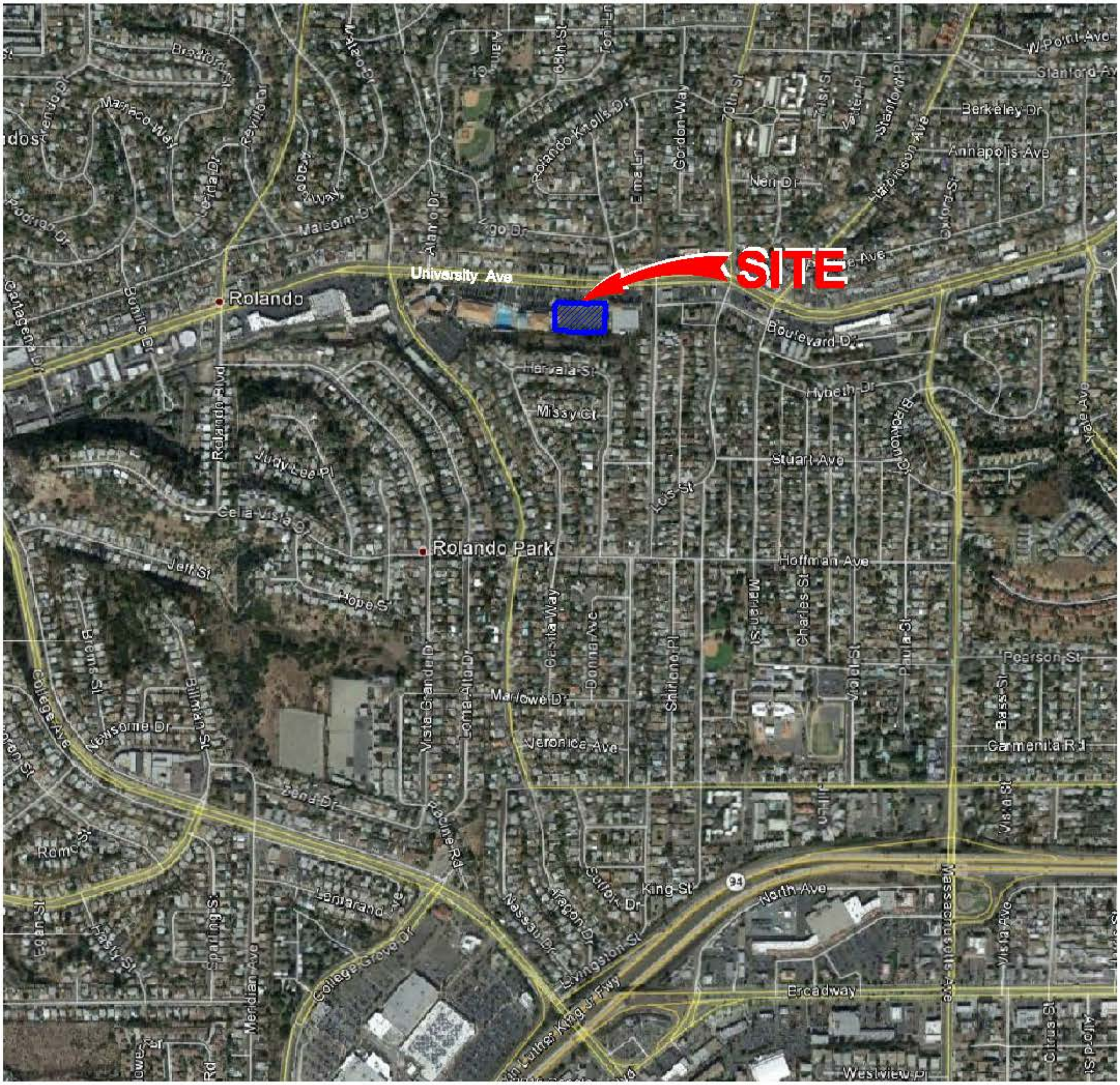
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



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NO SCALE

VICINITY MAP

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

KROC II - WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 05 - 05 - 2017	PROJECT NO. 06151 - 42 - 05	FIG. 1

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GEOCON LEGEND

- Qcf........COMPACTED FILL
- Qudf........UNDOCUMENTED FILL (Dotted Where Buried)
- Qal........ALLUVIUM (Dotted Where Buried)
- Tst........STADIUM CONGLOMERATE (Dotted Where Buried)
- ~ ....APPROX. LOCATION OF GEOLOGIC CONTACT
- B-2 ⊕........APPROX. LOCATION OF EXPLORATORY BORING
- A-5 ◉........APPROX. LOCATION OF INFILTRATION TEST
- B ⎯ B'........APPROX. LOCATION GEOLOGIC CROSS SECTION
- 369 ....APPROX. ELEVATION AT BASE OF FILL

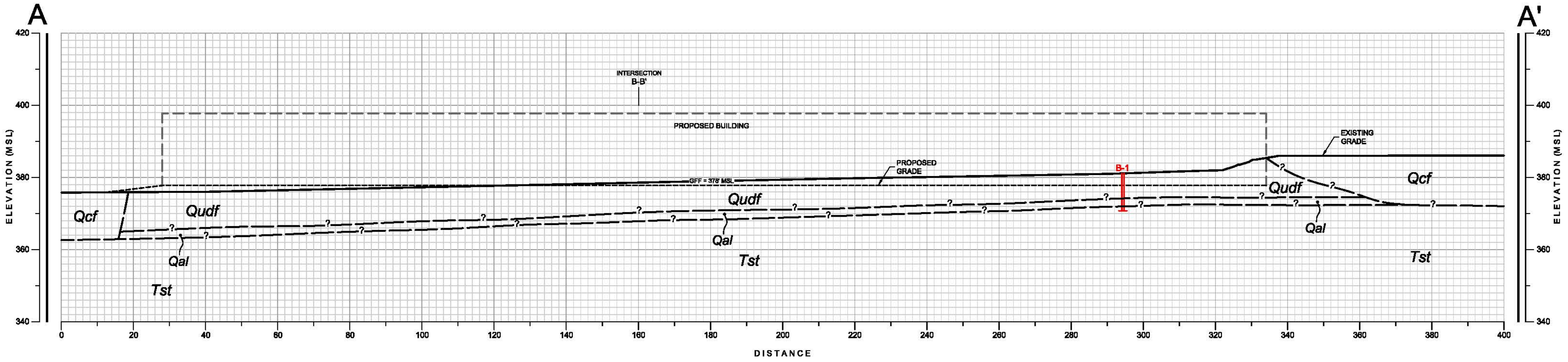
GEOLOGIC MAP

KROC II WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

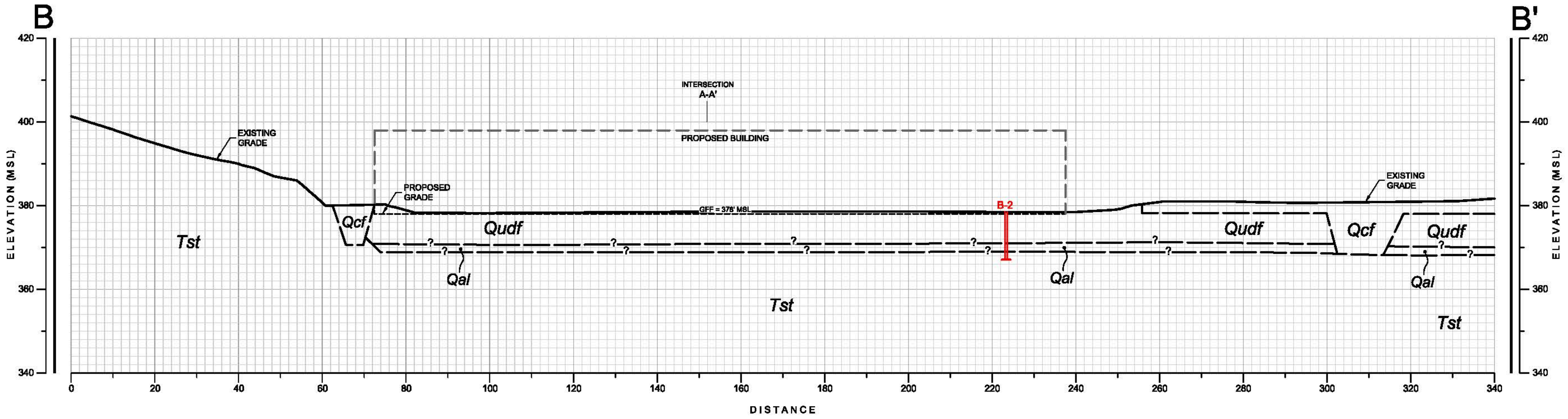
SCALE 1" = 20'	DATE 05 - 05 - 2017	
PROJECT NO. 06151 - 42 - 05		FIGURE 2
SHEET 1 OF 1		

Plotted:05/04/2017 4:05PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06151-42-05 (Kroc II - Wellness Ctr)\SHEETS\06151-42-05 Geo Map.dwg



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 20' (Vert. = Horiz.)

GEOCON LEGEND

Qcf ....COMPACTED FILL

Qudf ........UNDOCUMENTED FILL

Qal ....ALLUVIUM

Tst ....STADIUM CONGLOMERATE

~ ....APPROX. LOCATION OF GEOLOGIC CONTACT

B-2 ....APPROX. LOCATION OF EXPLORATORY BORING

GEOLOGIC CROSS SECTION

KROC II WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

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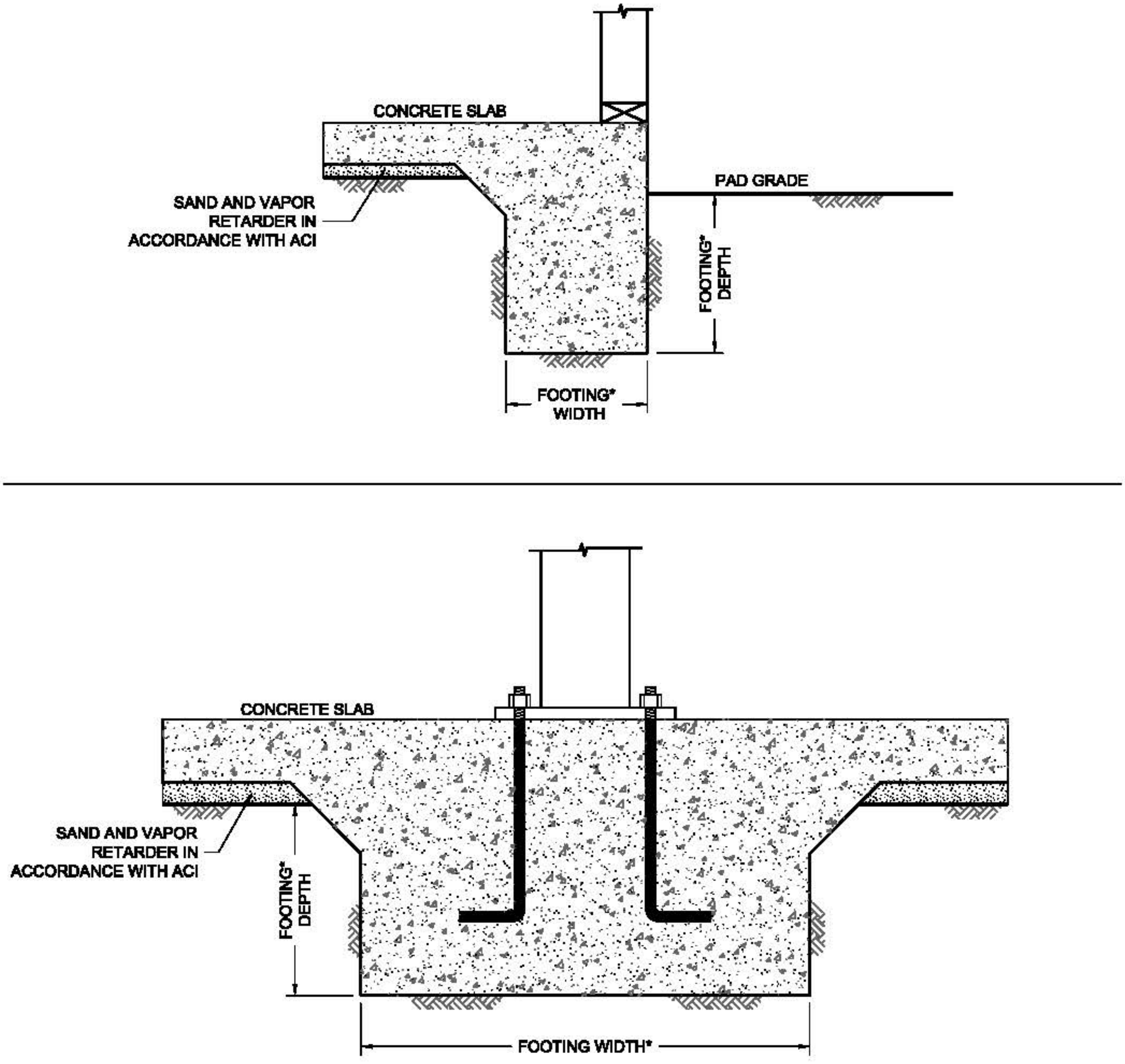
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 20'
DATE 05 - 05 - 2017
PROJECT NO. 06151 - 42 - 05
FIGURE 3
SHEET 1 OF 1

Plotted:05/05/2017 8:14AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06151-42-05 (Kroc II - Wellness Ctr)\SHEETS\06151-42-05 XSections.dwg



*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

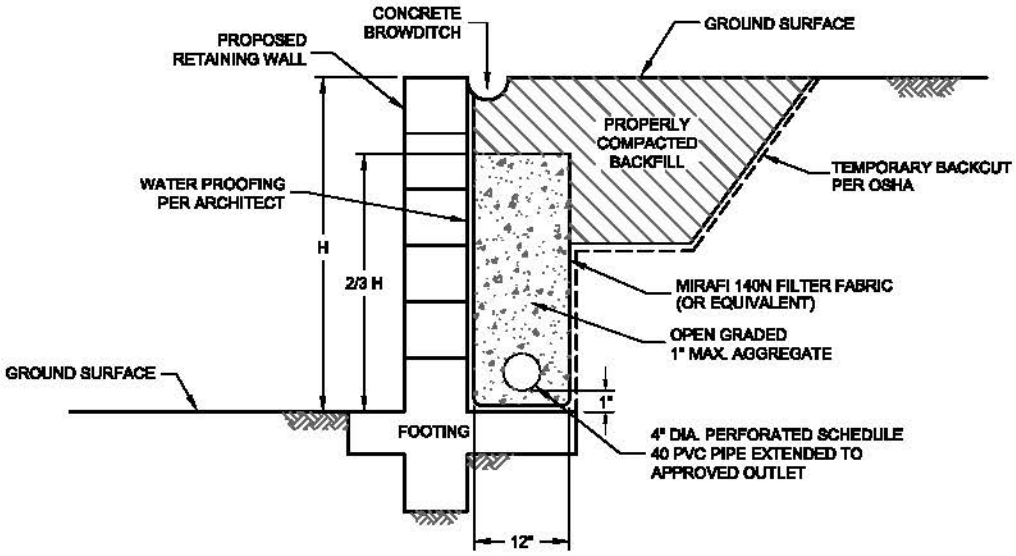
WALL / COLUMN FOOTING DIMENSION DETAIL

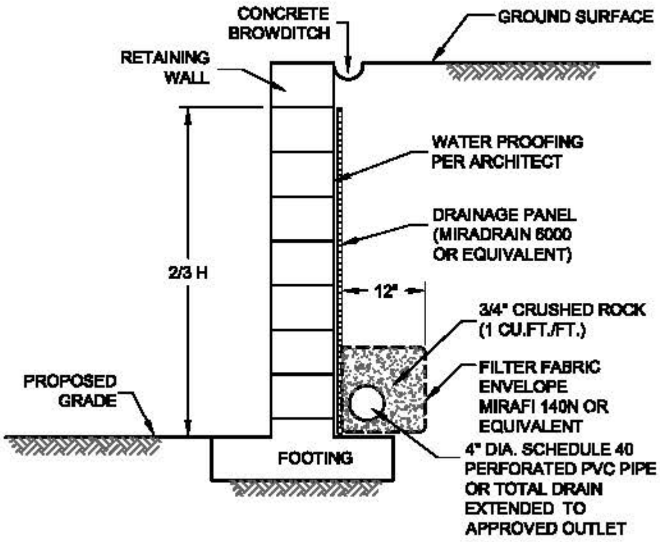
GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

KROC II - WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 05 - 05 - 2017	PROJECT NO. 06151 - 42 - 05	FIG. 4

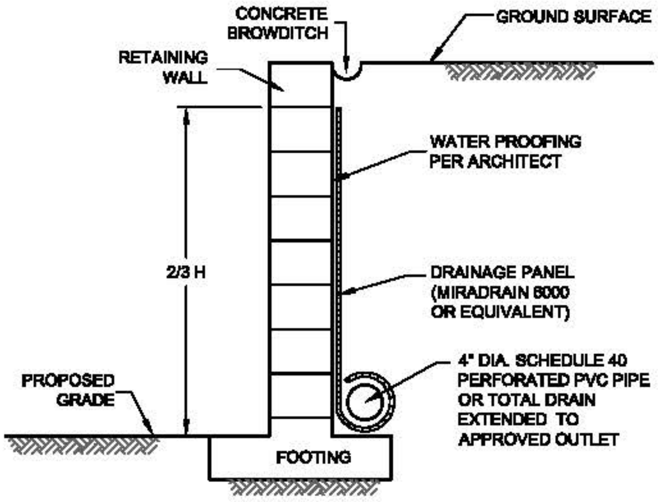
Plotted:05/05/2017 10:53AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06151-42-05 (Kroc II - Wellness Ctr)\DETAILS\Wall-Column Footing Dimension Detail (COLFOOT2).dwg





NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING



NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

KROC II - WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 05 - 05 - 2017	PROJECT NO. 06151 - 42 - 05	FIG. 5

Plotted:05/05/2017 10:54AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06151-42-05 (Kroc II - Wellness Ctr)\DETAILS\Typical Retaining Wall Drainage Detail (RWDD7A).dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

We performed the field investigation on January 29, 2017. The investigation consisted of drilling two, small-diameter borings and five, 8-inch diameter infiltration test holes. The approximate locations of the exploratory borings and infiltration tests are shown on Figure 2.

The borings were drilled to depths ranging from approximately 11 to 11.5 feet below existing grade using a CME 75 drill rig equipped with 8-inch diameter hollow-stem augers. We obtained relatively undisturbed samples from the borings by driving a 3-inch-diameter sampler 12 inches into the undisturbed soil mass with blows from a 140 pound hammer weighing falling 30 inches. The sampler was lined with 1-inch by 2.5-inch-diameter brass rings to facilitate sampling. Bulk samples were also collected.

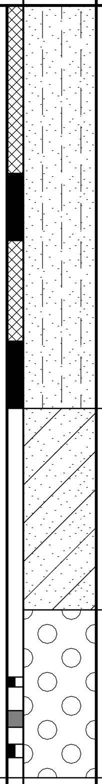
The soil conditions encountered in the borings were visually examined, classified, and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). Logs of the exploratory borings are presented on Figures A-1 and A-2. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained.

PROJECT NO. 06151-42-05

BORING B 1

ELEV. (MSL.) **380** DATE COMPLETED **01-29-2017**

EQUIPMENT **IR A-300** BY: **N. BORJA**



DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B1-1		SM	**UNDOCUMENTED FILL** Medium dense, moist to wet, dark grayish brown to dark, Silty, fine to medium SAND; little gravel and cobble			
2							
	B1-2				50/5.5"		
4							
	B1-3				54		
6			CL	**ALLUVIUM** Stiff to hard, moist, dark gray to black, Sandy CLAY; little gravel			
8							
				STADIUM CONGLOMERATE Very dense, damp, yellowish brown, Silty Sand CONGLOMERATE; no recovery at 10.9 feet samples; resampled with SPT sampler; very difficult drilling below 10 feet			
10	B1-4				50/1"		
	B1-5				50/3"		
	B1-6				50/2"		

REFUSAL AT 11.5 FEET
Groundwater not encountered
Backfilled on 01-29-2017

Figure A-1,
Log of Boring B 1, Page 1 of 1

06151-42-05.GPJ

SAMPLE SYMBOLS

▩ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06151-42-05

BORING B 2

ELEV. (MSL.) **378** DATE COMPLETED **01-29-2017**

EQUIPMENT **IR A-300** BY: **N. BORJA**

DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B2-1		SP	**UNDOCUMENTED FILL** Loose to medium dense, moist, yellowish brown to brown, medium to coarse SAND; trace silt			
			SM	Loose, moist to wet, dark gray to black, Silty, tine to medium SAND; little gravel and cobble			
2							
	B2-2			-Disturbed sample at 2.5 feet	9		
4							
	B2-3			-Becomes dense, blow count may not be accurate due to presence of rock	69		
6							
			CL	**ALLUVIUM** Stiff, moist to wet, gray to grayish brown, Sandy CLAY; little gravel and cobble			
8	B2-4				65/11"		
				STADIUM CONGLOMERATE Very dense, damp to moist, mottled yellowish brown and greenish gray, Silty Sand CONGLOMERATE; hard drilling below 9 feet			
10	B2-5				100/10"		

REFUSAL AT 11 FEET
Groundwater not encountered
Backfilled on 01-30-2017

Figure A-2,
Log of Boring B 2, Page 1 of 1

06151-42-05.GPJ

SAMPLE SYMBOLS			
	▩ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

APPENDIX B

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected samples for their in-place dry density and moisture content, maximum dry density and optimum moisture content, expansion, water-soluble sulfate characteristics, and gradation. The results of our laboratory tests are presented on the following tables and graph. The in-place dry density and moisture content test results are presented on the exploratory boring logs in Appendix A.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557

Proctor Curve No.	Source and Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B1-1	Grayish brown, Silty, fine to coarse SAND; some gravel	132.2	8.5

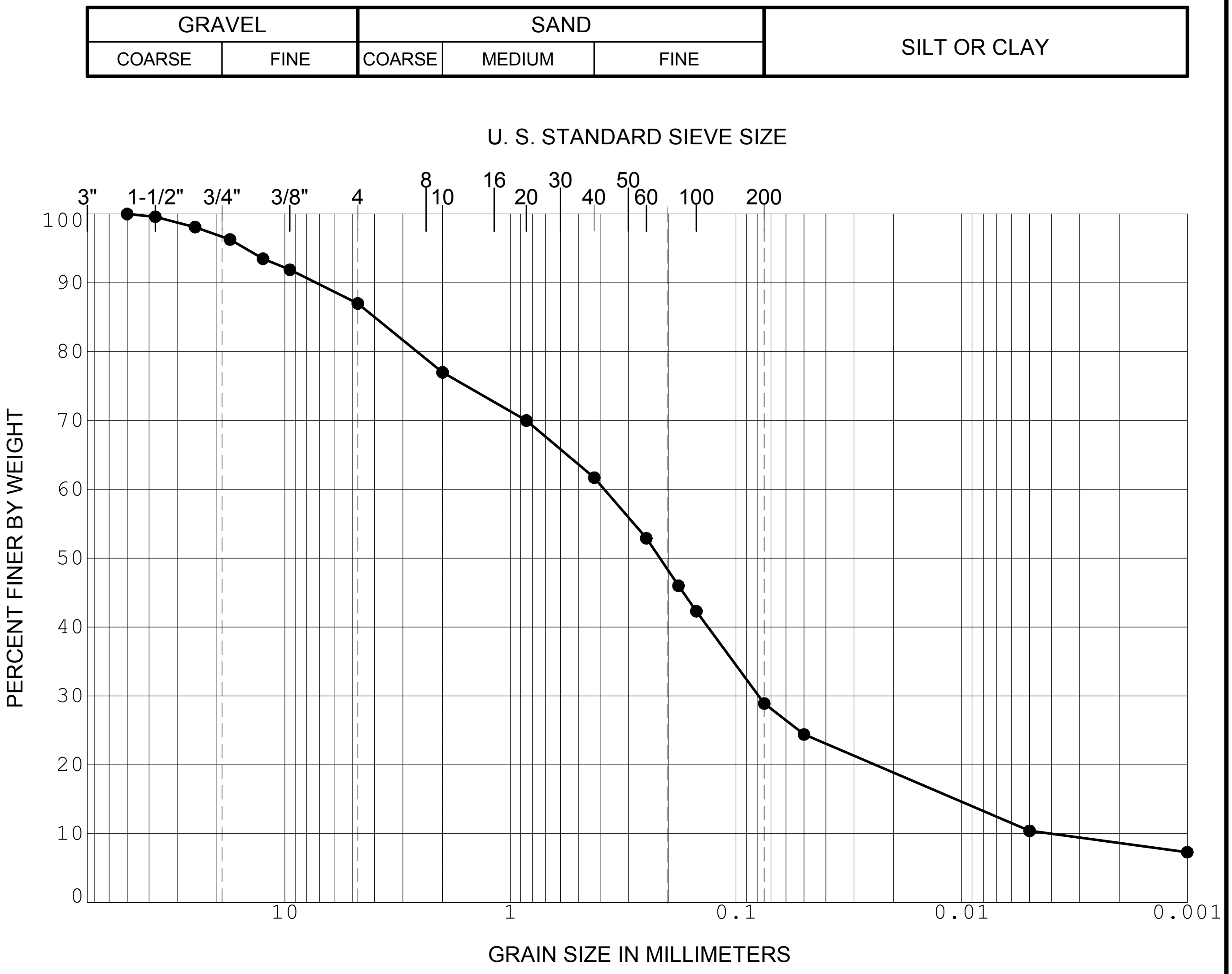
TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Expansion Classification
	Before Test	After Test			
B1-1	8.1	16.1	116.9	15	Very Low

TABLE B-III
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417

Sample No.	Water-Soluble Sulfate (%)	Classification
B1-1	0.063	Not Applicable (S0)

PROJECT NO. 06151-42-05



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B2-1	0.0	(SM) Silty SAND				
⧗							
▲							

GRADATION CURVE

KROC II - WELLNESS CENTER/GYMNASIUM

SAN DIEGO, CALIFORNIA

Figure B-1

APPENDIX C

APPENDIX C

STORM WATER MANAGEMENT

If storm water management devices are not properly designed and constructed, there is a risk for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water being detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff into the subsurface occurs, downstream improvements may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, provides general information regarding soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table C-1 presents the descriptions of the hydrologic soil groups.

TABLE C-1
HYDROLOGIC SOIL GROUP DEFINITIONS

Soil Group	Soil Group Definition
A	Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
B	Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
C	Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
D	Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The site is underlain by compacted fill, undocumented fill, alluvium, and the Stadium Conglomerate formation. The property falls within Hydraulic Soil Group D, which has a very slow infiltration rating. Table C-2 presents the information from the USDA website for the property.

TABLE C-2
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group
Olivenhain-Urban land complex, 2 to 9 percent slopes	OkC	100	D

In-Situ Testing

We performed 5 field-saturated, hydraulic conductivity tests at the site using a Soil Moisture Corp Aardvark Permeameter at the locations presented on the Geologic Map, Figure 2. All of the borings were drilled with a small-diameter drill rig using an 8-inch auger. Table C-3 presents the results of the saturated hydraulic conductivity testing.

We used the guidelines presented in the Riverside County Low Impact Development BMP Design Handbook which references the United States Bureau of Reclamation Well Permeameter Test Method (USBR 7300-89). Based on this widely accepted guideline, the saturated hydraulic conductivity (Ksat) is equal to the infiltration rate. Therefore, the Ksat value determined from the Aardvark Permeameter test is the unfactored infiltration rate. The Ksat (infiltration rate) equation provided in the Riverside County Handbook was used to compute the unfactored infiltration rate.

TABLE C-3
UNFACTORED, FIELD-SATURATED, INFILTRATION TEST RESULTS USING THE SOILMOISTURE CORP AARDVARK PERMEAMETER

Test No.	Depth (inches)	Geologic Unit	Field Infiltration Rate, I (inches/hour)
A-1	40	Qudf	0.0003
A-2	55	Qudf	0.030
A-3	48	Qudf	0.0007
A-4	37	Qcf	0.10
A-5	57	Qudf	0.0004

Soil permeability values from in-situ tests can vary significantly from one location to another due to the non-homogeneous characteristics inherent to most soil. However, if a sufficient amount of field and laboratory test data is obtained, a general trend of soil permeability can usually be evaluated. For this project and for storm water purposes, the test results presented herein should be considered approximate values.

STORM WATER MANAGEMENT CONCLUSIONS

Soil Types

Undocumented Fill and Compacted Fill – Undocumented fill and compacted fill underlies the property. The fills are predominately comprised of silty to clayey sand. The infiltration rates indicate the soils are not suitable for full or partial infiltration.

Existing Improvements

The proposed area of infiltration is planned adjacent to existing hardscape and structures. Due to variable soil conditions and the low infiltration rates, there is a potential for lateral water movement, which could impact nearby structures.

Infiltration Rates

The results of the testing show infiltration rates ranging from approximately 0.003 to 0.1 inches per hour. The rates are not high enough to support full or partial infiltration.

Groundwater

Groundwater or seepage was previously observed during grading in the alluvium along the bedrock contact. We expect groundwater is present at depths of approximately 10 to 15 feet below existing grades. Groundwater/seepage may impact infiltration.

Existing Utilities

Existing utilities exist along the perimeter of the property. Infiltrating near utilities is not recommended. Mitigation measures to prevent water from infiltrating into the utilities consist of setbacks, installing cutoff walls around the utilities and installing subdrains and/or installing liners.

Soil or Groundwater Contamination

We are unaware of contaminated soil or groundwater on the property. Therefore, infiltration associated with this risk is considered feasible.

Storm Water Management Devices

Liners and subdrains are recommended in the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride**,** PVC). The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. The attached Worksheet C.4-1 presents the completed information for the submittal process.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table C-4 describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE C-4
SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS

Consideration	**High Concern – 3 Points**	**Medium Concern – 2 Points**	**Low Concern – 1 Point**
Assessment Methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., infiltrometer). Moderate spatial resolution	Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods.
Predominant Soil Texture	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site Soil Variability	Highly variable soils indicated from site assessment or unknown variability	Soil boring/test pits indicate moderately homogenous soils	Soil boring/test pits indicate relatively homogenous soils
Depth to Groundwater/ Impervious Layer	<5 feet below facility bottom	5-15 feet below facility bottom	>15 feet below facility bottom

Table C-5 presents the estimated factor values for the evaluation of the factor of safety. The factor of safety is determined using the information contained in Table C-4 and the results of our geotechnical investigation. Table C-5 only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B of Worksheet D.5-1) and use the combined safety factor for the design infiltration rate.

TABLE C-5
FACTOR OF SAFETY WORKSHEET D.5-1 DESIGN VALUES – PART A[1]

Suitability Assessment Factor Category	Assigned Weight (w)	Factor Value (v)	Product (p = w x v)
Assessment Methods	0.25	2	0.50
Predominant Soil Texture	0.25	2	0.50
Site Soil Variability	0.25	2	0.50
Depth to Groundwater/Impervious Layer	0.25	2	0.50
Suitability Assessment Safety Factor, $S_A = \Sigma p$			2.0

[1] The project civil engineer should complete Worksheet D.5-1 or Form I-9 to determine the overall factor of safety.

CONCLUSIONS

Our results indicate the site has soils that inhibit infiltration. Because of these site conditions, and the presence of groundwater, it is our opinion that there is a high probability for lateral water migration. It is our opinion that full and partial infiltration is infeasible on this site. Liners and subdrains should be installed within BMP areas.

Categorization of Infiltration Feasibility Condition

Worksheet C.4-1

Part 1 - Full Infiltration Feasibility Screening Criteria

Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

We performed 5 infiltration tests. Using a factor of safety of 2.0 for screening, the rates are not above 0.5 inches/hour.

A-1: 0.0003 in/hr
A-2: 0.030 in/hr
A-3: 0.0007 in/hr
A-4: 0.1 in/hr
A-5: 0.0004 in/hr

2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provided infiltration basins are founded in the underlying native formation bedrock and at least 15 feet away from existing buildings and utilities, infiltration should not increase the risk of geotechnical hazards.

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 2 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:

Groundwater is expected to be present within 10 feet of the bottom of proposed basins. Groundwater was encountered in the alluvium along the contact with the Stadium Conglomerate formation during previous grading for the community center.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

Infiltration is not anticipated to have a negative impact on nearby water balance or discharge of contaminated groundwater to surface waters.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration

If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2</td><td>No</td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

Worksheet C.4-1 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

We performed 5 infiltration tests. The test results are as follows:

A-1: 0.0003 in/hr (factored rate of 0.00015 for F.S. = 2.0)
A-2: 0.030 in/hr (factored rate of 0.015 for F.S. = 2.0)
A-3: 0.0007 in/hr (factored rate of 0.00035 for F.S. = 2.0)
A-4: 0.1 in/hr (factored rate of 0.05 for F.S. = 2.0)
A-5: 0.0004 in/hr (factored rate of 0.0002 for F.S. = 2.0)

The rates indicate the majority of the soils do not allow for an appreciable rate.

6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provided infiltration basins are founded in the underlying native formation bedrock and at least 15 feet away from existing buildings and utilities, infiltration should not increase the risk of geotechnical hazards.

Worksheet C.4-1 Page 4 of 4

Criteria	Screening Question	Yes	No
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X
Provide basis: Groundwater is expected to be present within 10 feet of the bottom of proposed basins. Groundwater was encountered in the alluvium along the contact with the Stadium Conglomerate formation during previous grading for the community center.			
8	**Can infiltration be allowed without violating downstream water rights?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Infiltration is not anticipated to have a negative impact on nearby water balance or discharge of contaminated groundwater to surface waters.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**	No Infiltration	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

06451-42-05
Kroc Center
1/29/2017
JML

A-1

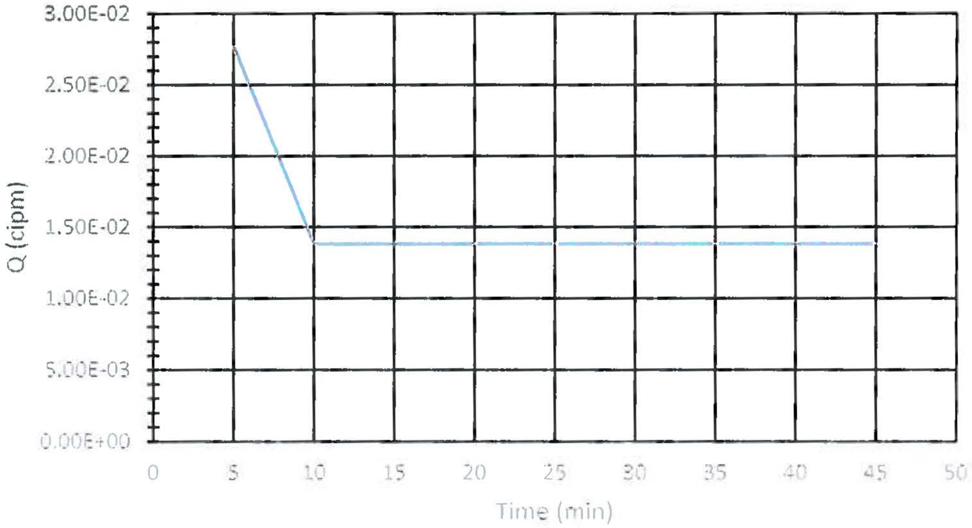
Dia_{hole}	8	inches
$Depth_{hole}$	40	inches
$Depth_{inst}$	32	inches
Ht_{res}	30.5	inches

Q (cipm):	1.38E-02
K_{fs} (iph)	0.0003

Wt_0	20	lbs

D =	55.25	inches
h_{calc} =	11.68	inches
$h_{measured}$ =	9.25	inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (in^3/min)
5	5	14.010	5.990	9.60E-02	1.66E+02	3.32E+01
10	5	13.770	0.240	3.85E-03	6.65E+00	1.33E+00
15	5	13.765	0.005	8.01E-05	1.38E-01	2.77E-02
25	10	13.760	0.005	8.01E-05	1.38E-01	1.38E-02
45	20	13.750	0.010	1.60E-04	2.77E-01	1.38E-02
65	20	13.740	0.010	1.60E-04	2.77E-01	1.38E-02
85	20	13.730	0.010	1.60E-04	2.77E-01	1.38E-02



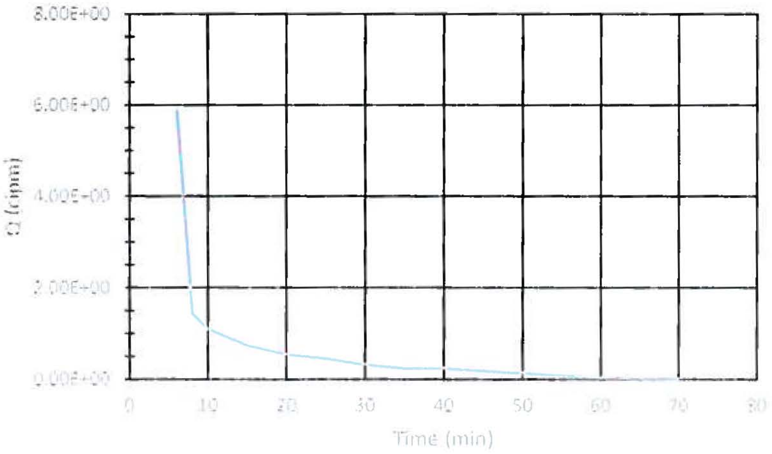
G1796-42-01
Parkview Terrace
1/29/2017
JML

A-2

Dia_{hole}	8	inches
$Depth_{hole}$	55	inches
$Depth_{inst}$	53	inches
Ht_{res}	30.5	inches
Wt_0	19.875	lbs
D =	76.25	inches
h_{calc} =	5.75	inches
$h_{measured}$ =	5.75	inches

Q (cipm):	**2.49E-01**
K_{fs} (iph)	**0.030**

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (in^3/min)
2	2	14.750	5.125	8.21E-02	1.42E+02	7.10E+01
4	2	12.560	2.190	3.51E-02	6.06E+01	3.03E+01
6	2	12.135	0.425	6.81E-03	1.18E+01	5.88E+00
8	2	12.030	0.105	1.68E-03	2.91E+00	1.45E+00
10	2	11.950	0.080	1.28E-03	2.22E+00	1.11E+00
15	5	11.815	0.135	2.16E-03	3.74E+00	7.48E-01
20	5	11.715	0.100	1.60E-03	2.77E+00	5.54E-01
25	5	11.630	0.085	1.36E-03	2.35E+00	4.71E-01
30	5	11.570	0.060	9.62E-04	1.66E+00	3.32E-01
35	5	11.525	0.045	7.21E-04	1.25E+00	2.49E-01
40	5	11.480	0.045	7.21E-04	1.25E+00	2.49E-01
45	5	11.445	0.035	5.61E-04	9.69E-01	1.94E-01
50	5	11.420	0.025	4.01E-04	6.92E-01	1.38E-01
60	10	11.405	0.015	2.40E-04	4.15E-01	4.15E-02
70	10	11.400	0.005	8.01E-05	1.38E-01	1.38E-02



06151-42-05
Kroc Center
1/29/2017
NB

A-3

Dia_{hole}	8	inches
$Depth_{hole}$	48	inches
$Depth_{inst}$	45	inches
Ht_{res}	30	inches

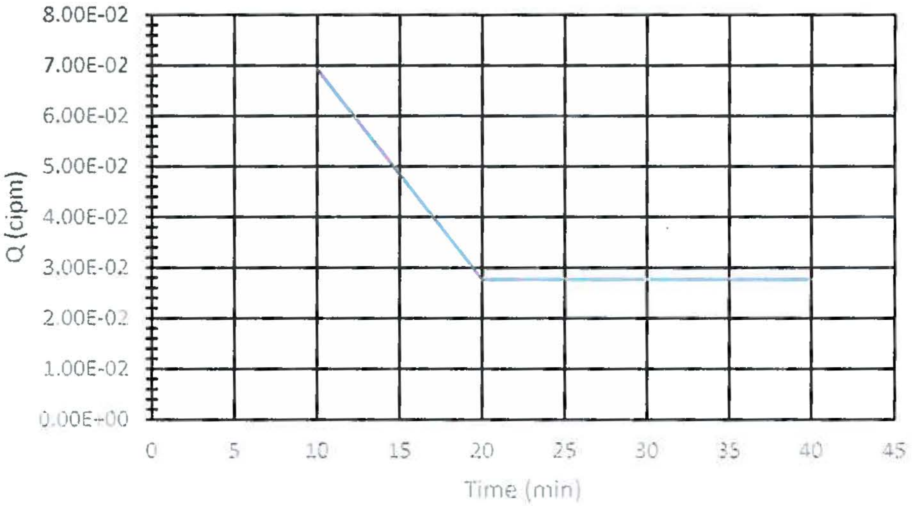
Q (cipm): 2.77E-02

K_{fs} (iph) 0.0007

Wt_0 24.98 lbs

D = 67.75 inches
h_{calc} = 6.73 inches
$h_{measured}$ = 7 inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (in^3/min)
10	10	24.955	0.025	4.01E-04	6.92E-01	6.92E-02
20	10	24.945	0.010	1.60E-04	2.77E-01	2.77E-02
30	10	24.935	0.010	1.60E-04	2.77E-01	2.77E-02
40	10	24.925	0.010	1.60E-04	2.77E-01	2.77E-02



06151-42-05
Kroc Center
1/29/2017
NB

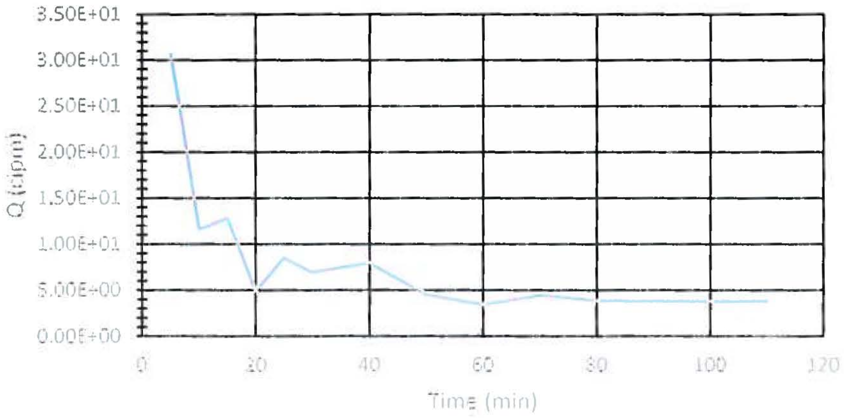
A-4

Dia_{hole}	8	inches
$Depth_{hole}$	37	inches
$Depth_{inst}$	35	inches
Ht_{res}	30.5	inches
Wt_0	24.378	lbs

Q (cipm):	**3.80E+00**
K_{fs} (iph)	**0.10**

D = 58.25 inches
h_{calc} = 5.69 inches
$h_{measured}$ = 5.5 inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (in^3/min)
5	5	18.835	5.543	8.88E-02	1.53E+02	3.07E+01
10	5	16.725	2.110	3.38E-02	5.84E+01	1.17E+01
15	5	14.405	2.320	3.72E-02	6.42E+01	1.28E+01
20	5	13.510	0.895	1.43E-02	2.48E+01	4.96E+00
25	5	11.965	1.545	2.48E-02	4.28E+01	8.56E+00
30	5	10.700	1.265	2.03E-02	3.50E+01	7.01E+00
40	10	7.805	2.895	4.64E-02	8.02E+01	8.02E+00
50	10	6.160	1.645	2.64E-02	4.56E+01	4.56E+00
60	10	4.910	1.250	2.00E-02	3.46E+01	3.46E+00
70	10	3.290	1.620	2.60E-02	4.49E+01	4.49E+00
80	10	1.890	1.400	2.24E-02	3.88E+01	3.88E+00
90	10	0.495	1.395	2.24E-02	3.86E+01	3.86E+00
100	10	-0.890	1.385	2.22E-02	3.84E+01	3.84E+00
110	10	-2.280	1.390	2.23E-02	3.85E+01	3.85E+00



06151-42-05
Kroc Center
1/29/2017
JML

A-5

Dia_{hole}	8	inches
$Depth_{hole}$	57	inches
$Depth_{inst}$	55	inches
Ht_{res}	29.5	inches

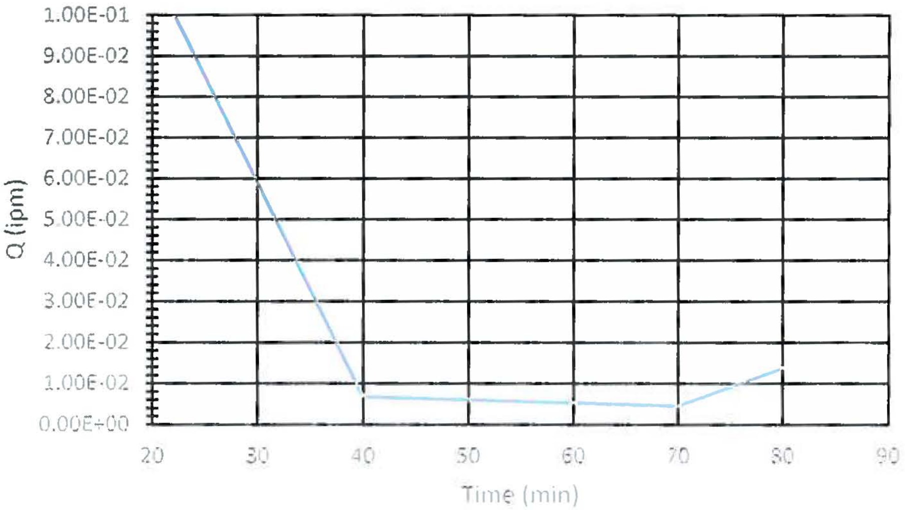
Wt_0	13.42	lbs

Q (cipm): 1.38E-02

K_{fs} (iph): 0.0004

$D =$ 77.25 inches
$h_{calc} =$ 5.76 inches
$h_{measured} =$ 5.5 inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (in^3/min)
5	5	13.160	0.260	4.17E-03	7.20E+00	1.44E+00
10	5	13.125	0.035	5.61E-04	9.69E-01	1.94E-01
15	5	13.115	0.010	1.60E-04	2.77E-01	5.54E-02
20	5	13.095	0.020	3.21E-04	5.54E-01	1.11E-01
40	20	13.090	0.005	8.01E-05	1.38E-01	6.92E-03
70	30	13.085	0.005	8.01E-05	1.38E-01	4.62E-03
80	10	13.080	0.005	8.01E-05	1.38E-01	1.38E-02



APPENDIX D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

KROC II – WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

MAY 5,2017
PROJECT NO. 06151-42-01

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

4. CLEARING AND PREPARING AREAS TO BE FILLED

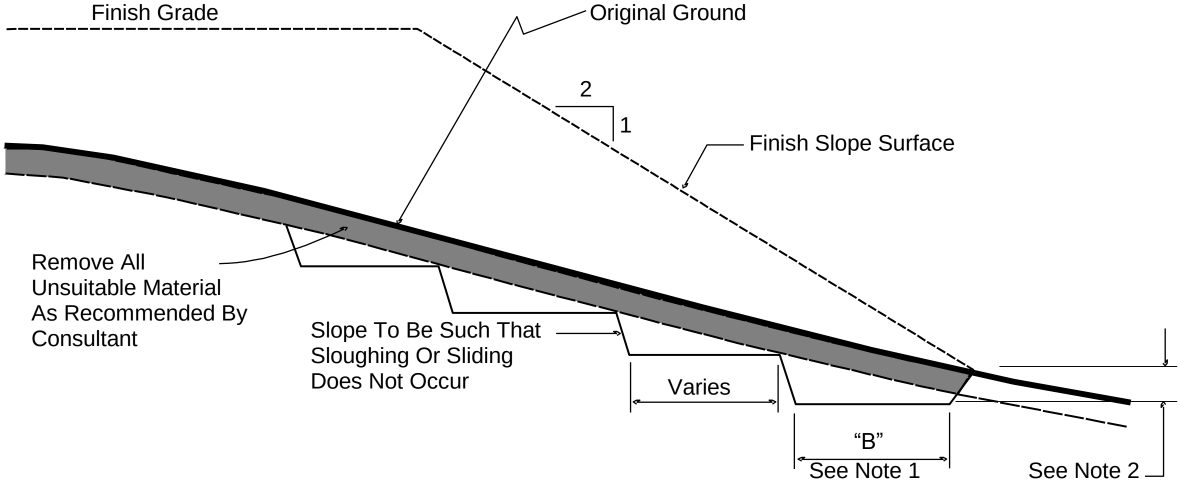
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

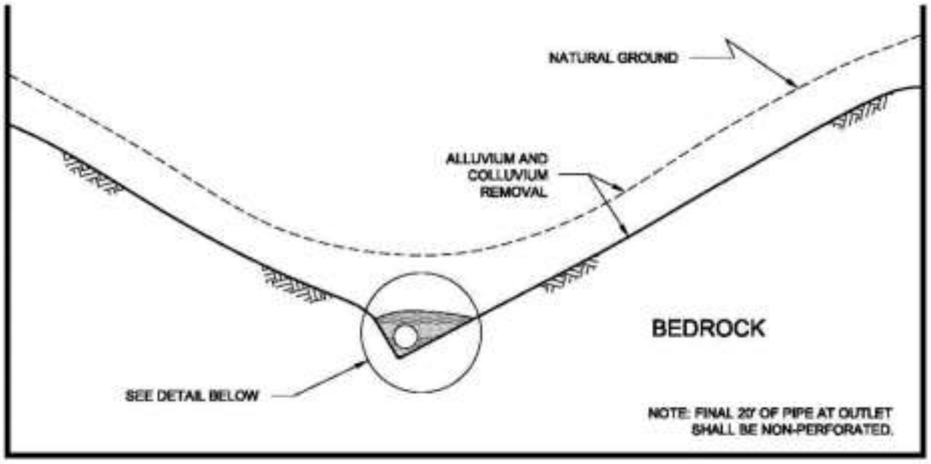
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

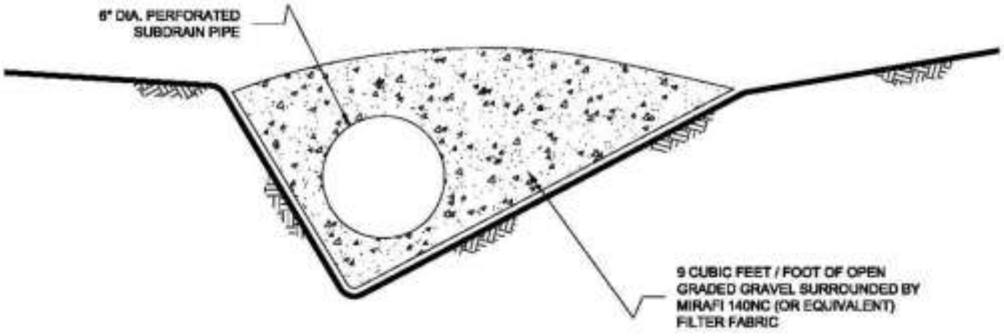
7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL



NOTE: FINAL 20' OF PIPE AT OUTLET SHALL BE NON-PERFORATED.



NOTES:

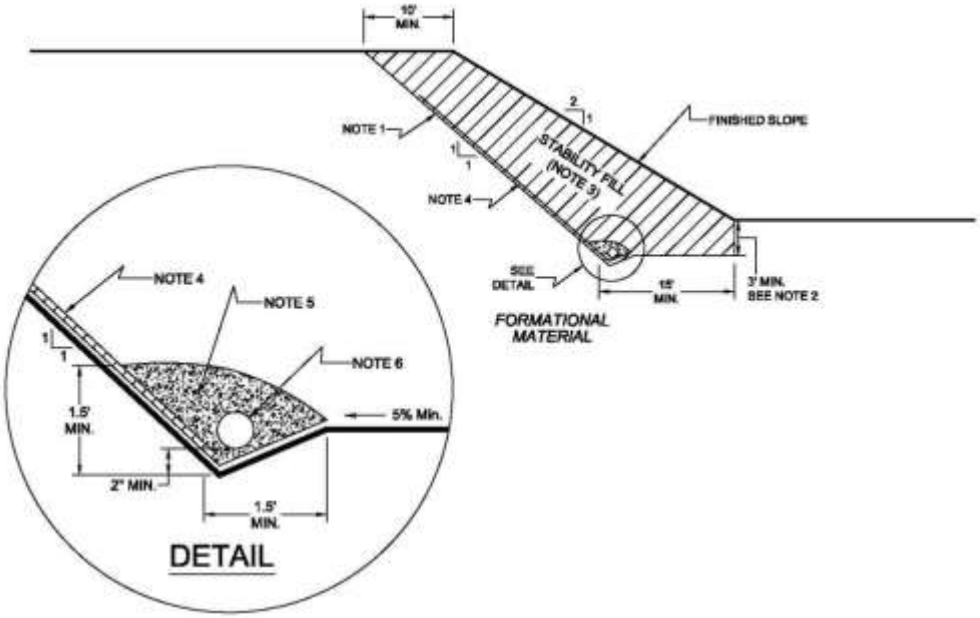
1......6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

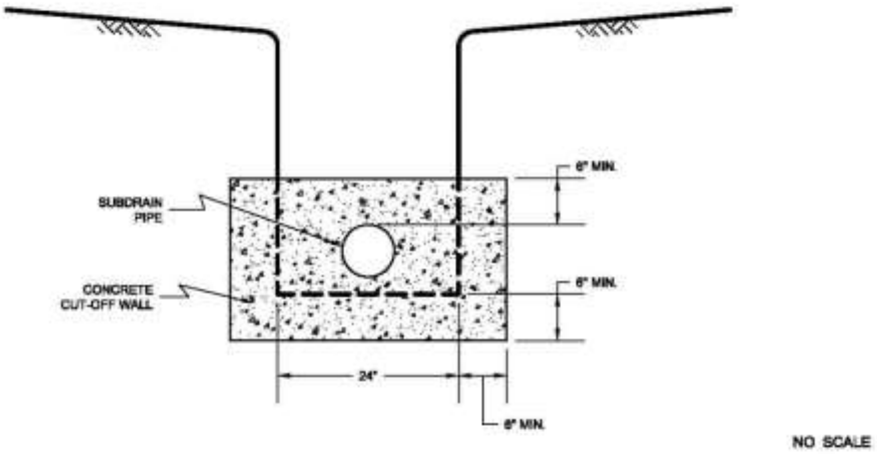
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

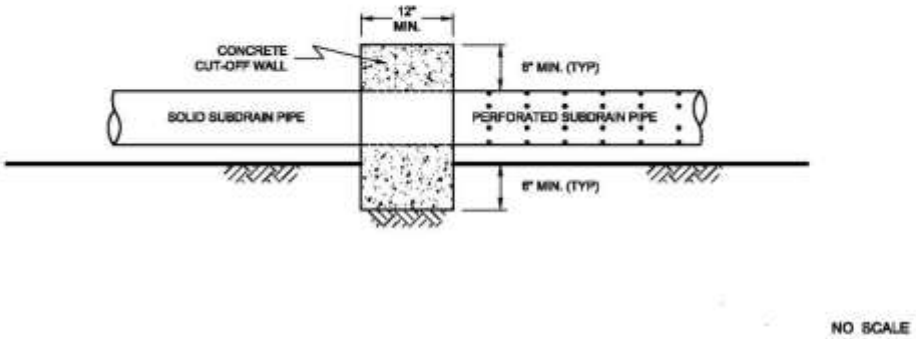
7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

TYPICAL CUT OFF WALL DETAIL

FRONT VIEW

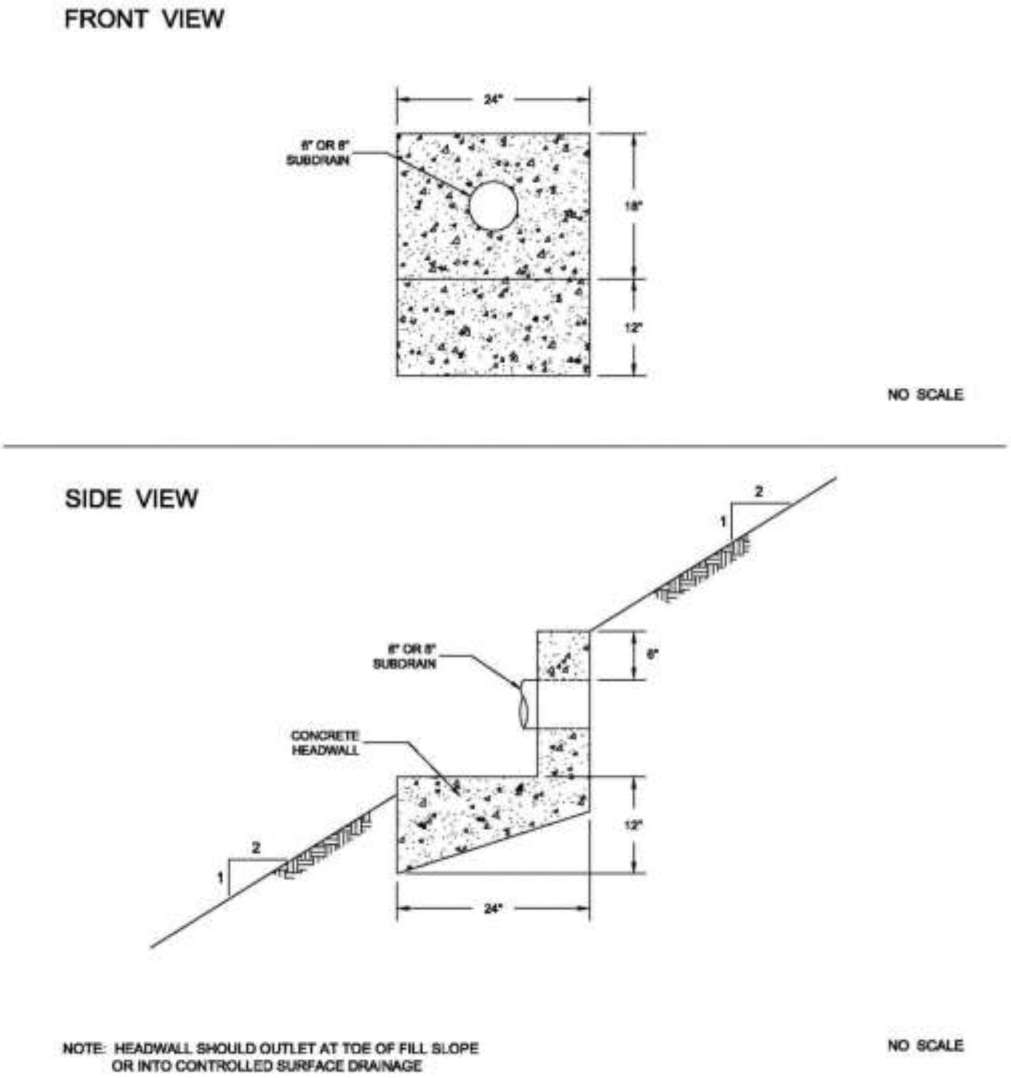


SIDE VIEW



7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

TYPICAL HEADWALL DETAIL



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE OR INTO CONTROLLED SURFACE DRAINAGE

7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an “as-built” map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

City of San Diego (2008), *Seismic Safety Study, Geologic Hazards and Faults, Map Sheet 22*;

Kennedy, M. P., and Tan, S. S., (2008), *Geologic Map of the San Diego 30’ x 60’ Quadrangle, California*, USGS Regional Geologic Map Series, 1:100,000 Scale, Map No. 3;

Risk Engineering (2011), *EZ-FRISK (version 7.62)*, software package used to perform site-specific earthquake hazard analyses, accessed May 2, 2017;

USGS (2016), *Quaternary Fault and Fold Database of the United States*: U.S. Geological Survey website, http://earthquakes,usgs.gov/hazards/qfaults, accessed May 2, 2017;

USGS (2017), U.S. Seismic Design Maps; USGS Earthquake Hazards Program website, https://earthquake.usgs.gov/designmaps/us/application.php, accessed May 2, 2017

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. 06151-42-05
November 30, 2017

The Salvation Army
Ray and Joan Kroc Community Center
6845 University Avenue
San Diego, California 92115

Attention: Mr. Kevin Forrey

Subject: RESPONSE TO CITY OF SAN DIEGO REVIEW COMMENTS
KROC II – WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

References:

1. *Geotechnical Investigation, Kroc II – Wellness Center/Gymnasium, San Diego, California*, prepared by Geocon Incorporated dated May 5, 2017 (Project No. 06151-42-05).

2. City of San Diego Review Comments, *Cycle 3, Project No. 552436*, dated November 27, 2017, prepared by Mr. Kreg Mills.

3. Development Plans, Sports & Wellness Center, San Diego, California, dated July 8, 2017, Architectural Plans (Sheets DD-1 through DD-7) by Kenneth D. Smith Architect & Associates, Inc., Civil Plan (Sheet C-1) by REC Consultants, Inc., and Landscape Plans (Sheets LDP-1 and LDP-2) by Howard Associates.

Dear Mr. Forrey:

In accordance with the request of the project architect, we have prepared this letter to respond to a City of San Diego Review comment (Reference 2) for the project. The City review comment followed by our response is provided below.

Issue No. 2: *The project's geotechnical consultant must submit an addendum geotechnical report or update letter for the purposes of environmental review that specifically addresses the proposed development plans and the following:*

The project's geotechnical consultant should provide a conclusion regarding if the proposed development will destabilize or result in settlement of adjacent property or the right of way.

Response: Based on our review of the development plans (Reference 3), Reference 1 remains applicable to the design and construction of the project. Additionally, it is our opinion, from a geotechnical engineering perspective, that the proposed development will not destabilize or result in settlement of adjacent property or the right of way provided the recommendations in the geotechnical report are followed.

Should you have any questions regarding this letter, or if we m be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

REGISTERED PROFESSIONAL ENGINEER
RODNEY C. MIKESELL
No.2533
GEOTECHNICAL
STATE OF CALIFORNIA

Rodney C. Mikesell
GE 2533

RCM:dmc

(e-mail)	Addressee
(e-mail)	Kenneth D. Smith Architect & Associates, Inc. Attention: Mr. Dean Smith

TECHNICAL MEMORANDUM:

SWMM Modeling for Hydromodification Compliance of:

Ray & Joan Kroc Community Center

Prepared For:

The Salvation Army

Prepared by:

Luis Parra, PhD, CPSWQ, ToR, D.WRE.
R.C.E. 66377

REGISTERED PROFESSIONAL ENGINEER
LUIS A PARRA–ROSALES
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EXP 6/30/18
CIVIL
STATE OF CALIFORNIA

REC Consultants
2442 Second Avenue
San Diego, CA 92101
Telephone: (619) 232-9200

TECHNICAL MEMORANDUM

TO: The Salvation Army

FROM: Luis Parra, PhD, PE, CPSWQ, ToR, D.WRE.
David Edwards, PE.

DATE: April 14, 2017, Revised February 14, 2018, August 9, 2018

RE: Summary of SWMM Modeling for Hydromodification Compliance for KROC Community Center, San Diego, CA.

INTRODUCTION

This memorandum summarizes the approach used to model the proposed community use site in the City of San Diego using the Environmental Protection Agency (EPA) Storm Water Management Model 5.0 (SWMM). SWMM models were prepared for the pre and post-developed conditions at the site in order to determine if the proposed HMP detention facility has sufficient volume to meet Order R9-2013-001 requirements of the California Regional Water Quality Control Board San Diego Region (SDRWQCB), as explained in the Final Hydromodification Management Plan (HMP), dated March 2011, prepared for the County of San Diego by Brown and Caldwell.

SWMM MODEL DEVELOPMENT

The Kroc Community Center project site consists of a proposed community use development within the existing community use site. Two (2) SWMM models were prepared for this study: the first for the pre-developed and the second for the post-developed conditions. The project site drains to one (1) Point of Compliance (POC) located to the north west of the project site at the existing storm drain.

The SWMM model was used since we have found it to be more comparable to San Diego area watersheds than the alternative San Diego Hydrology Model (SDHM) and also because it is a non-proprietary model approved by the HMP document. For both SWMM models, flow duration curves were prepared to determine if the proposed HMP facility is sufficient to meet the current HMP requirements.

The inputs required to develop SWMM models include rainfall, watershed characteristics, and BMP configurations. The Kearny Mesa Gage from the Project Clean Water website was used for this study, since it is the most representative of the project site precipitation due to elevation and proximity to the project site.

Per the California Irrigation Management Information System “Reference Evaporation Zones” (CIMIS ETo Zone Map), the project site is located within the Zone 6 Evapotranspiration Area. Thus evapotranspiration vales for the site were modeled using Zone 6 average monthly values from Table G.1-1 from the 2016 BMP Design Manual. Per the NRCS web soil survey, the project site is situated upon Class D soils. Soils have been assumed to be compacted in the existing condition to represent the current condition of the site, while fully compacted in the post developed conditions. Other SWMM inputs for the subareas are discussed in the appendices to this document, where the selection of parameters is explained in detail.

HMP MODELING

PRE DEVELOPED CONDITIONS

In current existing conditions, runoff from the development site (currently compacted landscaping area) discharges via overland flow to one (1) point of compliance located at the existing storm drain inlet located at the north-west boundary of the project site. Table 1 below illustrates the pre-developed area and impervious percentage accordingly.

TABLE 1 – SUMMARY OF PRE-DEVELOPED CONDITIONS

POC	DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip$^{(1)}$
POC-1	DMA-1-D	1.3652	0%
TOTAL	**--**	**1.3652**	--

Notes: (1) – Per the 2013 RWQCB permit, existing condition impervious surfaces are not to be accounted for in existing conditions analysis.

DEVELOPED CONDITIONS

The Kroc Community site proposes the construction of a community use facility with a soccer field located on the roof of the proposed structure. Runoff from the majority of the project site is drained to one (1) onsite receiving HMP detention facility. Once flows are routed via the proposed HMP detention facility, flows are then discharged to the adjacent storm drain at POC-1.

TABLE 2 – SUMMARY OF POST-DEVELOPED CONDITIONS

POC	DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
POC-1	DMA-1-D	0.6257	43.4%
	DMA-2-D	0.5045	100%
	DMA-3-D-N	0.0299	0%
	DMA-3-D-W	0.0793	0%
	DMA-3-D-S	0.0275	0%
	DMA-4-D	0.0855	0%
	DMA-5-D	0.0128	0%
TOTAL	**--**	**1.3652**	N/A

One (1) HMP detention facility is located within the project site and is responsible for handling hydromodification requirements for the project site. In developed conditions, the vault will have a depth of 4-feet and will contain a riser spillway structure to control outflow (see dimensions in Table 3). The riser structure will act as a spillway such that peak flows can be safely discharged to the receiving storm drain.

It should be noted that detailed outlet structure location and elevations will be shown on the construction plans based on the recommendations of this study.

One (1) HMP detention facility is located within the project site and is responsible for handling hydromodification requirements for the project site. In developed conditions, the vault will have a depth of 4-feet and will contain a riser spillway structure to control outflow (see dimensions in Table 3). The riser structure will act as a spillway such that peak flows can be safely discharged to the receiving storm drain.

It should be noted that detailed outlet structure location and elevations will be shown on the construction plans based on the recommendations of this study.

One tree well will be responsible for meeting water quality and hydromodification requirements for DMA-1-5. Please refer to Attachment 1 of Storm Water Quality Management Plan for compliance and sizing details.

Water Quality BMP Sizing

It is assumed all storm water quality requirements for the project will be met by the proposed water quality BMP detailed in the SWQMP and other BMPs included within the site design. However, detailed water quality requirements are not discussed within this technical memo.

For further information in regards to storm water quality requirements for the project (including sizing and drawdown) please refer to the site specific Storm Water Quality Management Plan (SWQMP).

BMP MODELING FOR HMP PURPOSES

One (1) HMP detention vault is proposed for hydromodification conformance for the project site. Tables 3 & 4 illustrate the dimensions required for HMP compliance according to the SWMM model that was undertaken for the project.

TABLE 3 – SUMMARY OF DEVELOPED HMP BMP

BMP	Tributary Area (1) (Ac)	DIMENSIONS					
		HMP Area (2) (Ac)	Vault Depth (ft)	Vault Volume (ft^3)	Depth Riser Invert (ft)(3)	Weir Length(4) (ft)	Total Depth(5) (ft)
BASIN 1	1.32	800	4	3,200	3.5-ft	3-ft	4

NOTES:
(1) Tributary Area to detention vault excludes DMAs 1-4 and 1-6.
(2) Area of vault base footprint.
(3) Depth of ponding beneath the riser structure's surface spillway.
(4) Overflow length of the internal emergency spillway weir.
(5) Total surface depth of BMP from top crest elevation to surface invert.

FLOW DURATION CURVE COMPARISON

The Flow Duration Curve (FDC) for the site was compared at the POC by exporting the hourly runoff time series results from SWMM to a spreadsheet.

Q_2 and Q_{10} were determined with a partial duration statistical analysis of the runoff time series in an Excel spreadsheet using the Cunnane plotting position method (which is the preferred plotting methodology in the HMP Permit). As the SWMM Model includes a statistical analysis based on the Weibull Plotting Position Method, the Weibull Method was also used within the spreadsheet to ensure that the results were similar to those obtained by the SWMM Model.

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals; the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period "i" were obtained (Q_i with i=3 to 9). For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate. FDC comparison at the POC is illustrated in Figure 1 in both normal and logarithmic scale. Attachment 5 provides a detailed drainage exhibit for the post-developed condition.

As can be seen in Figure 1, the FDC for the proposed condition with the HMP BMP is within 110% of the curve for the existing condition in both peak flows and durations. The additional runoff volume generated from developing the site will be released to the existing point of discharge at a flow rate below the 10% Q_2 lower threshold for POC-1. Additionally, the project will also not increase peak flow rates between the Q_2 and the Q_{10}, as shown in the peak flow tables in Attachment 1.

Discussion of the Manning's coefficient (Pervious Areas) for Pre and Post-Development Conditions

Typically the Manning's coefficient is selected as n = 0.10 for pervious areas and n = 0.012 for impervious areas. However, due to the impact that n has in the continuous simulation a more accurate value of the Manning's coefficient has been chosen for pervious areas. Taken into consideration the study prepared by TRWE (Reference [6]) a value of n = 0.05 has been selected (see Table 1 of Reference [6] included in Attachment 7). An average n value between average grass plus pasture (0.04) and dense grass (0.06) has been selected per the reference cited, for light rain (<0.8 in/hr) as more than 99% of the rainfall has been measured with this intensity.

SUMMARY

This study has demonstrated that the proposed HMP BMP provided for the Kroc Community Center site is sufficient to meet the current HMP criteria for the Point of Compliance (POC), if the cross-section area and volume recommended within this technical memorandum, and the respective orifice and outlet structure are incorporated as specified within the proposed project site.

KEY ASSUMPTIONS

1. Type D Soils is representative of the existing condition site.

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. FDC Plots (log and natural "x" scale) and Flow Duration Table.
3. List of the "n" largest Peaks: Pre-Development and Post-Development Conditions
4. Elevations vs. Discharge Curves to be used in SWMM
5. Pre & Post Development Maps, Project plan and section sketches
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. SWMM Screens and Explanation of Significant Variables
8. Geotechnical Documentation
9. Summary files from the SWMM Model

REFERENCES

[1] – *"Review and Analysis of San Diego County Hydromodification Management Plan (HMP): Assumptions, Criteria, Methods, & Modeling Tools – Prepared for the Cities of San Marcos, Oceanside & Vista",* May 2012, TRW Engineering.

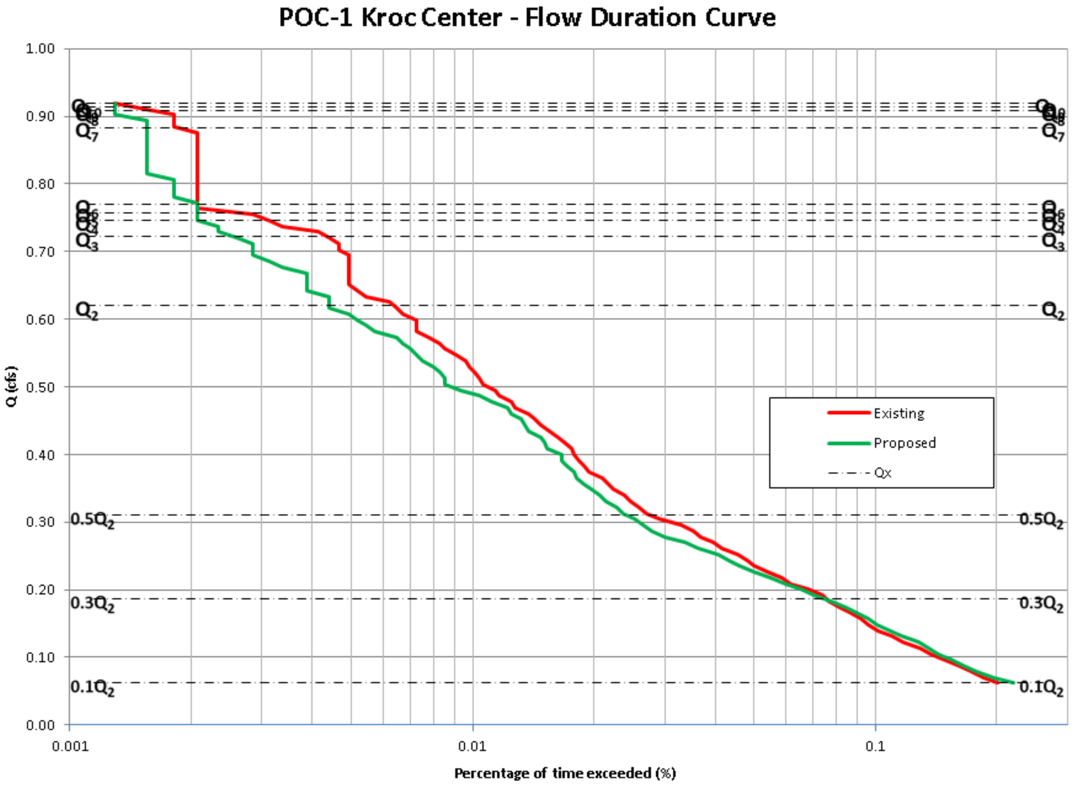
[2] – *"Final Hydromodification Management Plan (HMP) prepared for the County of San Diego",* March 2011, Brown and Caldwell.

[3] - Order R9-20013-001, California Regional Water Quality Control Board San Diego Region (SDRWQCB).

[4] – "*Handbook of Hydrology*", David R. Maidment, Editor in Chief. 1992, McGraw Hill.

[5] – "*City of San Diego BMP Design Manual*", February 2016.

[6] – "*Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region*", 2016, TRW Engineering.



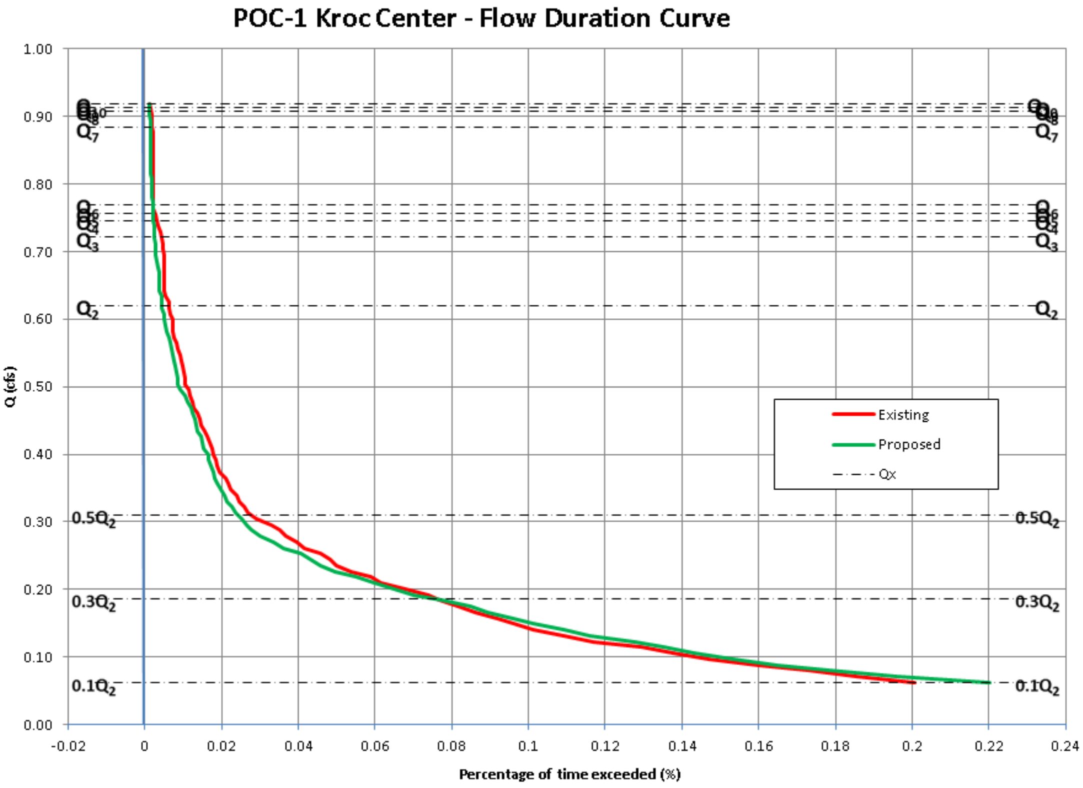


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal “x” scale)

ATTACHMENT 1.

Q_2 to Q_{10} Comparison Table – POC 1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
2-year	0.620	0.554	0.066
3-year	0.722	0.626	0.096
4-year	0.746	0.678	0.068
5-year	0.757	0.706	0.051
6-year	0.770	0.743	0.027
7-year	0.884	0.781	0.103
8-year	0.908	0.807	0.101
9-year	0.914	0.857	0.057
10-year	0.919	0.903	0.017

ATTACHMENT 2

FLOW DURATION CURVE ANALYSIS

1) Flow duration curve shall not exceed the existing conditions by more than 10%, neither in peak flow nor duration.

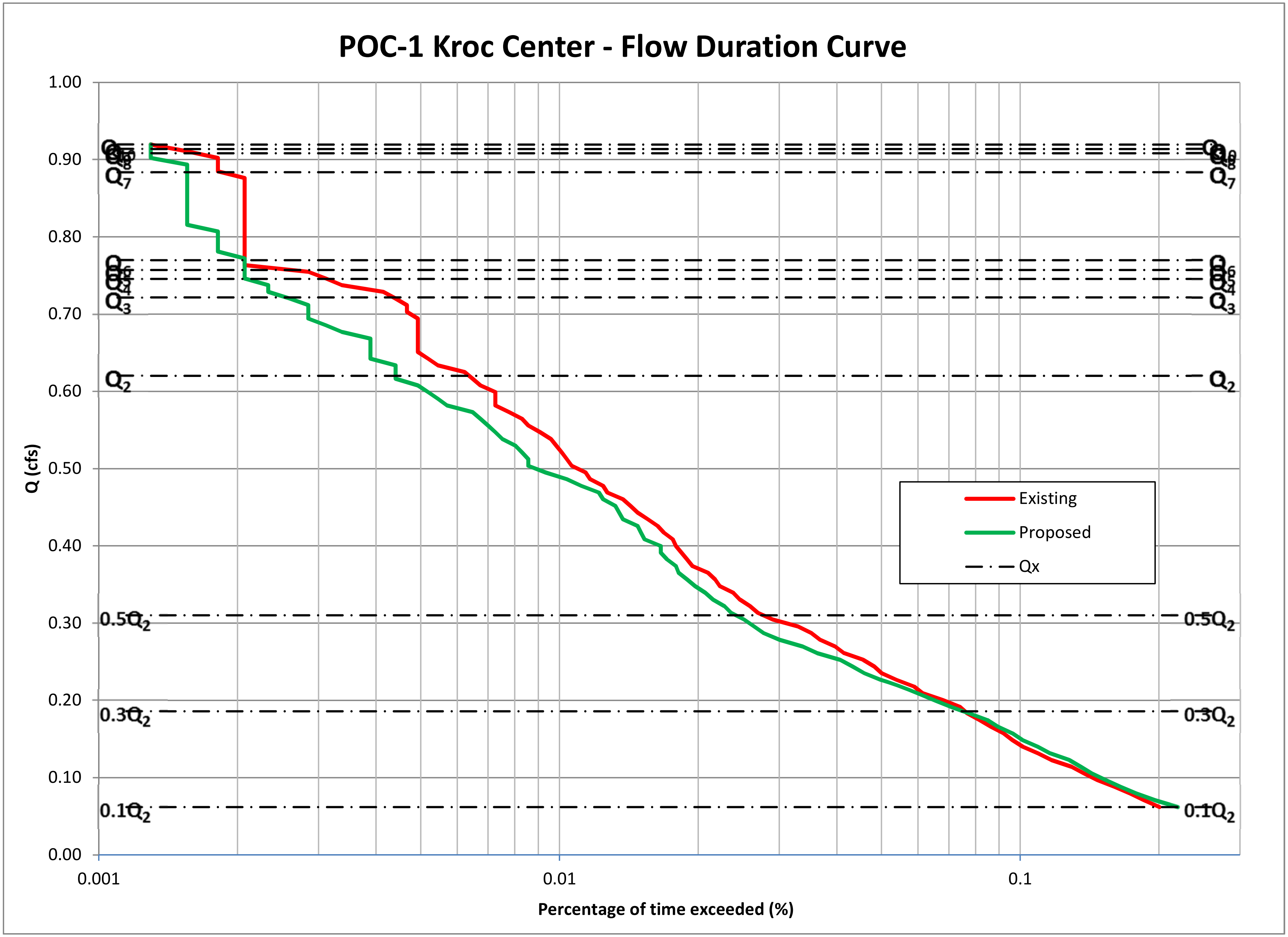
The figures on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval $0.10Q_2 – Q_{10}$ is divided in 100 sub-intervals, then a) the post development divided by pre-development durations are never larger than 110% (the permit allows up to 110%); and b) there are no more than 10 intervals in the range 101%-110% which would imply an excess over 10% of the length of the curve (the permit allows less than 10% of excesses measured as 101-110%).

Consequently, the design passes the hydromodification test.

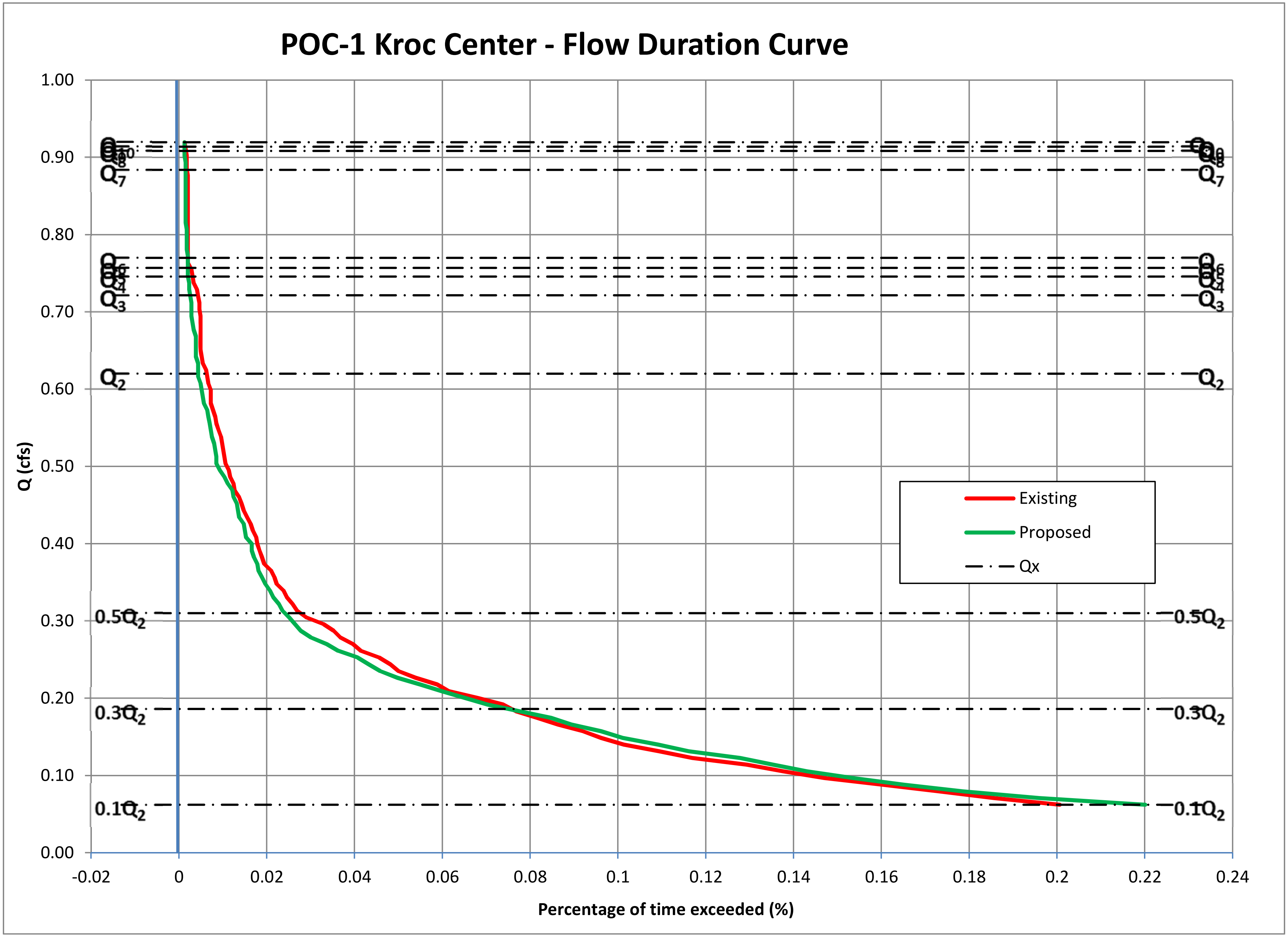
It is important to note that the flow duration curve can be expressed in the "x" axis as percentage of time, hours per year, total number of hours, or any other similar time variable. As those variables only differ by a multiplying constant, their plot in logarithmic scale is going to look exactly the same, and compliance can be observed regardless of the variable selected. However, in order to satisfy the City of San Diego HMP example, % of time exceeded is the variable of choice in the flow duration curve. The selection of a logarithmic scale in lieu of the normal scale is preferred, as differences between the pre-development and post-development curves can be seen more clearly in the entire range of analysis. Both graphics are presented just to prove the difference.

In terms of the "y" axis, the peak flow value is the variable of choice. As an additional analysis performed by REC, not only the range of analysis is clearly depicted (10% of Q_2 to Q_{10}) but also all intermediate flows are shown (Q_2, Q_3, Q_4, Q_5, Q_6, Q_7, Q_8 and Q_9) in order to demonstrate compliance at any range $Q_x – Q_{x+1}$. It must be pointed out that one of the limitations of both the SWMM and SDHM models is that the intermediate analysis is not performed (to obtain Q_i from i = 2 to 10). REC performed the analysis using the Cunnane Plotting position Method (the preferred method in the HMP permit) from the "n" largest independent peak flows obtained from the continuous time series.

The largest "n" peak flows are attached in this appendix, as well as the values of Q_i with a return period "i", from i=2 to 10. The Q_i values are also added into the flow-duration plot.



POC-1 Kroc Center - Flow Duration Curve



POC-1 Kroc Center - Flow Duration Curve

Flow Duration Curve Data for Kroc Center, San Diego, CA

Q2 =	0.620	cfs	Fraction	10	%
Q10 =	0.92	cfs			
Step =	0.0087	cfs			
Count =	385703	hours			
	44.00	years			

	Existing Condition			Detention Optimized			Pass or Fail?
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
1	0.062	774	2.01E-01	849	2.20E-01	110%	Pass
2	0.071	716	1.86E-01	756	1.96E-01	106%	Pass
3	0.079	668	1.73E-01	689	1.79E-01	103%	Pass
4	0.088	618	1.60E-01	637	1.65E-01	103%	Pass
5	0.097	567	1.47E-01	592	1.53E-01	104%	Pass
6	0.105	531	1.38E-01	552	1.43E-01	104%	Pass
7	0.114	499	1.29E-01	522	1.35E-01	105%	Pass
8	0.123	451	1.17E-01	493	1.28E-01	109%	Pass
9	0.131	422	1.09E-01	448	1.16E-01	106%	Pass
10	0.140	391	1.01E-01	421	1.09E-01	108%	Pass
11	0.149	371	9.62E-02	390	1.01E-01	105%	Pass
12	0.157	355	9.20E-02	371	9.62E-02	105%	Pass
13	0.166	333	8.63E-02	345	8.94E-02	104%	Pass
14	0.175	315	8.17E-02	327	8.48E-02	104%	Pass
15	0.183	296	7.67E-02	299	7.75E-02	101%	Pass
16	0.192	285	7.39E-02	271	7.03E-02	95%	Pass
17	0.201	262	6.79E-02	251	6.51E-02	96%	Pass
18	0.209	237	6.14E-02	231	5.99E-02	97%	Pass
19	0.218	227	5.89E-02	212	5.50E-02	93%	Pass
20	0.227	208	5.39E-02	192	4.98E-02	92%	Pass
21	0.235	193	5.00E-02	177	4.59E-02	92%	Pass
22	0.244	186	4.82E-02	167	4.33E-02	90%	Pass
23	0.253	176	4.56E-02	157	4.07E-02	89%	Pass
24	0.261	160	4.15E-02	140	3.63E-02	88%	Pass
25	0.270	153	3.97E-02	130	3.37E-02	85%	Pass
26	0.279	142	3.68E-02	116	3.01E-02	82%	Pass
27	0.287	136	3.53E-02	107	2.77E-02	79%	Pass
28	0.296	127	3.29E-02	102	2.64E-02	80%	Pass
29	0.305	112	2.90E-02	97	2.51E-02	87%	Pass
30	0.313	104	2.70E-02	91	2.36E-02	88%	Pass
31	0.322	100	2.59E-02	88	2.28E-02	88%	Pass
32	0.331	95	2.46E-02	83	2.15E-02	87%	Pass
33	0.339	92	2.39E-02	80	2.07E-02	87%	Pass
34	0.348	86	2.23E-02	76	1.97E-02	88%	Pass
35	0.356	84	2.18E-02	73	1.89E-02	87%	Pass
36	0.365	81	2.10E-02	70	1.81E-02	86%	Pass

	Existing Condition			Detention Optimized			Pass or Fail?
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
37	0.374	75	1.94E-02	69	1.79E-02	92%	Pass
38	0.382	73	1.89E-02	66	1.71E-02	90%	Pass
39	0.391	71	1.84E-02	64	1.66E-02	90%	Pass
40	0.400	69	1.79E-02	64	1.66E-02	93%	Pass
41	0.408	68	1.76E-02	59	1.53E-02	87%	Pass
42	0.417	65	1.69E-02	58	1.50E-02	89%	Pass
43	0.426	63	1.63E-02	57	1.48E-02	90%	Pass
44	0.434	60	1.56E-02	53	1.37E-02	88%	Pass
45	0.443	57	1.48E-02	52	1.35E-02	91%	Pass
46	0.452	55	1.43E-02	51	1.32E-02	93%	Pass
47	0.460	53	1.37E-02	48	1.24E-02	91%	Pass
48	0.469	49	1.27E-02	47	1.22E-02	96%	Pass
49	0.478	48	1.24E-02	43	1.11E-02	90%	Pass
50	0.486	45	1.17E-02	40	1.04E-02	89%	Pass
51	0.495	44	1.14E-02	36	9.33E-03	82%	Pass
52	0.504	41	1.06E-02	33	8.56E-03	80%	Pass
53	0.512	40	1.04E-02	33	8.56E-03	83%	Pass
54	0.521	39	1.01E-02	32	8.30E-03	82%	Pass
55	0.530	38	9.85E-03	31	8.04E-03	82%	Pass
56	0.538	37	9.59E-03	29	7.52E-03	78%	Pass
57	0.547	35	9.07E-03	28	7.26E-03	80%	Pass
58	0.556	33	8.56E-03	27	7.00E-03	82%	Pass
59	0.564	32	8.30E-03	26	6.74E-03	81%	Pass
60	0.573	30	7.78E-03	25	6.48E-03	83%	Pass
61	0.582	28	7.26E-03	22	5.70E-03	79%	Pass
62	0.590	28	7.26E-03	21	5.44E-03	75%	Pass
63	0.599	28	7.26E-03	20	5.19E-03	71%	Pass
64	0.608	26	6.74E-03	19	4.93E-03	73%	Pass
65	0.616	25	6.48E-03	17	4.41E-03	68%	Pass
66	0.625	24	6.22E-03	17	4.41E-03	71%	Pass
67	0.634	21	5.44E-03	17	4.41E-03	81%	Pass
68	0.642	20	5.19E-03	15	3.89E-03	75%	Pass
69	0.651	19	4.93E-03	15	3.89E-03	79%	Pass
70	0.660	19	4.93E-03	15	3.89E-03	79%	Pass
71	0.668	19	4.93E-03	15	3.89E-03	79%	Pass
72	0.677	19	4.93E-03	13	3.37E-03	68%	Pass
73	0.686	19	4.93E-03	12	3.11E-03	63%	Pass
74	0.694	19	4.93E-03	11	2.85E-03	58%	Pass
75	0.703	18	4.67E-03	11	2.85E-03	61%	Pass
76	0.712	18	4.67E-03	11	2.85E-03	61%	Pass
77	0.720	17	4.41E-03	10	2.59E-03	59%	Pass
78	0.729	16	4.15E-03	9	2.33E-03	56%	Pass
79	0.738	13	3.37E-03	9	2.33E-03	69%	Pass
80	0.746	12	3.11E-03	8	2.07E-03	67%	Pass
81	0.755	11	2.85E-03	8	2.07E-03	73%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
82	0.764	8	2.07E-03	8	2.07E-03	100%	Pass
83	0.772	8	2.07E-03	8	2.07E-03	100%	Pass
84	0.781	8	2.07E-03	7	1.81E-03	88%	Pass
85	0.790	8	2.07E-03	7	1.81E-03	88%	Pass
86	0.798	8	2.07E-03	7	1.81E-03	88%	Pass
87	0.807	8	2.07E-03	7	1.81E-03	88%	Pass
88	0.816	8	2.07E-03	6	1.56E-03	75%	Pass
89	0.824	8	2.07E-03	6	1.56E-03	75%	Pass
90	0.833	8	2.07E-03	6	1.56E-03	75%	Pass
91	0.842	8	2.07E-03	6	1.56E-03	75%	Pass
92	0.850	8	2.07E-03	6	1.56E-03	75%	Pass
93	0.859	8	2.07E-03	6	1.56E-03	75%	Pass
94	0.868	8	2.07E-03	6	1.56E-03	75%	Pass
95	0.876	8	2.07E-03	6	1.56E-03	75%	Pass
96	0.885	7	1.81E-03	6	1.56E-03	86%	Pass
97	0.894	7	1.81E-03	6	1.56E-03	86%	Pass
98	0.902	7	1.81E-03	5	1.30E-03	71%	Pass
99	0.911	6	1.56E-03	5	1.30E-03	83%	Pass
100	0.919	5	1.30E-03	5	1.30E-03	100%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period (years)	Pre-dev. Q (cfs)	Post-Dev. Q (cfs)	Reduction (cfs)
10	0.919	0.903	0.017
9	0.914	0.857	0.057
8	0.908	0.807	0.101
7	0.884	0.781	0.103
6	0.770	0.743	0.027
5	0.757	0.706	0.051
4	0.746	0.678	0.068
3	0.722	0.626	0.096
2	0.620	0.554	0.066

ATTACHMENT 3

List of the “n” Largest Peaks: Pre & Post-Developed Conditions

Basic Probabilistic Equation:

R = 1/P R: Return period (years).

P: Probability of a flow to be equaled or exceeded any given year (dimensionless).

Cunnane Equation:

$$P = \frac{i - 0.4}{n + 0.2}$$

Weibull Equation:

$$P = \frac{i}{n + 1}$$

i: Position of the peak whose probability is desired (sorted from large to small)

n: number of years analyzed.

Explanation of Variables for the Tables in this Attachment

Peak: Refers to the peak flow at the date given, taken from the continuous simulation hourly results of the n year analyzed.

Posit: If all peaks are sorted from large to small, the position of the peak in a sorting analysis is included under the variable Posit.

Date: Date of the occurrence of the peak at the outlet from the continuous simulation

Note: all peaks are not annual maxima; instead they are defined as event maxima, with a threshold to separate peaks of at least 12 hours. In other words, any peak P in a time series is defined as a value where dP/dt = 0, and the peak is the largest value in 25 hours (12 hours before, the hour of occurrence and 12 hours after the occurrence, so it is in essence a daily peak).

List of Peak events and Determination of P2 and P10 (Pre-Development)
Kroc Center POC 1 - San Diego, CA

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**0.92**	**0.93**
9	**0.91**	**0.92**
8	**0.91**	**0.91**
7	**0.88**	**0.89**
6	**0.77**	**0.80**
5	**0.76**	**0.76**
4	**0.75**	**0.75**
3	**0.72**	**0.72**
2	**0.62**	**0.62**

Note:
Cunnane is the preferred
method by the HMP permit.

Peaks (cfs)			Period of Return (Years)	
	Date	Posit	Weibull	Cunnane
0.462	1/16/1978	45	1.02	1.01
0.463	3/2/1983	44	1.05	1.04
0.473	10/28/1974	43	1.07	1.06
0.48	1/27/1983	42	1.10	1.09
0.485	2/6/1992	41	1.12	1.11
0.486	2/19/1980	40	1.15	1.14
0.492	1/6/1979	39	1.18	1.17
0.497	2/8/1976	38	1.21	1.20
0.502	1/8/1974	37	1.24	1.23
0.507	1/31/1979	36	1.28	1.27
0.514	2/21/2000	35	1.31	1.31
0.527	1/15/1997	34	1.35	1.35
0.541	1/9/2005	33	1.39	1.39
0.545	2/6/1976	32	1.44	1.43
0.555	3/17/1982	31	1.48	1.48
0.558	3/11/1995	30	1.53	1.53
0.572	1/31/1993	29	1.59	1.58
0.573	3/17/1979	28	1.64	1.64
0.574	2/11/2003	27	1.70	1.70
0.579	3/8/1968	26	1.77	1.77
0.601	3/2/1992	25	1.84	1.84
0.607	12/18/1978	24	1.92	1.92
0.62	12/23/1995	23	2.00	2.00
0.626	2/14/1995	22	2.09	2.09
0.629	12/5/1966	21	2.19	2.19
0.633	3/1/1981	20	2.30	2.31
0.639	12/6/1966	19	2.42	2.43
0.647	3/20/1983	18	2.56	2.57
0.702	5/8/1977	17	2.71	2.72
0.718	2/11/1973	16	2.88	2.90
0.725	10/27/2004	15	3.07	3.10
0.731	1/18/1993	14	3.29	3.32
0.733	1/10/1978	13	3.54	3.59
0.744	2/6/1969	12	3.83	3.90
0.75	2/13/1973	11	4.18	4.26
0.757	11/5/1987	10	4.60	4.71
0.757	2/24/2003	9	5.11	5.26
0.763	3/1/1983	8	5.75	5.95
0.88	1/4/1978	7	6.57	6.85
0.91	1/14/1969	6	7.67	8.07
0.917	1/25/1995	5	9.20	9.83
0.956	11/13/1998	4	11.50	12.56
1.034	11/13/1972	3	15.33	17.38
1.066	2/28/1970	2	23.00	28.25
1.685	12/4/1974	1	46.00	75.33

List of Peak events and Determination of P2 and P10 (Post-Development)
Kroc Center POC 1 - San Diego, CA

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**0.90**	**0.92**
9	**0.86**	**0.89**
8	**0.81**	**0.83**
7	**0.78**	**0.79**
6	**0.74**	**0.75**
5	**0.71**	**0.71**
4	**0.68**	**0.68**
3	**0.63**	**0.63**
2	**0.55**	**0.55**

Note:
Cunnane is the preferred
method by the HMP permit.

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
0.433	11/21/1967	45	1.02	1.01
0.442	11/16/1965	44	1.05	1.04
0.446	3/2/1983	43	1.07	1.06
0.452	1/3/1977	42	1.10	1.09
0.457	11/22/1965	41	1.12	1.11
0.46	1/18/1993	40	1.15	1.14
0.473	2/21/2005	39	1.18	1.17
0.474	2/19/2007	38	1.21	1.20
0.478	2/8/1993	37	1.24	1.23
0.479	1/29/1980	36	1.28	1.27
0.482	3/11/1995	35	1.31	1.31
0.49	12/30/1976	34	1.35	1.35
0.494	12/19/1970	33	1.39	1.39
0.495	1/16/1978	32	1.44	1.43
0.496	1/20/1982	31	1.48	1.48
0.499	2/13/1973	30	1.53	1.53
0.501	2/21/2000	29	1.59	1.58
0.518	3/1/1983	28	1.64	1.64
0.525	2/6/1969	27	1.70	1.70
0.535	1/8/1974	26	1.77	1.77
0.537	10/10/1966	25	1.84	1.84
0.547	1/9/2005	24	1.92	1.92
0.554	12/18/1978	23	2.00	2.00
0.556	1/6/1979	22	2.09	2.09
0.565	1/31/1979	21	2.19	2.19
0.576	4/13/2003	20	2.30	2.31
0.577	3/17/1982	19	2.42	2.43
0.592	3/8/1968	18	2.56	2.57
0.613	2/6/1976	17	2.71	2.72
0.613	2/6/1992	16	2.88	2.90
0.638	3/1/1981	15	3.07	3.10
0.641	2/11/2003	14	3.29	3.32
0.675	12/5/1966	13	3.54	3.59
0.675	12/6/1966	12	3.83	3.90
0.685	3/2/1992	11	4.18	4.26
0.688	1/4/1978	10	4.60	4.71
0.721	2/14/1995	9	5.11	5.26
0.741	11/13/1998	8	5.75	5.95
0.777	5/8/1977	7	6.57	6.85
0.809	2/24/2003	6	7.67	8.07
0.899	1/25/1995	5	9.20	9.83
0.957	11/13/1972	4	11.50	12.56
0.979	1/14/1969	3	15.33	17.38
1.172	2/28/1970	2	23.00	28.25
1.85	12/4/1974	1	46.00	75.33

ATTACHMENT 4

AREA VS ELEVATION

A stage-storage relationship is provided within this Module, It should be noted that basin comprises of vertical walls, as such the area vs elevation is a constant with only depth increasing.

DISCHARGE VS ELEVATION

The orifices have been selected to maximize their size while still restricting flows to conform with the required 10% of the Q2 event flow as mandated in the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011. While REC acknowledges that these orifices are small, to increase the size of these outlets would impact the basin's ability to restrict flows beneath the HMP thresholds, thus preventing the BMP from conformance with HMP requirements.

In order to further reduce the risk of blockage of the orifices, regular maintenance of the riser and orifices must be performed to ensure potential blockages are minimized. A detail of the orifice and riser structure is provided in Attachment 5 of this memorandum.

A stage-discharge relationship is provided on the following pages for the surface outlet structure. The LID low flow orifice discharge relationship is addressed within the LID Module within SWMM – please refer to Attachment 7 for further information.

DRAWDOWN CALCULATIONS

Drawdown calculations are provided in the project specific SWQMP. Please refer to this aforementioned document for further information.

DISCHARGE EQUATIONS

1) Weir:

$Q_W = C_W \cdot L \cdot H^{3/2}$ (1)

2) Slot:

As an orifice: $Q_s = B_s \cdot h_s \cdot c_g \cdot \sqrt{2g\left(H - \frac{h_s}{2}\right)}$ (2.a)

As a weir: $Q_s = C_W \cdot B_s \cdot H^{3/2}$ (2.b)

For H > h_s slot works as weir until orifice equation provides a smaller discharge. The elevation such that equation (2.a) = equation (2.b) is the elevation at which the behavior changes from weir to orifice.

3) Vertical Orifices

As an orifice: $Q_o = 0.25 \cdot \pi D^2 \cdot c_g \cdot \sqrt{2g\left(H - \frac{D}{2}\right)}$ (3.a)

As a weir: Critical depth and geometric family of circular sector must be solved to determined Q as a function of H:

$$\frac{Q_O^2}{g} = \frac{A_{cr}^3}{T_{cr}}; \quad H = y_{cr} + \frac{A_{cr}}{2 \cdot T_{cr}}; \; T_{cr} = 2\sqrt{y_{cr}(D - y_{cr})}\,; \quad A_{cr} = \frac{D^2}{8}[\alpha_{cr} - sin(\alpha_{cr})]\,;$$

$y_{cr} = \frac{D}{2}[1 - sin(0.5 \cdot \alpha_{cr})]$ (3.b.1, 3.b.2, 3.b.3, 3.b.4 and 3.b.5)

There is a value of H (approximately H = 110% D) from which orifices no longer work as weirs as critical depth is not possible at the entrance of the orifice. This value of H is obtained equaling the discharge using critical equations and equations (3.b).

A mathematical model is prepared with the previous equations depending on the type o discharge.

The following are the variables used above:

Q_W, Q_s, Q_O = Discharge of weir, slot or orifice (cfs)

C_W, c_g : Coefficients of discharge of weir (typically 3.1) and orifice (0.61 to 0.62)

L, B_s, D, h_s : Length of weir, width of slot, diameter of orifice and height of slot, respectively; (ft)

H: Level of water in the pond over the invert of slot, weir or orifice (ft)

A_{cr}, T_{cr}, y_{cr}, α_{cr}: Critical variables for circular sector: area (sq-ft), top width (ft), critical depth (ft), and angle to the center, respectively.

Outlet structure for Underground Detention System

Discharge vs Elevation Table

Low orifice: 0.675 "
Number: 2
Cg-low: 0.61
Middle orifice: 1 "
number of orif: 0
Cg-middle: 0.61
invert elev: 0.25 ft

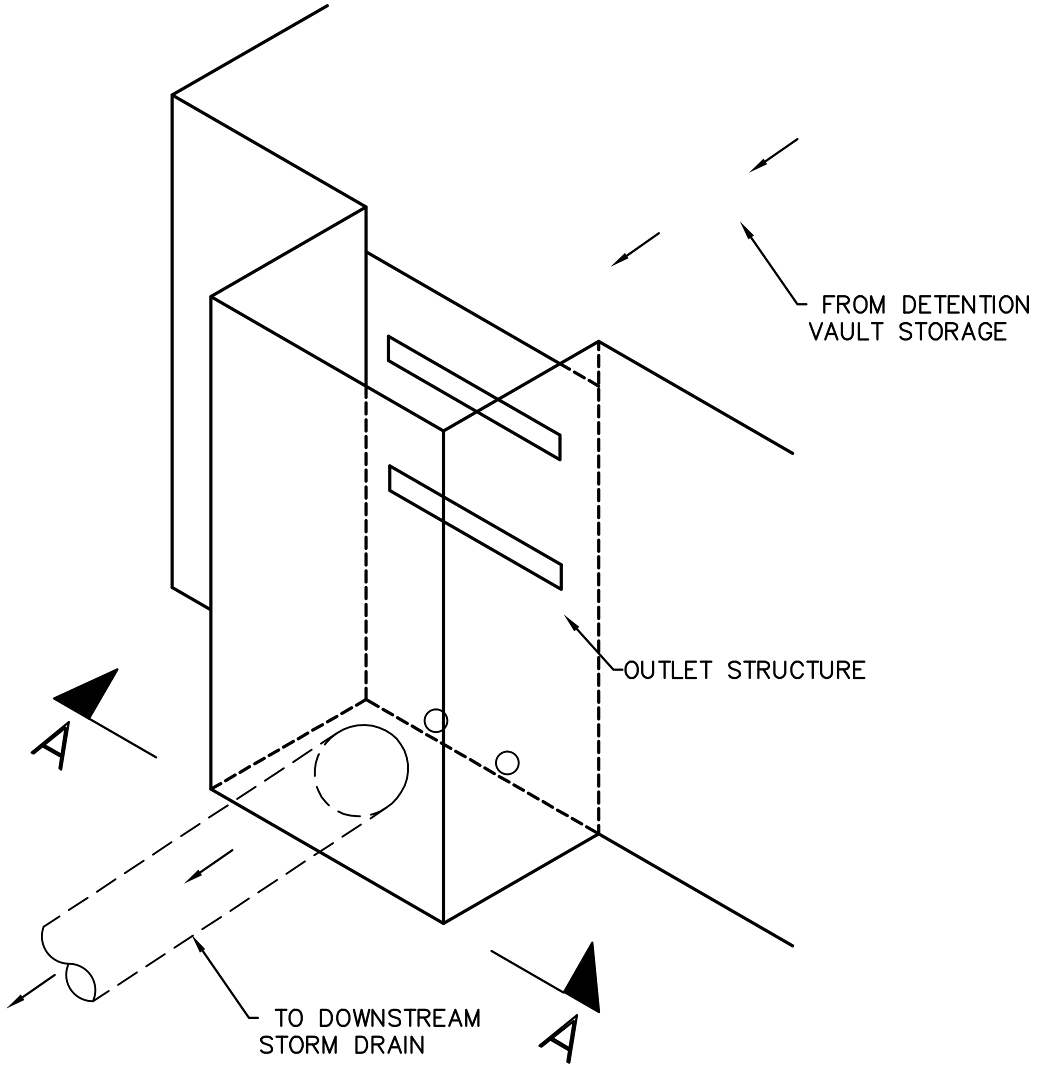
Lower slot
Invert: 2.250 ft
B 0.75 ft
h 0.083 ft
Upper slot
Invert: 2.750 ft
B: 1.667 ft
h 0.083 ft

Emergency Weir
Invert: 3.500 ft
B: 3 ft

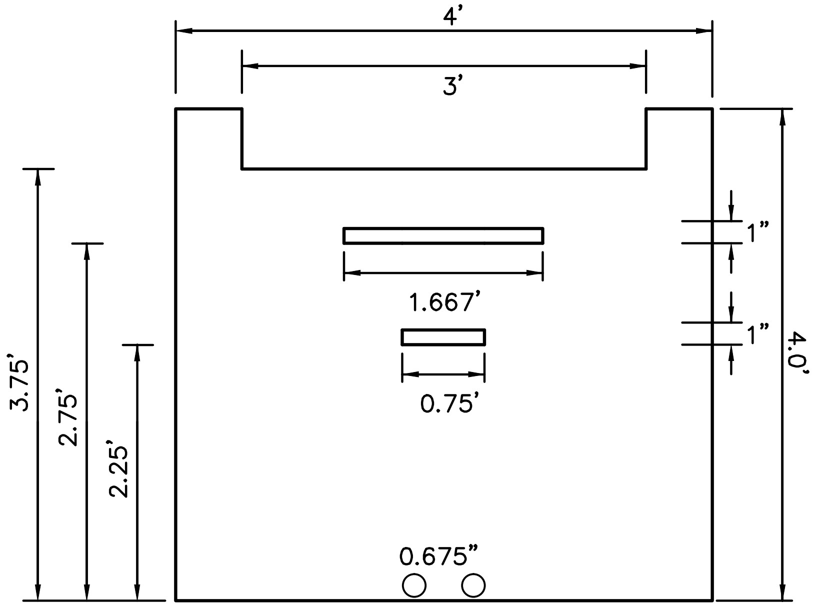
h (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qemer (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.100	1.778	0.000	0.007	0.008	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.200	3.556	0.000	0.010	0.012	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.010
0.300	5.333	0.600	0.013	0.113	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.400	7.111	1.800	0.015	0.148	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.015
0.500	8.889	3.000	0.017	0.167	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.017
0.600	10.667	4.200	0.018	0.184	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.018
0.700	12.444	5.400	0.020	0.199	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.020
0.800	14.222	6.600	0.021	0.214	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.900	16.000	7.800	0.023	0.227	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.023
1.000	17.778	9.000	0.024	0.240	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.024
1.100	19.556	10.200	0.025	0.252	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.025
1.200	21.333	11.400	0.026	0.263	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.026
1.300	23.111	12.600	0.027	0.274	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.027
1.400	24.889	13.800	0.028	0.285	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.028
1.500	26.667	15.000	0.030	0.295	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.030
1.600	28.444	16.200	0.031	0.305	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.031
1.700	30.222	17.400	0.031	0.315	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.031
1.800	32.000	18.600	0.032	0.324	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.032
1.900	33.778	19.800	0.033	0.333	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.033
2.000	35.556	21.000	0.034	0.342	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.034
2.100	37.333	22.200	0.035	0.350	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.035
2.200	39.111	23.400	0.036	0.359	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.036
2.300	40.889	24.600	0.037	0.367	0.037	0.000	0.000	0.000	0.026	0.000	0.000	0.063
2.400	42.667	25.800	0.037	0.375	0.037	0.000	0.000	0.000	0.101	0.000	0.000	0.138
2.500	44.444	27.000	0.038	0.383	0.038	0.000	0.000	0.000	0.140	0.000	0.000	0.178
2.600	46.222	28.200	0.039	0.390	0.039	0.000	0.000	0.000	0.170	0.000	0.000	0.209
2.700	48.000	29.400	0.040	0.398	0.040	0.000	0.000	0.000	0.196	0.000	0.000	0.235
2.800	49.778	30.600	0.041	0.405	0.041	0.000	0.000	0.000	0.218	0.058	0.000	0.316
2.900	51.556	31.800	0.041	0.412	0.041	0.000	0.000	0.000	0.239	0.224	0.000	0.504
3.000	53.333	33.000	0.042	0.419	0.042	0.000	0.000	0.000	0.257	0.310	0.000	0.610
3.100	55.111	34.200	0.043	0.426	0.043	0.000	0.000	0.000	0.275	0.378	0.000	0.695
3.200	56.889	35.400	0.043	0.433	0.043	0.000	0.000	0.000	0.292	0.434	0.000	0.769
3.300	58.667	36.600	0.044	0.440	0.044	0.000	0.000	0.000	0.307	0.485	0.000	0.836
3.400	60.444	37.800	0.045	0.447	0.045	0.000	0.000	0.000	0.322	0.530	0.000	0.897
3.500	62.222	39.000	0.045	0.453	0.045	0.000	0.000	0.000	0.336	0.572	0.000	0.954
3.600	64.000	40.200	0.046	0.460	0.046	0.000	0.000	0.000	0.350	0.611	0.294	1.301
3.700	65.778	41.400	0.047	0.466	0.047	0.000	0.000	0.000	0.363	0.648	0.832	1.890
3.800	67.556	42.600	0.047	0.473	0.047	0.000	0.000	0.000	0.376	0.683	1.528	2.634
3.900	69.333	43.800	0.048	0.479	0.048	0.000	0.000	0.000	0.388	0.716	2.353	3.504
4.000	71.111	45.000	0.048	0.485	0.048	0.000	0.000	0.000	0.400	0.747	3.288	4.484

ATTACHMENT 5

Pre & Post-Developed Maps, Project Plan and Detention Section Sketches



BASIN 1
(N.T.S.)



SECTION A–A
(N.T.S.)

R·E·C
Consultants, Inc.

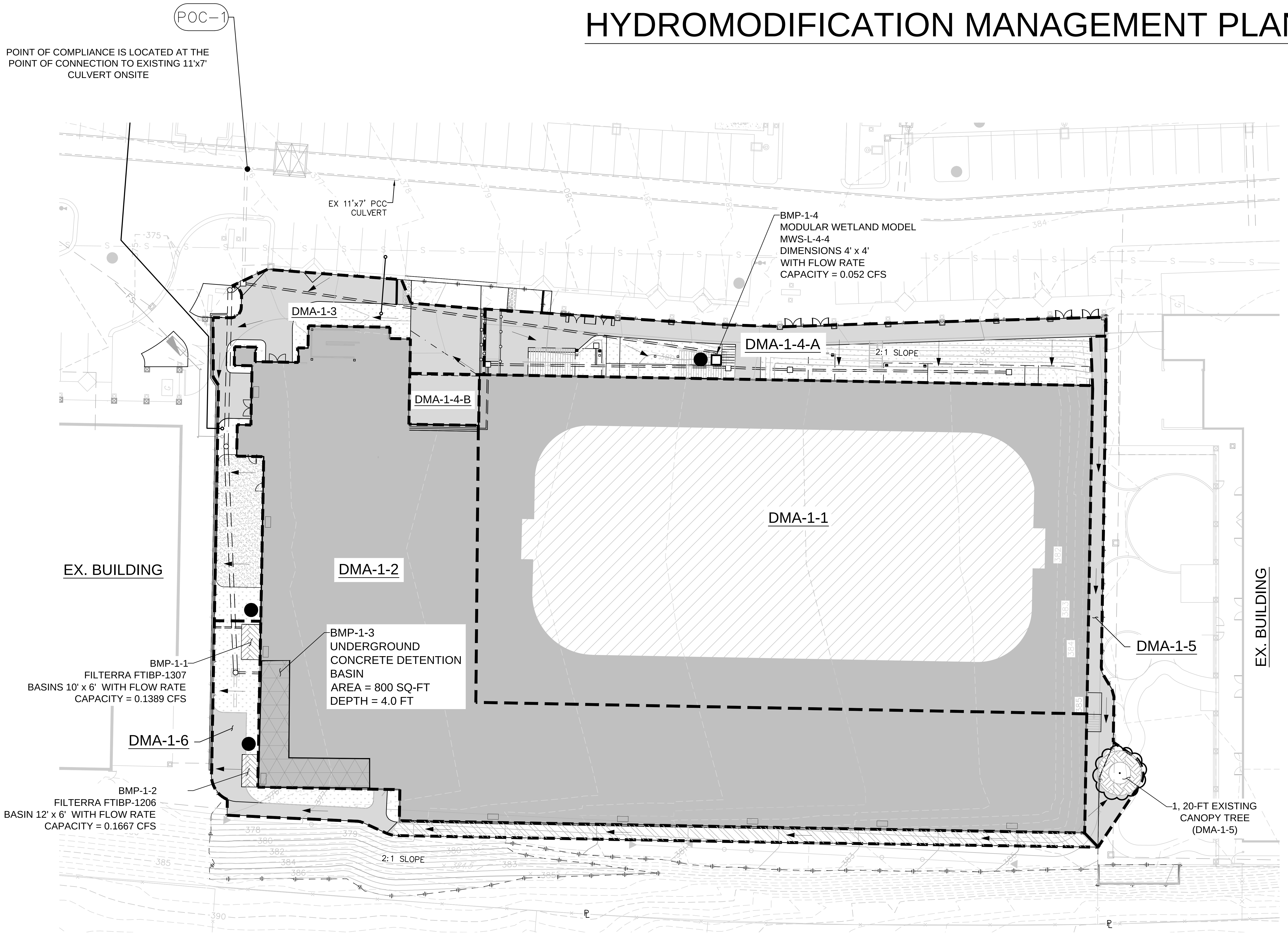
Civil Engineering Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

BASIN 1 DETAIL

NTS

SAVE DATE: 4/18/2017 ~ PLOT DATE: 4/18/2017 ~ FILE NAME: P:\Acad\7001 JRoberts-KARN\7001.8 Sanyo Ave in Otay Mesa\Drawings\BMP structure sections.dwg

HYDROMODIFICATION MANAGEMENT PLAN EXHIBIT



NOTES:

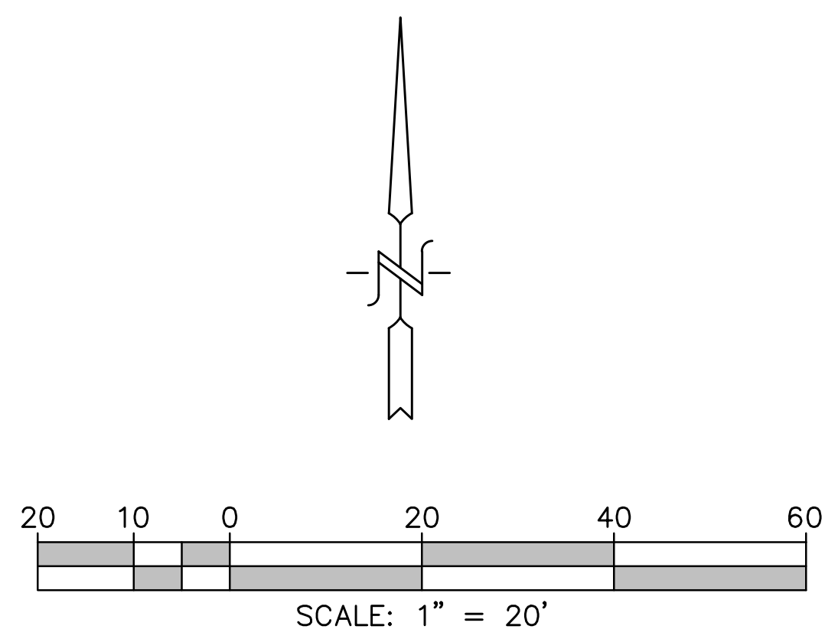
1. NO EXISTING NATURAL HYDROLOGIC FEATURES (WATERCOURSES, SEEPS, SPRINGS, WETLANDS). DEVELOPMENT PROPOSED ON EXISTING GRADED LOT.

2. NO CRITICAL COURSE SEDIMENT YIELD AREAS PRESENT WITHIN PROJECT LIMITS.

3. DEPTH OF GROUNDWATER > 6 FT
4. UNDERLYING SOIL GROUP "D"

SAMPLE PROHIBITIVE SIGNAGE

NTS



LEGEND

DESCRIPTION	SYMBOL
PROPERTY LINE	℄
DMA BOUNDARY	
PROPOSED CONTOUR	630
EXISTING CONTOUR	630
DAYLIGHT	
RAISED PLANTAR BOX (FILTERRA UNIT)	▨
DRAINAGE VAULT	▨
MODULAR WETLAND	□
15' CANOPY TREE WELL	○
TREE WELL AMENDED SOIL	◎
IMPERVIOUS AREA	▭
PROPOSED BUILDING (IMPERVIOUS)	▬
ARTIFICIAL TURF (PERVIOUS)	▨
PERVIOUS LANDSCAPE AREA	▭
DECOMPOSED GRANITE AREA (PERMEABLE)	▒
PROPOSED PERVIOUS CONCRETE	▨

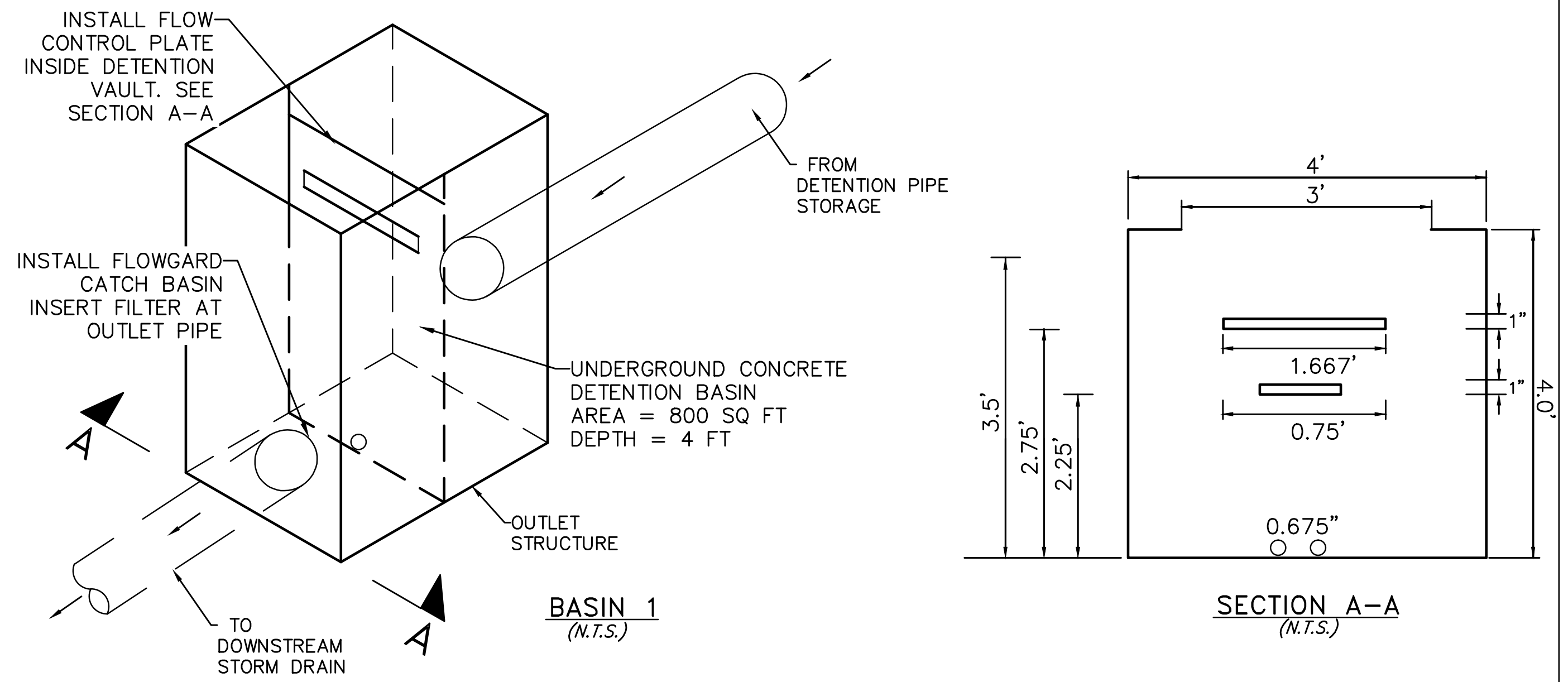
TREE WELL SIZING

TREE WELL SUMMARY				
DMA	DCV (CU-FT)	TREE CREDITS (CU-FT)	FINAL DCV (CU-FT)	PROPOSED TREE WELL
1-5	108	180	-72	1, 20-FT CANOPY TREE

DMA	TREE CANOPY DIAMETER (FT)	TREE WELL AMMENDED SOIL SPECIFICATIONS			
		REQUIRED VOLUME (CU-FT)	PROPOSED SOIL DEPTH (FT)	AREA (SQ-FT)	PROPOSED SOIL DIAMETER (FT)
1-5	20	628.3	3	209.4	16.5

DMA AREAS

PROPOSED CONDITIONS DMA AREAS								
DMA	SUB-AREA	IMPERVIOUS (AC)	PERVIOUS (AC)	ARTIFICIAL TURF (AC)	PROPOSED DG SURFACE (AC)	TOTAL AREA (AC)	DRAINS TO	POC
1	1-1	0.28	0.00	0.35	0.00	0.63	BMP-1-1	POC-1
	1-2	0.53	0.00	0.00	0.00	0.53	BMP-1-2	
	1-3	0.05	0.02	0.00	0.02	0.09	BMP-1-1	
	1-4-A	0.05	0.06	0.00	0.00	0.12	BMP-1-4	
	1-4-B	0.01	0.00	0.00	0.00	0.01		
	1-5	0.03	0.01	0.00	0.00	0.03	BMP-1-5 (TREE WELL)	
	1-6	0.02	0.02	0.00	0.03	0.07	BMP-1-2	
TOTAL	0	0.96	0.11	0.35	0.05	1.48	-	



DETENTION VAULT DETAIL

NTS

KENNETH D. SMITH
ARCHITECT
& ASSOCIATES, INC.
500 FESLER ST.   SUITE 102
EL CAJON – CA – 92020
PH / 619 444 2182
Fax / 619 442 2699

DATE: 08-23-2017
JOB NO: 15024
DRAWN BY: RJD
CHECKED BY: Checker

Revision Schedule		
#	Date	Description

ORIGINAL PREPERATION DATE:
7/8/17

REVISION DATE(S):

project:
HMP EXHIBIT
Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

1
SHEET: 1 of 1

R·E·C
Consultants, Inc.
Civil Engineering·Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232–9200 (619)232–9210 Fax

ATTACHMENT 6

SWMM Input Data in Input Format (Existing & Proposed Models)

PRE & POST_DEV

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           09/09/1964
START_TIME           00:00:00
REPORT_START_DATE    09/09/1964
REPORT_START_TIME    00:00:00
END_DATE             09/08/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.06   0.08   0.11   0.16   0.18   0.21   0.21   0.2    0.16   0.12   0.08   0.06
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
KEARNY-MESA      INTENSITY 1:00   1.0    TIMESERIES KEARNY-MESA

[SUBCATCHMENTS]
;;                                                 Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
1D-PRE           KEARNY-MESA      POC-1-PRE        1.3652   0        186      1        0
2D-POST          KEARNY-MESA      BASIN-1          0.5045   100      120      1        0
1D-POST          KEARNY-MESA      BASIN-1          0.6257   43.4     130      1        0
4D               KEARNY-MESA      3N               0.0855   0        17       1        0
5D               KEARNY-MESA      3N               0.0128   92.3     19       1        0
3N               KEARNY-MESA      3W               0.0299   39.5     16       1        0
3W               KEARNY-MESA      POC-1-POST       0.0793   13       173      1        0
3S               KEARNY-MESA      3W               0.0275   52.1     7        1        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
1D-PRE           0.012      0.05       0.05       0.1        25         OUTLET
2D-POST          0.012      0.05       0.05       0.1        25         OUTLET
1D-POST          0.012      0.05       0.05       0.1        25         OUTLET
4D               0.012      0.05       0.05       0.1        25         OUTLET
5D               0.012      0.05       0.05       0.1        25         OUTLET
3N               0.012      0.05       0.05       0.1        25         PERVIOUS   100
3W               0.012      0.05       0.05       0.1        25         PERVIOUS   100
3S               0.012      0.05       0.05       0.1        25         PERVIOUS   100

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
1D-PRE           9          0.01875    0.33
```

```
2D-POST          9          0.01875    0.33
1D-POST          9          0.001      0.33
4D               9          0.01875    0.33
5D               9          0.01875    0.33
3N               9          0.01875    0.33
3W               9          0.01875    0.33
3S               9          0.01875    0.33

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
POC-1-PRE        0          FREE                        NO
POC-1-POST       0          FREE                        NO

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                      Ponded   Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                     Area     Frac.    Infiltration
Parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- -------- -----------------
------
BASIN-1          0        4        0        TABULAR    BASIN-1                    800      0

[OUTLETS]
;;               Inlet            Outlet           Outflow    Outlet          Qcoeff/                     Flap
;;Name           Node             Node             Height     Type            QTable           Qexpon     Gate
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- ----
OUT-1            BASIN-1          POC-1-POST       0          TABULAR/HEAD    OUT-1                       NO

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
OUT-1            Rating     0.000      0.000
OUT-1                       0.100      0.007
OUT-1                       0.200      0.010
OUT-1                       0.300      0.013
OUT-1                       0.400      0.015
OUT-1                       0.500      0.017
OUT-1                       0.600      0.018
OUT-1                       0.700      0.020
OUT-1                       0.800      0.021
OUT-1                       0.900      0.023
OUT-1                       1.000      0.024
OUT-1                       1.100      0.025
OUT-1                       1.200      0.026
OUT-1                       1.300      0.027
OUT-1                       1.400      0.028
OUT-1                       1.500      0.030
OUT-1                       1.600      0.031
OUT-1                       1.700      0.031
OUT-1                       1.800      0.032
OUT-1                       1.900      0.033
OUT-1                       2.000      0.034
OUT-1                       2.100      0.035
OUT-1                       2.200      0.036
OUT-1                       2.300      0.063
OUT-1                       2.400      0.138
OUT-1                       2.500      0.178
OUT-1                       2.600      0.209
OUT-1                       2.700      0.235
OUT-1                       2.800      0.316
OUT-1                       2.900      0.504
OUT-1                       3.000      0.610
OUT-1                       3.100      0.695
OUT-1                       3.200      0.769
OUT-1                       3.300      0.836
OUT-1                       3.400      0.897
OUT-1                       3.500      0.954
OUT-1                       3.600      1.301
OUT-1                       3.700      1.890
OUT-1                       3.800      2.634
```

PRE & POST_DEV

```
OUT-1                       3.900      3.504
OUT-1                       4.000      4.484

BASIN-1          Storage    0          800
BASIN-1                     4          800

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
KEARNY-MESA      FILE "Kearny Mesa.txt"

[REPORT]
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1-PRE        750.000            2900.000
POC-1-POST       3750.000           2900.000
BASIN-1          3750.000           4500.000

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
1D-PRE           750.000            6000.000
1D-PRE           750.000            6000.000
2D-POST          4500.000           6000.000
1D-POST          3000.000           6000.000
4D               6000.000           6000.000
5D               7500.000           6000.000
3N               6000.000           4500.000
3W               6000.000           2900.000
3S               7500.000           2900.000

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
KEARNY-MESA      1525.424           6864.407
```

ATTACHMENT 7

EPA SWMM FIGURES AND EXPLANATIONS

Per the attached, the reader can see the screens associated with the EPA-SWMM Model in both pre-development and post-development conditions. Each portion, i.e., sub-catchments, outfalls, storage units, weir as a discharge, and outfalls (point of compliance), are also shown.

Variables for modeling are associated with typical recommended values by the EPA-SWMM model, typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been attained from the interim Orange County criteria established for their SWMM calibration. Currently, no recommended values have been established by the San Diego County HMP Permit for the SWMM Model.

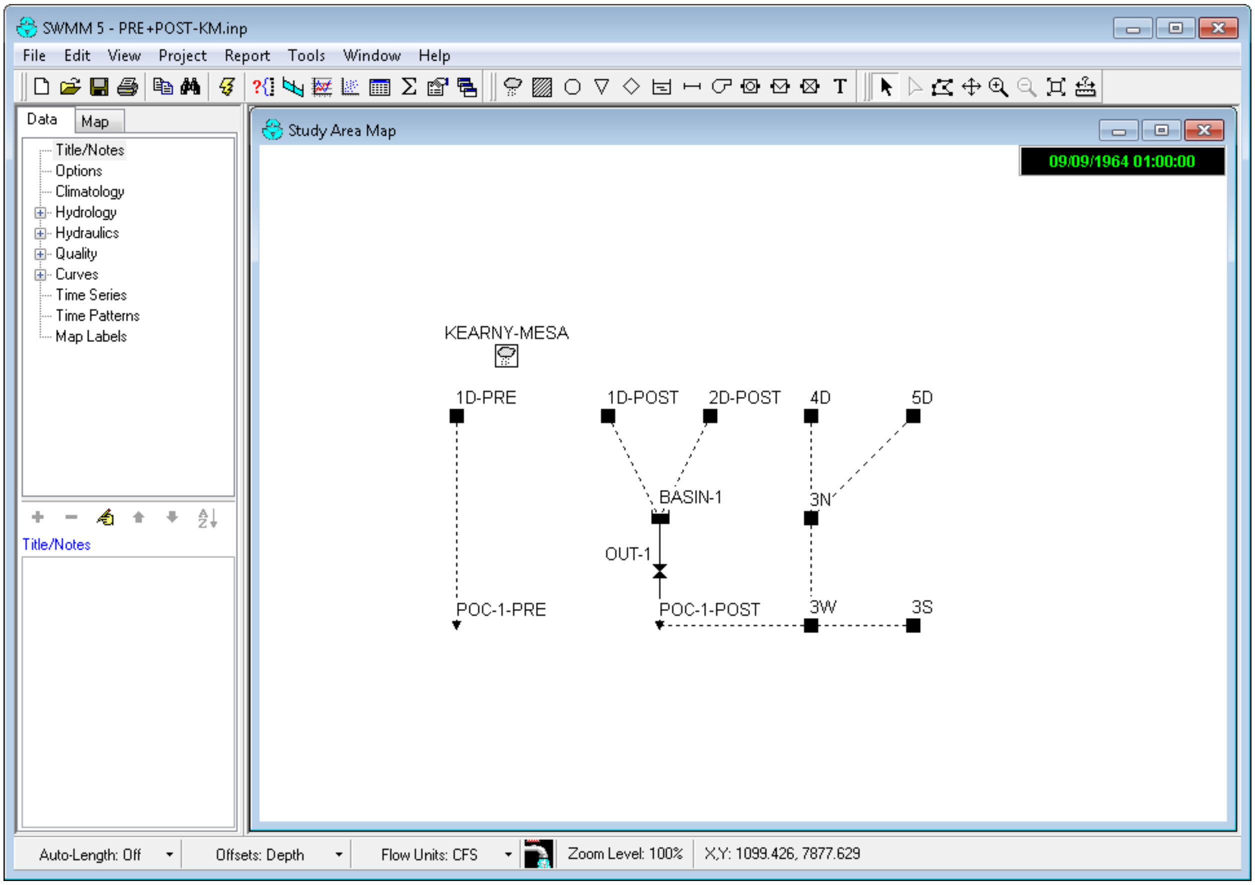
Soil characteristics of the existing soils were determined from the NRCS Web Soil Survey (located in Attachment 8 of this report).

Some values incorporated within the SWMM model have been determined from the professional experience of REC using conservative assumptions that have a tendency to increase the size of the needed BMP and also generate a long-term runoff as a percentage of rainfall similar to those measured in gage stations in Southern California by the USGS.

A Technical document prepared by Tory R Walker Engineering for the Cities of San Marcos, Oceanside and Vista (Reference [1]) can also be consulted for additional information regarding typical values for SWMM parameters.

Manning's roughness coefficients have been based upon the findings of the "*Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region*" date 2016 by TRW Engineering (Reference [6]).

PRE & POST-DEVELOPED CONDITIONS



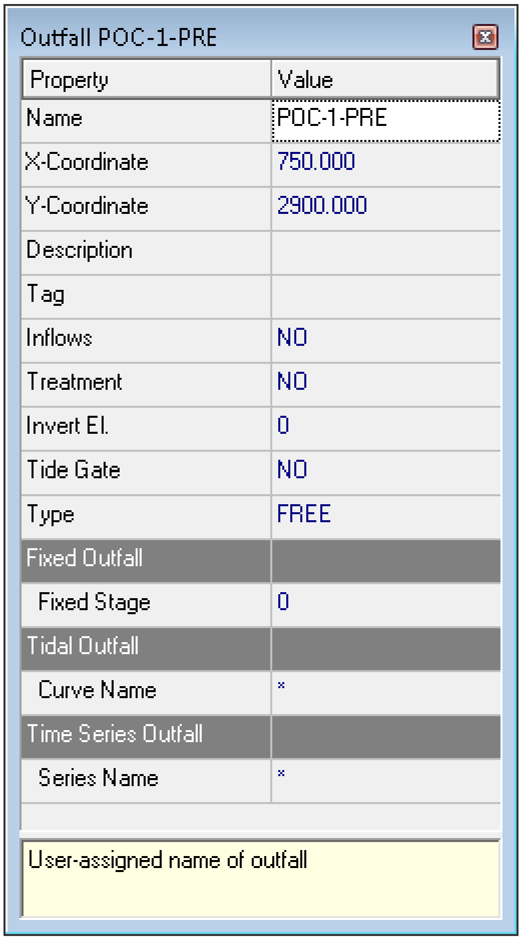
Auto-Length: Off

Offsets: Depth

Flow Units: CFS

Zoom Level: 100%

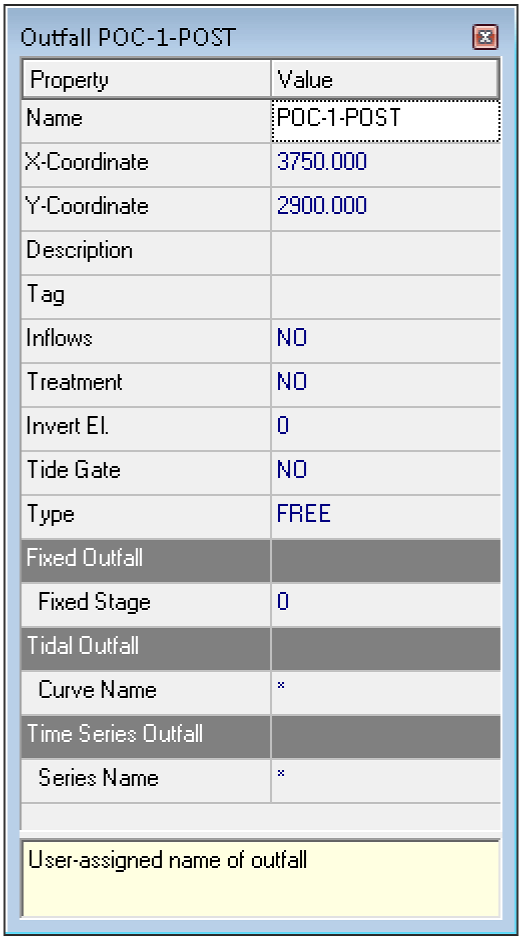
X,Y: 1099.426, 7877.629



Outfall POC-1-PRE

Property	Value
Name	POC-1-PRE
X-Coordinate	750.000
Y-Coordinate	2900.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

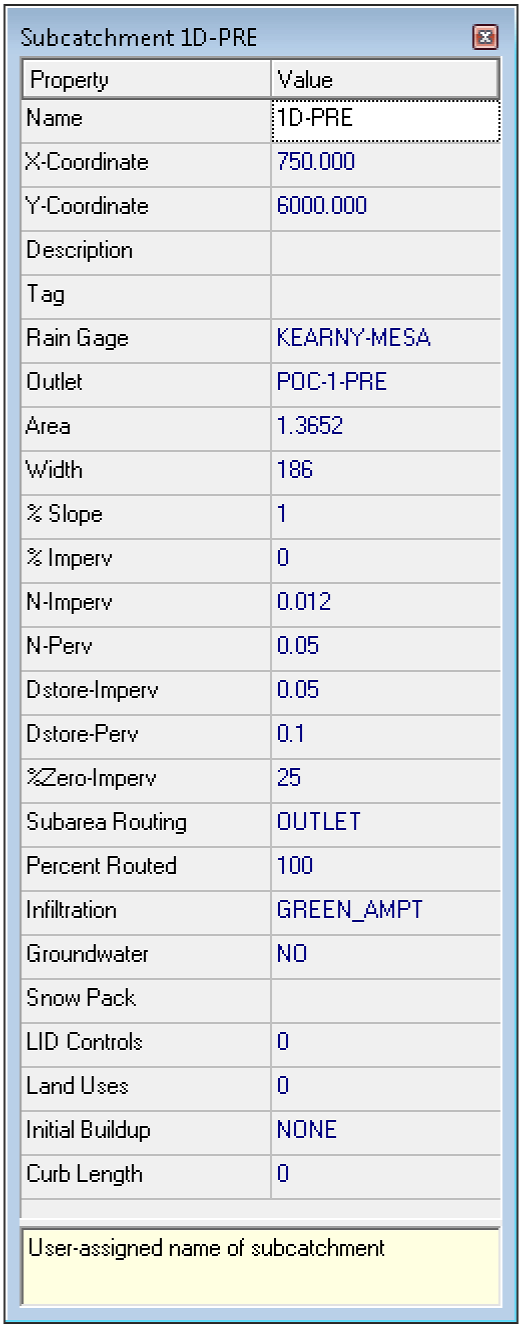
User-assigned name of outfall



Outfall POC-1-POST

Property	Value
Name	POC-1-POST
X-Coordinate	3750.000
Y-Coordinate	2900.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

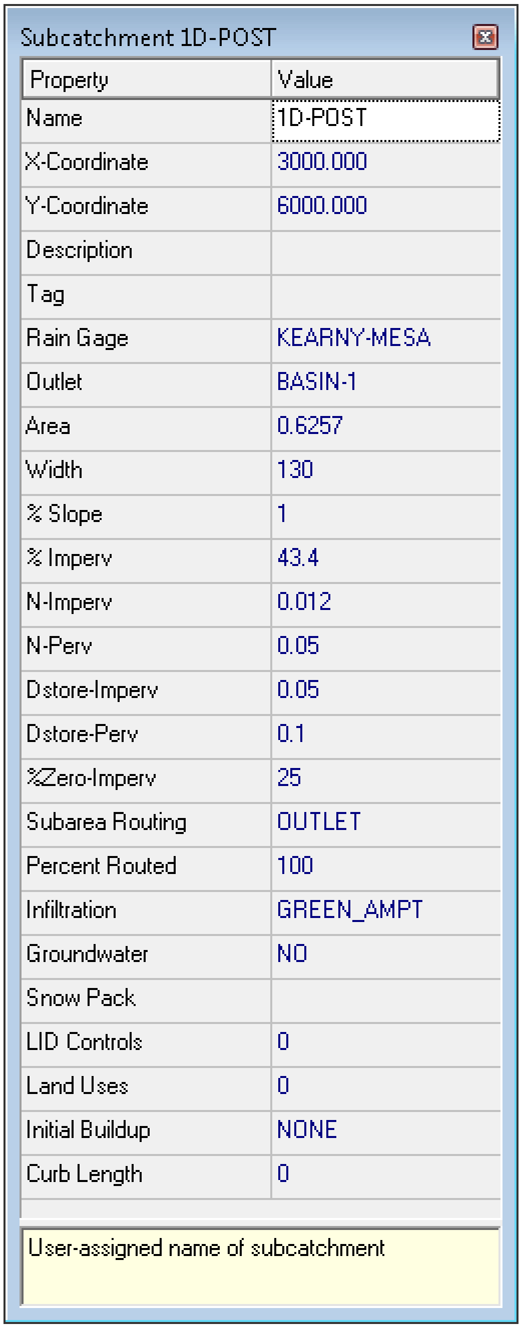
User-assigned name of outfall



Subcatchment 1D-PRE

Property	Value
Name	1D-PRE
X-Coordinate	750.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	POC-1-PRE
Area	1.3652
Width	186
% Slope	1
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

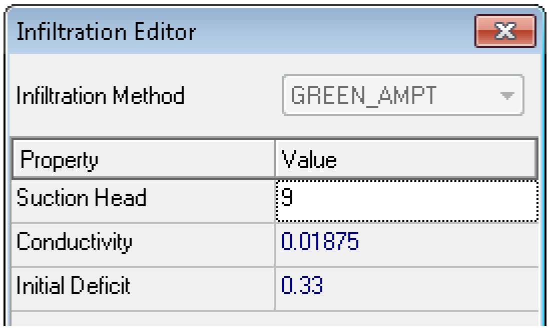
User-assigned name of subcatchment



Subcatchment 1D-POST

Property	Value
Name	1D-POST
X-Coordinate	3000.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	BASIN-1
Area	0.6257
Width	130
% Slope	1
% Imperv	43.4
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

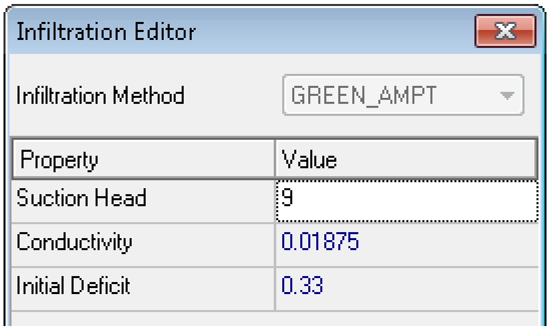
User-assigned name of subcatchment



Infiltration Editor

Infiltration Method: GREEN_AMPT

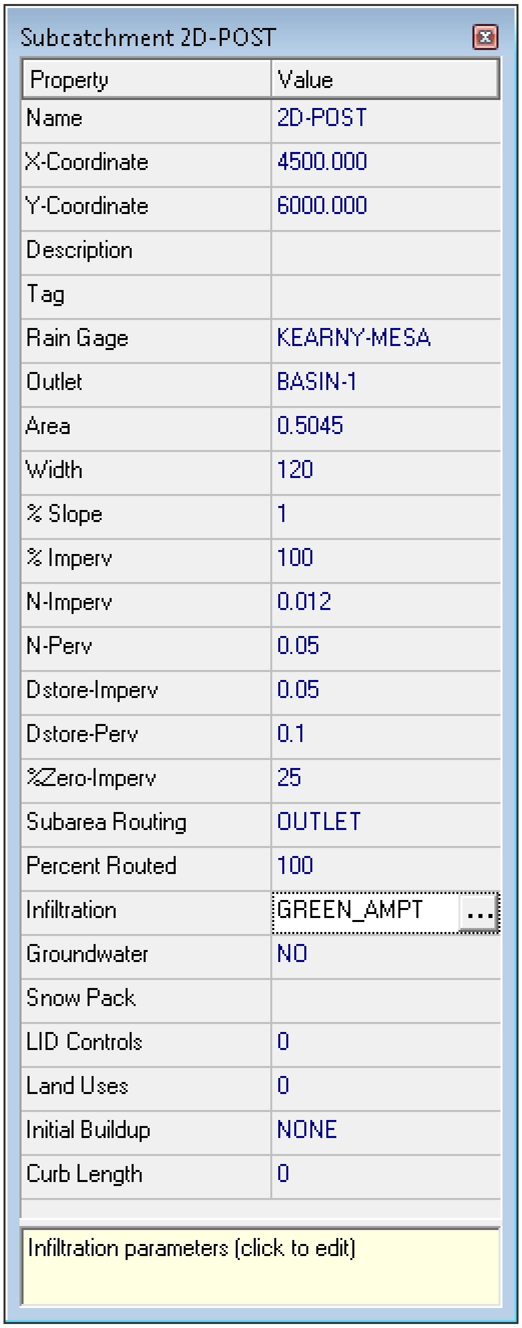
Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



Infiltration Editor

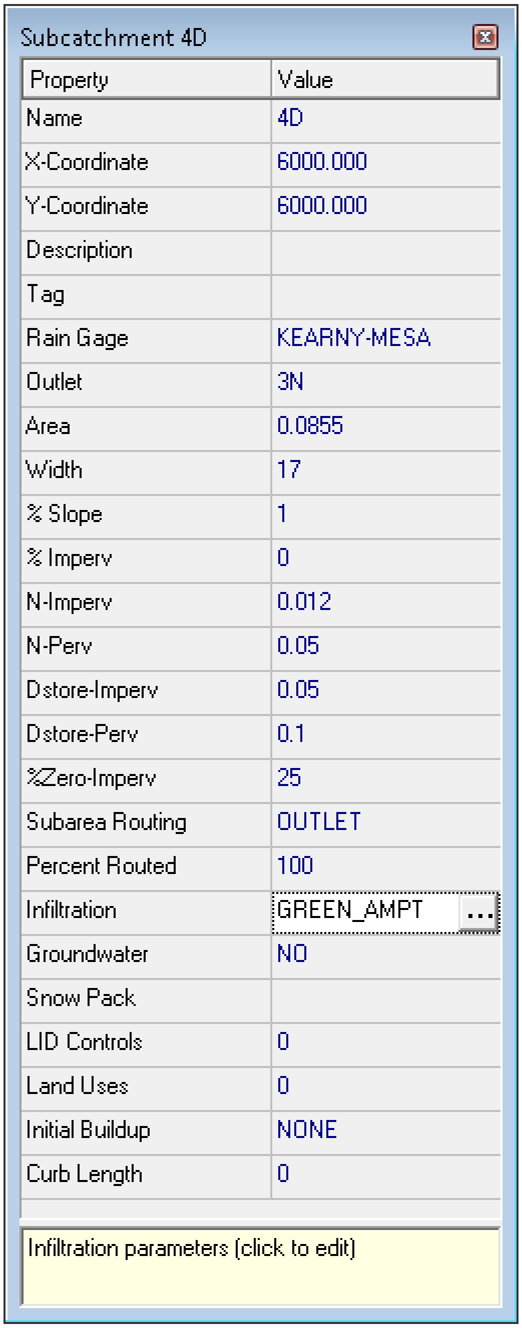
Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33


Subcatchment 2D-POST

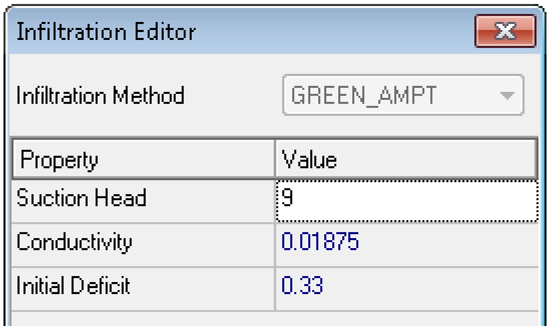
Property	Value
Name	2D-POST
X-Coordinate	4500.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	BASIN-1
Area	0.5045
Width	120
% Slope	1
% Imperv	100
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)


Subcatchment 4D

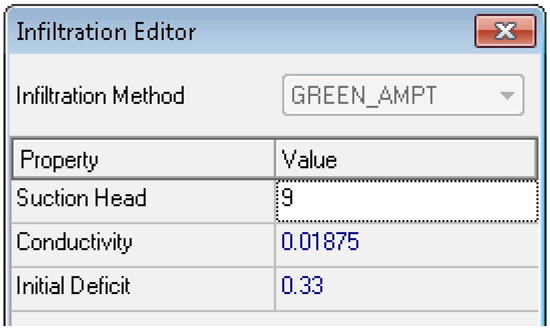
Property	Value
Name	4D
X-Coordinate	6000.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	3N
Area	0.0855
Width	17
% Slope	1
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)


Infiltration Editor

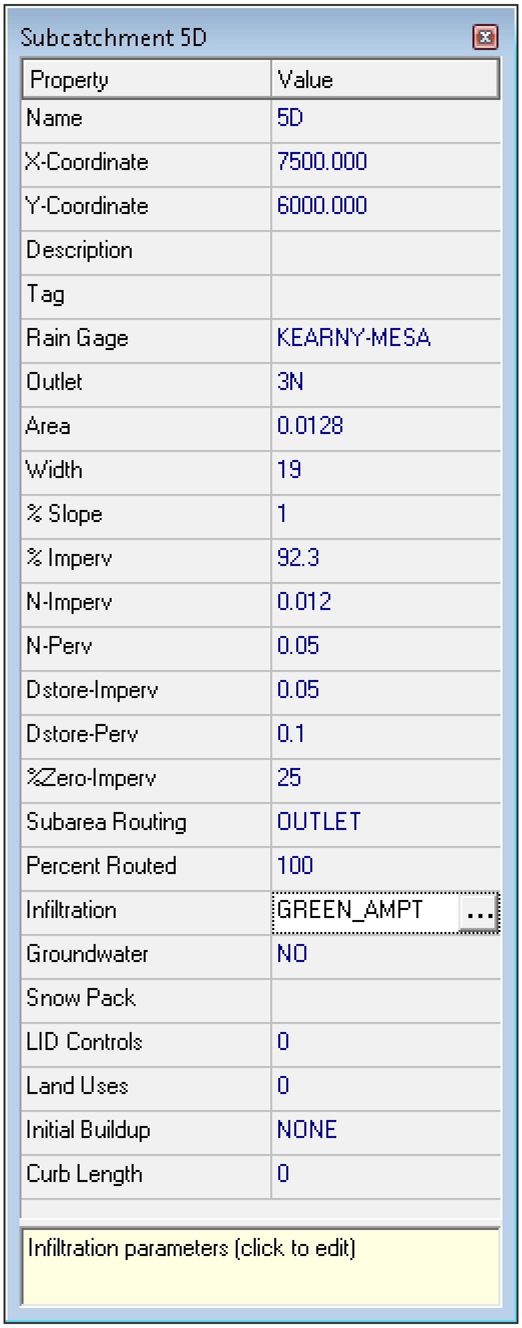
Infiltration Method GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33


Infiltration Editor

Infiltration Method GREEN_AMPT

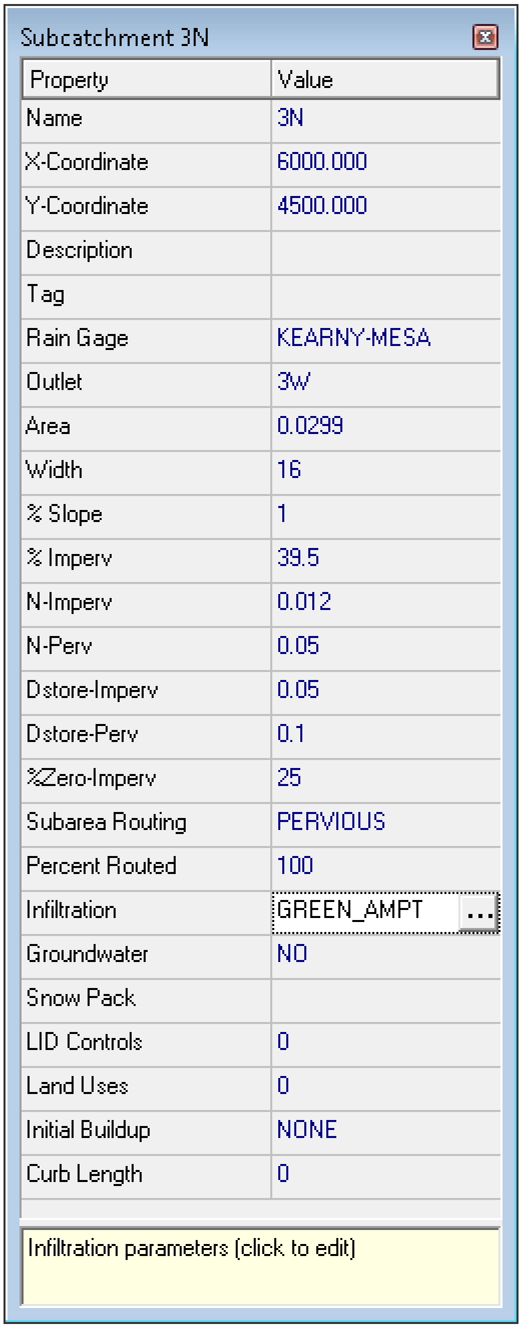
Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



Subcatchment 5D

Property	Value
Name	5D
X-Coordinate	7500.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	3N
Area	0.0128
Width	19
% Slope	1
% Imperv	92.3
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

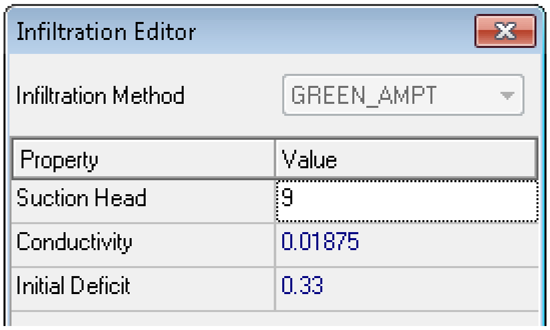
Infiltration parameters (click to edit)



Subcatchment 3N

Property	Value
Name	3N
X-Coordinate	6000.000
Y-Coordinate	4500.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	3W
Area	0.0299
Width	16
% Slope	1
% Imperv	39.5
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	PERVIOUS
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

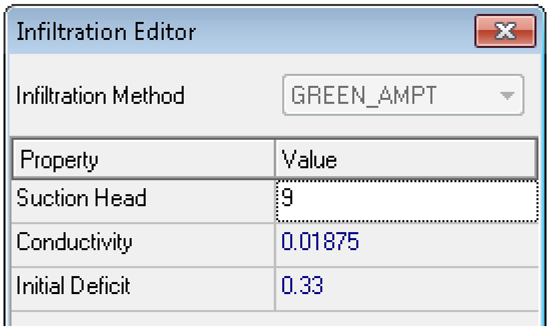
Infiltration parameters (click to edit)



Infiltration Editor

Infiltration Method: GREEN_AMPT

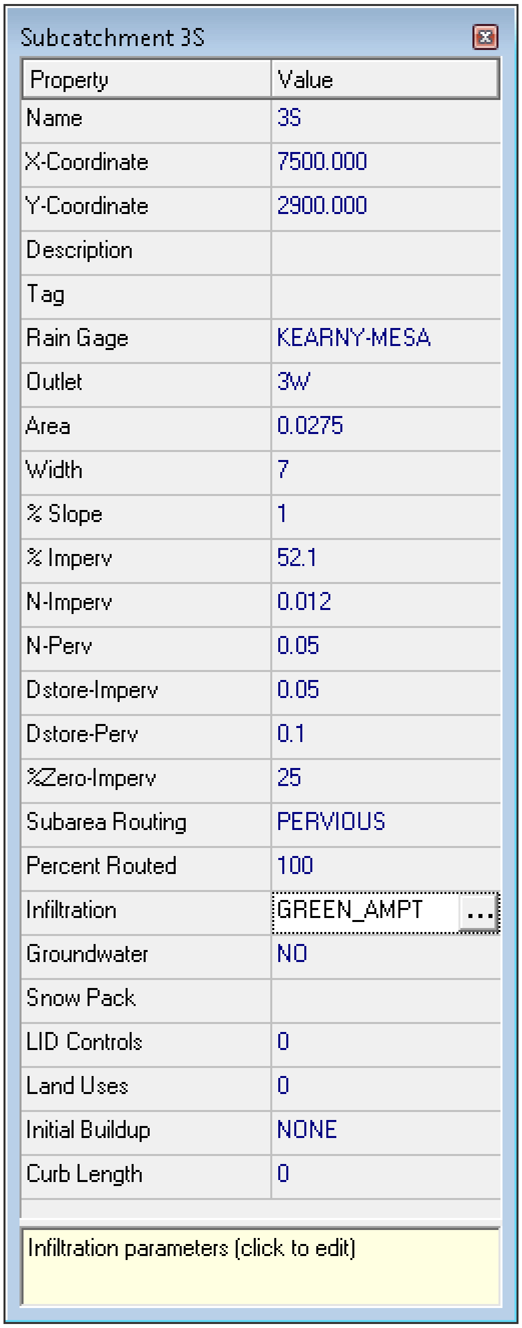
Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



Infiltration Editor

Infiltration Method: GREEN_AMPT

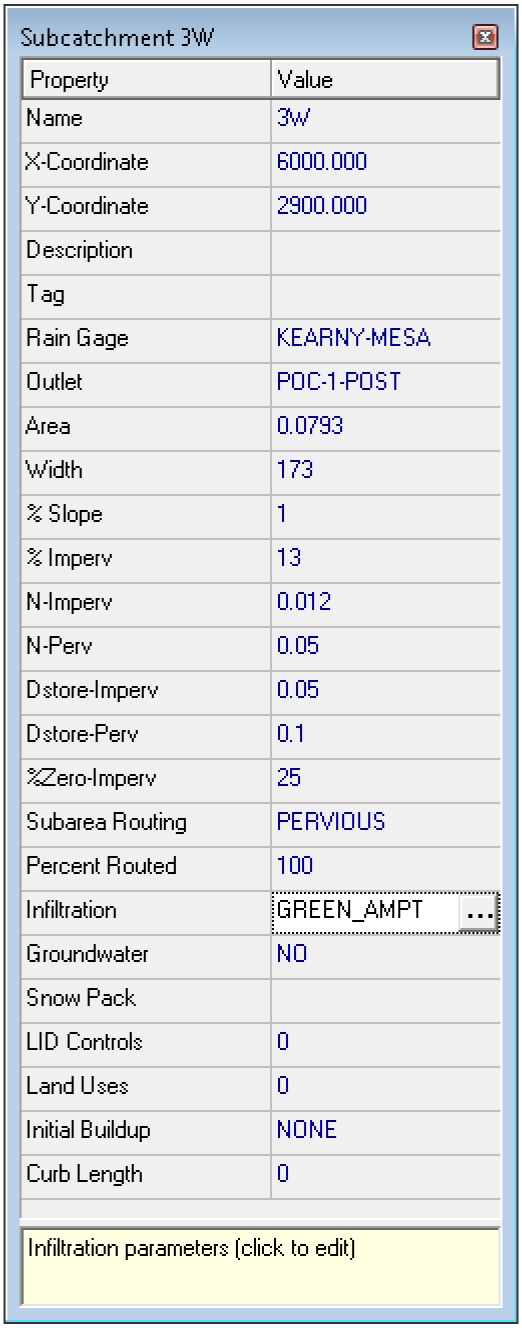
Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



Subcatchment 3S

Property	Value
Name	3S
X-Coordinate	7500.000
Y-Coordinate	2900.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	3W
Area	0.0275
Width	7
% Slope	1
% Imperv	52.1
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	PERVIOUS
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

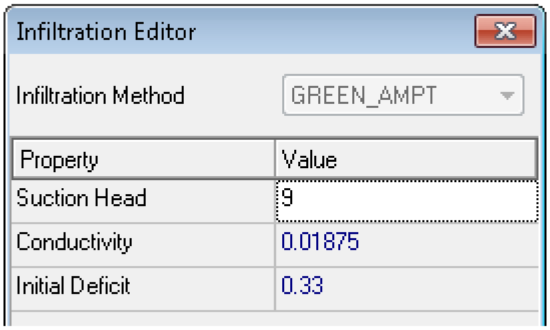
Infiltration parameters (click to edit)



Subcatchment 3W

Property	Value
Name	3W
X-Coordinate	6000.000
Y-Coordinate	2900.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	POC-1-POST
Area	0.0793
Width	173
% Slope	1
% Imperv	13
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	PERVIOUS
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

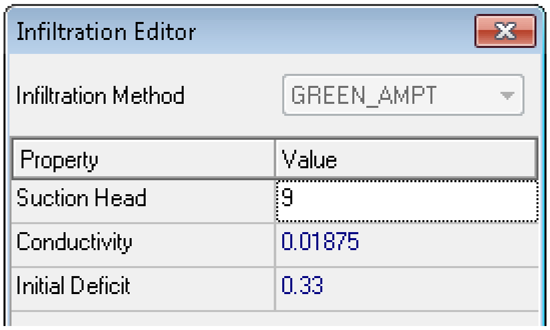
Infiltration parameters (click to edit)



Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

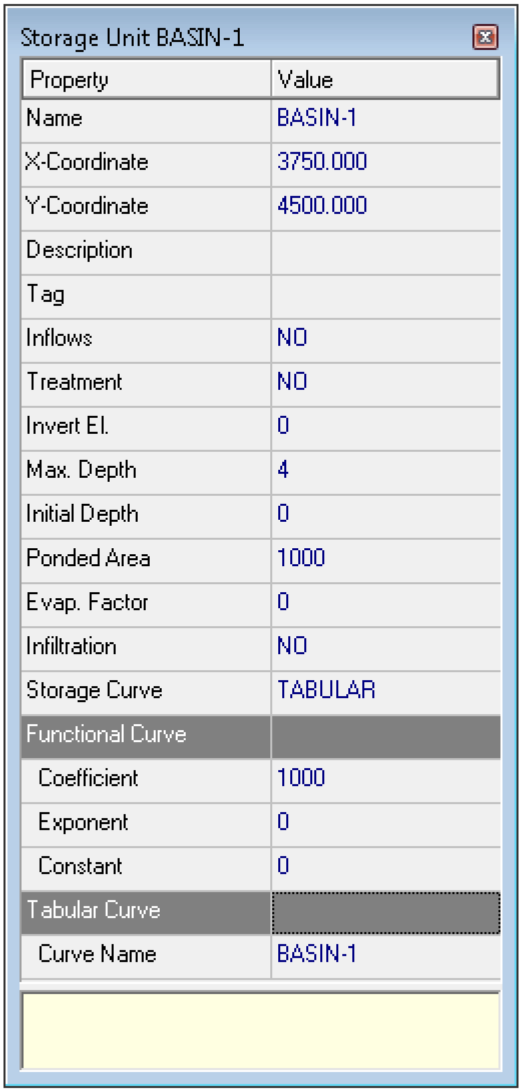


Infiltration Editor

Infiltration Method: GREEN_AMPT

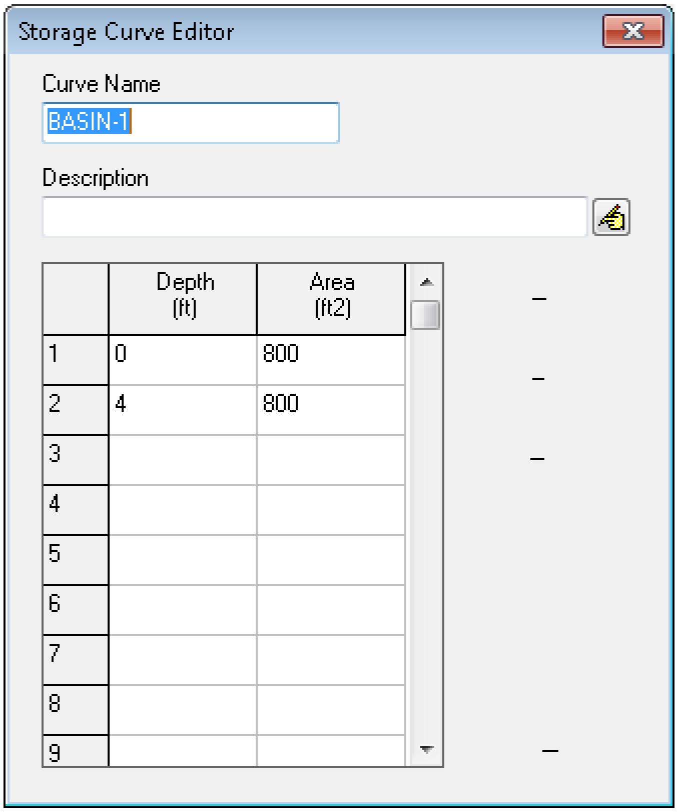
Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Detention Basin 1



Storage Unit BASIN-1

Property	Value
Name	BASIN-1
X-Coordinate	3750.000
Y-Coordinate	4500.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	4
Initial Depth	0
Ponded Area	1000
Evap. Factor	0
Infiltration	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	BASIN-1

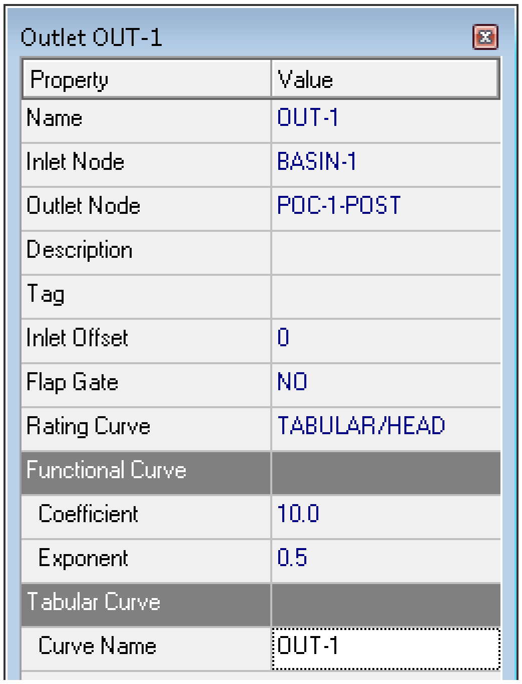


Storage Curve Editor

Curve Name: BASIN-1

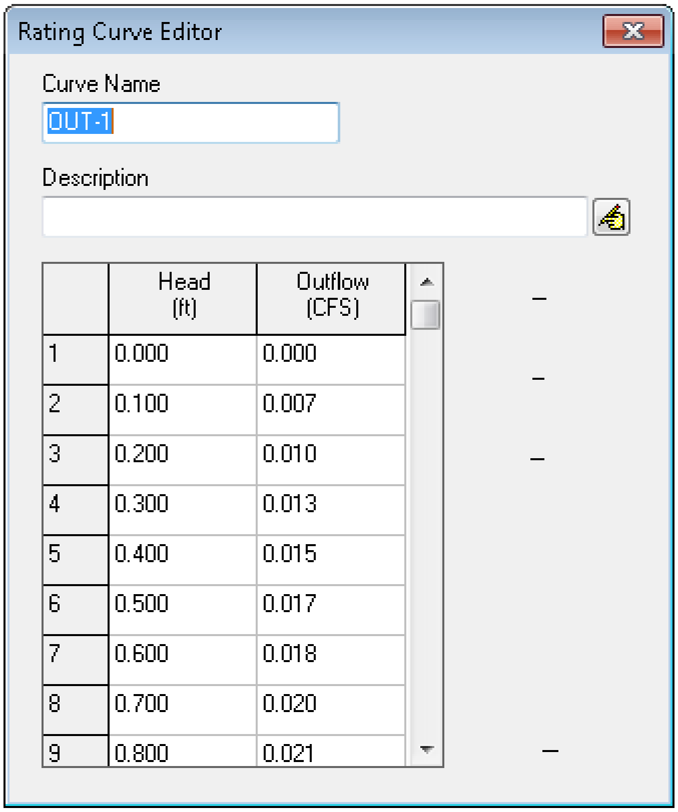
Description:

	Depth (ft)	Area (ft2)
1	0	800
2	4	800
3		
4		
5		
6		
7		
8		
9		



Outlet OUT-1

Property	Value
Name	OUT-1
Inlet Node	BASIN-1
Outlet Node	POC-1-POST
Description	
Tag	
Inlet Offset	0
Flap Gate	NO
Rating Curve	TABULAR/HEAD
Functional Curve	
Coefficient	10.0
Exponent	0.5
Tabular Curve	
Curve Name	OUT-1



Rating Curve Editor

Curve Name: OUT-1

Description:

	Head (ft)	Outflow (CFS)
1	0.000	0.000
2	0.100	0.007
3	0.200	0.010
4	0.300	0.013
5	0.400	0.015
6	0.500	0.017
7	0.600	0.018
8	0.700	0.020
9	0.800	0.021

EXPLANATION OF SELECTED VARIABLES

Sub Catchment Areas:

Please refer to the attached diagrams that indicate the DMA and Bio-Retention BMPs (BMP) sub areas modeled within the project site at both the pre and post developed conditions draining to the POC.

Parameters for the pre- and post-developed models include soil type D as determined from the NRCS websoil survey review (attached at the end of this appendix). Suction head, conductivity and initial deficit corresponds to average values expected for these soils types, according to sources consulted, professional experience, and approximate values obtained by the interim Orange County modeling approach.

REC selected infiltration values, such that the percentage of total precipitation that becomes runoff, is realistic for the soil types and slightly smaller than measured values for Southern California watersheds.

Selection of a Kinematic Approach: As the continuous model is based on hourly rainfall, and the time of concentration for the pre-development and post-development conditions is significantly smaller than 60 minutes, precise routing of the flows through the impervious surfaces, the underdrain pipe system, and the discharge pipe was considered unnecessary. The truncation error of the precipitation into hourly steps is much more significant than the precise routing in a system where the time of concentration is much smaller than 1 hour.

Overland Flow Manning’s Coefficient per TRWE (Reference [6])

appeal of a de facto value, we anticipate that jurisdictions will not be inclined to approve land surfaces other than short prairie grass. Therefore, in order to provide SWMM users with a wider range of land surfaces suitable for local application and to provide Copermittees with confidence in the design parameters, we recommend using the values published by Yen and Chow in Table 3-5 of the EPA SWMM Reference Manual Volume I – Hydrology.

SWMM-Endorsed Values Will Improve Model Quality

In January 2016, the EPA released the SWMM Reference Manual Volume I – Hydrology (SWMM Hydrology Reference Manual). The SWMM Hydrology Reference Manual complements the SWMM 5 User's Manual and SWMM 5 Applications Manual by providing an in-depth description of the program's hydrologic components (EPA 2016). Table 3-5 of the SWMM Hydrology Reference Manual expounds upon SWMM 5 User's Manual Table A.6 by providing Manning's *n* values for additional overland flow surfaces[3]. The values are provided in Table 1:

Table 1: Manning's *n* Values for Overland Flow (EPA, 2016; Yen 2001; Yen and Chow, 1983).

Overland Surface	Light Rain (< 0.8 in/hr)	Moderate Rain (0.8-1.2 in/hr)	Heavy Rain (> 1.2 in/hr)
Smooth asphalt pavement	0.010	0.012	0.015
Smooth impervious surface	0.011	0.013	0.015
Tar and sand pavement	0.012	0.014	0.016
Concrete pavement	0.014	0.017	0.020
Rough impervious surface	0.015	0.019	0.023
Smooth bare packed soil	0.017	0.021	0.025
Moderate bare packed soil	0.025	0.030	0.035
Rough bare packed soil	0.032	0.038	0.045
Gravel soil	0.025	0.032	0.045
Mowed poor grass	0.030	0.038	0.045
Average grass, closely clipped sod	0.040	0.050	0.060
Pasture	0.040	0.055	0.070
Timberland	0.060	0.090	0.120
Dense grass	0.060	0.090	0.120
Shrubs and bushes	0.080	0.120	0.180
Land Use			
Business	0.014	0.022	0.035
Semibusiness	0.022	0.035	0.050
Industrial	0.020	0.035	0.050
Dense residential	0.025	0.040	0.060
Suburban residential	0.030	0.055	0.080
Parks and lawns	0.040	0.075	0.120

For purposes of local hydromodification management BMP design, these Manning's *n* values are an improvement upon the values presented by Engman (1986) in SWMM 5 User's Manual Table A.6. Values from SWMM 5 User's Manual Table A.6, while completely suitable for the intended application to certain agricultural land covers, comes with the disclaimer that the provided Manning's *n* values are valid for shallow-depth overland flow that match the conditions in the experimental plots (Engman,

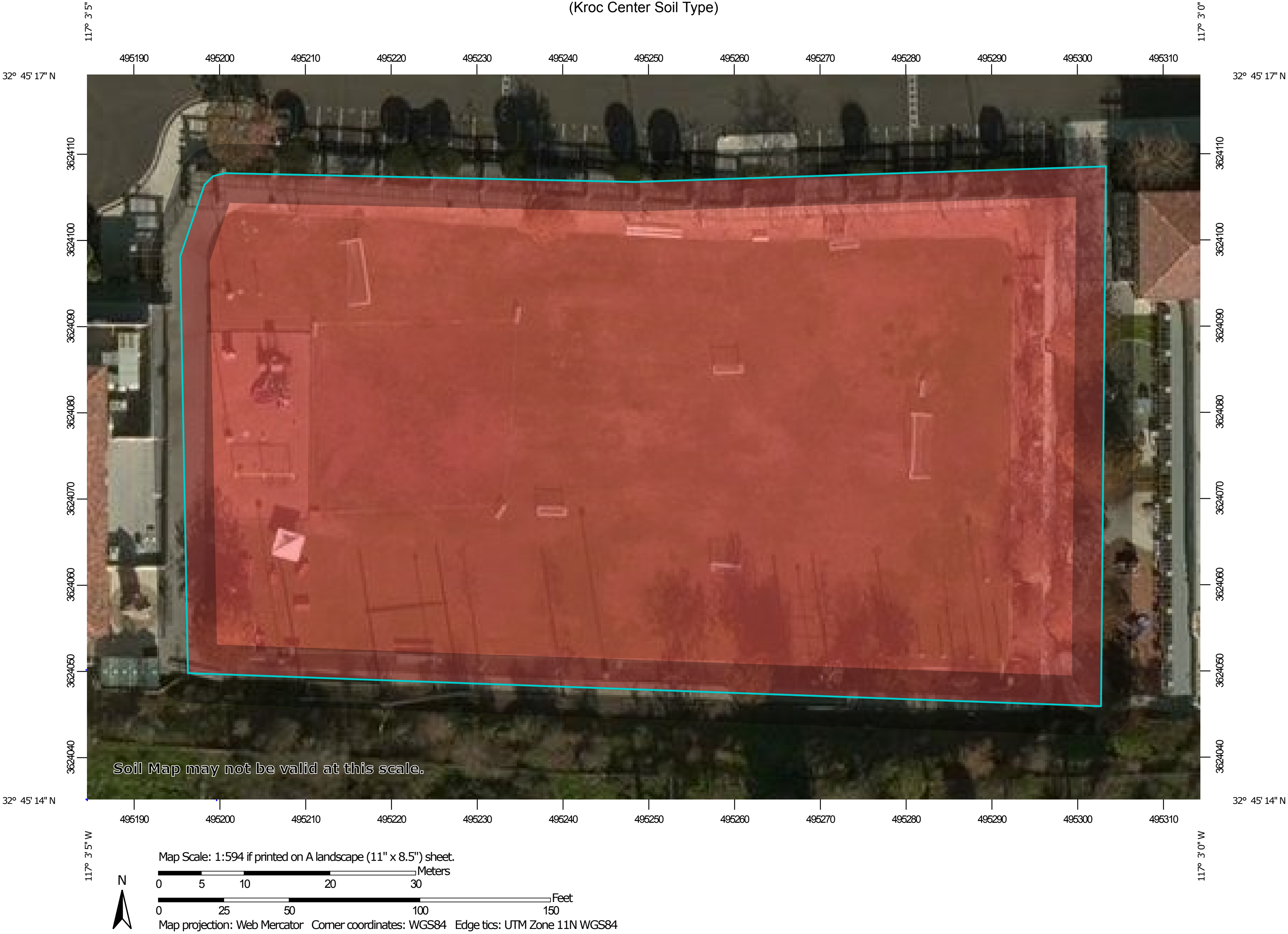
---

[3] Further discussion is provided on page 6 under "Discussion of Differences Between Manning's *n* Values"

ATTACHMENT 8

Geotechnical Documentation

Hydrologic Soil Group—San Diego County Area, California
(Kroc Center Soil Type)



Map Scale: 1:594 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

☐ Area of Interest (AOI)

Soils

Soil Rating Polygons

- 🟪 A
- 🟩 A/D
- 🟦 B
- 🟫 B/D
- 🟦 C
- 🟫 C/D
- 🟥 D
- ⬜ Not rated or not available

Soil Rating Lines

- 〰 A
- 〰 A/D
- 〰 B
- 〰 B/D
- 〰 C
- 〰 C/D
- 〰 D
- 〰 Not rated or not available

Soil Rating Points

- ■ A
- ■ A/D
- ■ B
- ■ B/D
- ■ C
- ■ C/D
- ■ D
- □ Not rated or not available

Water Features

- 〰 Streams and Canals

Transportation

- ┼┼┼ Rails
- 〰 Interstate Highways
- 〰 US Routes
- 〰 Major Roads
- 〰 Local Roads

Background

- ▨ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 10, Sep 12, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 7, 2014—Jan 4, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
OkC	Olivenhain-Urban land complex, 2 to 9 percent slopes	D	1.6	100.0%
Totals for Area of Interest			**1.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT 9

Summary Files from the SWMM Model

PRE & POST_DEV

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ SEP-09-1964 00:00:00
Ending Date .............. SEP-08-2008 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       111.207       488.750
Evaporation Loss .........        10.724        47.133
Infiltration Loss ........        50.441       221.685
Surface Runoff ...........        51.424       226.006
Final Surface Storage ....         0.000         0.000
Continuity Error (%) .....        -1.243


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        51.424        16.757
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        51.410        16.753
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.027


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
```

PRE & POST_DEV

```
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00


***************************
Subcatchment Runoff Summary
***************************

------------------------------------------------------------------------------------------------------------
                         Total      Total      Total      Total      Total       Total     Peak  Runoff
                         Precip     Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                 in         in         in         in         in    10^6 gal      CFS
------------------------------------------------------------------------------------------------------------
1D-PRE                   488.75       0.00      18.72     364.97     109.64        4.06     1.69   0.224
2D-POST                  488.75       0.00      84.24       0.00     409.87        5.61     0.71   0.839
1D-POST                  488.75       0.00      84.14      53.53     359.93        6.12     0.88   0.736
4D                       488.75       0.00      18.40     362.65     112.46        0.26     0.11   0.230
5D                       488.75       0.00      75.33      27.21     394.36        0.14     0.02   0.807
3N                       488.75     490.40      51.21     289.83     651.22        0.53     0.16   0.665
3W                       488.75     321.61      29.77     345.41     446.66        0.96     0.26   0.551
3S                       488.75       0.00      56.85     222.57     219.36        0.16     0.04   0.449


******************
Node Depth Summary
******************

---------------------------------------------------------------------
                                Average  Maximum  Maximum  Time of Max
                                  Depth    Depth      HGL   Occurrence
Node                 Type          Feet     Feet     Feet  days hr:min
---------------------------------------------------------------------
POC-1-PRE            OUTFALL       0.00     0.00     0.00     0  00:00
POC-1-POST           OUTFALL       0.00     0.00     0.00     0  00:00
BASIN-1              STORAGE       0.04     3.65     3.65  3738  08:49


*******************
Node Inflow Summary
*******************

-------------------------------------------------------------------------------------
                                 Maximum  Maximum                  Lateral       Total
                                 Lateral    Total  Time of Max      Inflow      Inflow
                                  Inflow   Inflow   Occurrence      Volume      Volume
Node                 Type            CFS      CFS  days hr:min    10^6 gal    10^6 gal
-------------------------------------------------------------------------------------
POC-1-PRE            OUTFALL        1.69     1.69  3738  09:00       4.064       4.064
POC-1-POST           OUTFALL        0.26     1.85  3738  09:00       0.962      12.687
BASIN-1              STORAGE        1.59     1.59  3738  09:00      11.730      11.730


**********************
Node Surcharge Summary
**********************

Surcharging occurs when water rises above the top of the highest conduit.
---------------------------------------------------------------------
                                              Max. Height   Min. Depth
                                    Hours     Above Crown    Below Rim
Node                 Type      Surcharged            Feet         Feet
---------------------------------------------------------------------
BASIN-1              STORAGE    385703.02           3.650        0.350


*********************
Node Flooding Summary
*********************

No nodes were flooded.
```

```
**********************
Storage Volume Summary
**********************

--------------------------------------------------------------------------------------------
                       Average     Avg   E&I       Maximum     Max    Time of Max    Maximum
                        Volume    Pcnt  Pcnt        Volume    Pcnt     Occurrence    Outflow
Storage Unit          1000 ft3    Full  Loss      1000 ft3    Full    days hr:min        CFS
--------------------------------------------------------------------------------------------
BASIN-1                  0.029       1     0         2.920      91    3738  08:48       1.59


***********************
Outfall Loading Summary
***********************

-----------------------------------------------------------
                      Flow       Avg.      Max.       Total
                      Freq.      Flow      Flow      Volume
Outfall Node          Pcnt.       CFS       CFS    10^6 gal
-----------------------------------------------------------
POC-1-PRE              0.43      0.09      1.69       4.064
POC-1-POST             5.84      0.02      1.85      12.687
-----------------------------------------------------------
System                 3.14      0.11      3.53      16.751


********************
Link Flow Summary
********************

-----------------------------------------------------------------------------
                               Maximum  Time of Max   Maximum    Max/    Max/
                                |Flow|   Occurrence   |Veloc|    Full    Full
Link                 Type          CFS  days hr:min    ft/sec    Flow   Depth
-----------------------------------------------------------------------------
OUT-1                DUMMY        1.59  3738  08:49


*************************
Conduit Surcharge Summary
*************************

No conduits were surcharged.


Analysis begun on:  Mon Apr 17 11:13:13 2017
Analysis ended on:  Mon Apr 17 11:13:31 2017
Total elapsed time: 00:00:18
```

NOISE STUDY

Kroc Center Sports and Wellness Development
San Diego CA

City Project No. 552436

Prepared For:

Kenneth D. Smith Architect & Associates, Inc.
500 Fesler Street, Suite 102
El Cajon, CA 92020

Prepared by:

Ldn Consulting, Inc.
42428 Chisolm Trail
Murrieta, CA 92562
760-473-1253

February 22, 2018

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GLOSSARY OF TERMS

Sound Pressure Level (SPL): a ratio of one sound pressure to a reference pressure (L_{ref}) of 20 µPa. Because of the dynamic range of the human ear, the ratio is calculated logarithmically by 20 log (L/L_{ref}).

A-weighted Sound Pressure Level (dBA): Some frequencies of noise are more noticeable than others. To compensate for this fact, different sound frequencies are weighted more.

Minimum Sound Level (L_{min}): Minimum SPL or the lowest SPL measured over the time interval using the A-weighted network and slow time weighting.

Maximum Sound Level (L_{max}): Maximum SPL or the highest SPL measured over the time interval the A-weighted network and slow time weighting.

Equivalent sound level (L_{eq}): the true equivalent sound level measured over the run time. Leq is the A-weighted steady sound level that contains the same total acoustical energy as the actual fluctuating sound level.

Day Night Sound Level (LDN): Representing the Day/Night sound level, this measurement is a 24 –hour average sound level where 10 dB is added to all the readings that occur between 10 pm and 7 am. This is primarily used in community noise regulations where there is a 10 dB "Penalty" for night time noise. Typically LDN's are measured using A weighting.

Community Noise Exposure Level (CNEL): The accumulated exposure to sound measured in a 24-hour sampling interval and artificially boosted during certain hours. For CNEL, samples taken between 7 pm and 10 pm are boosted by 5 dB; samples taken between 10 pm and 7 am are boosted by 10 dB.

Octave Band: An octave band is defined as a frequency band whose upper band-edge frequency is twice the lower band frequency.

Third-Octave Band: A third-octave band is defined as a frequency band whose upper band-edge frequency is 1.26 times the lower band frequency.

Response Time (F,S,I): The response time is a standardized exponential time weighting of the input signal according to fast (F), slow (S) or impulse (I) time response relationships. Time response can be described with a time constant. The time constants for fast, slow and impulse responses are 1.0 seconds, 0.125 seconds and 0.35 milliseconds, respectively.

EXECUTIVE SUMMARY

This noise study has been completed to determine the noise impacts associated with the proposed project. The project known as "Kroc Center Sports and Wellness Development" consists of the development of a two-story, 73,409-square-foot recreation building and an elevated sports deck structure with parking underneath. The 12.32-acre site is in the CC 5-3 zone within the Mid-City, Eastern Community Plan area located at 6605-6845 University Avenue in the City of San Diego, California.

Operational Noise Levels

Based upon the property line noise levels determined above none of the proposed noise sources directly or cumulatively exceeds the property line standards at the residential property lines. Therefore, the proposed development related operational noise levels comply with the City's daytime and evening noise standards at the residences. No impacts are anticipated and no mitigation is required.

Construction Noise Levels

Based upon the findings even if all the equipment was located, at a distance as close as 100-feet from the nearest property line, which is not physically possible, the combined noise level would be less than 75 dBA. Given this and the spatial separation of the equipment, the noise levels from the demolition activities and construction activities will comply with the City of San Diego's average 75 dBA 12-hour standard and no impacts will occur and no mitigation measures are required.

1.0 PROJECT INTRODUCTION

1.1 Purpose of this Study

The purpose of this Noise study is to determine both operational impacts (if any) generated from the proposed project to offsite uses. Should impacts be determined, the intent of this study would be to recommend suitable mitigation measures classify impacts as less then significant.

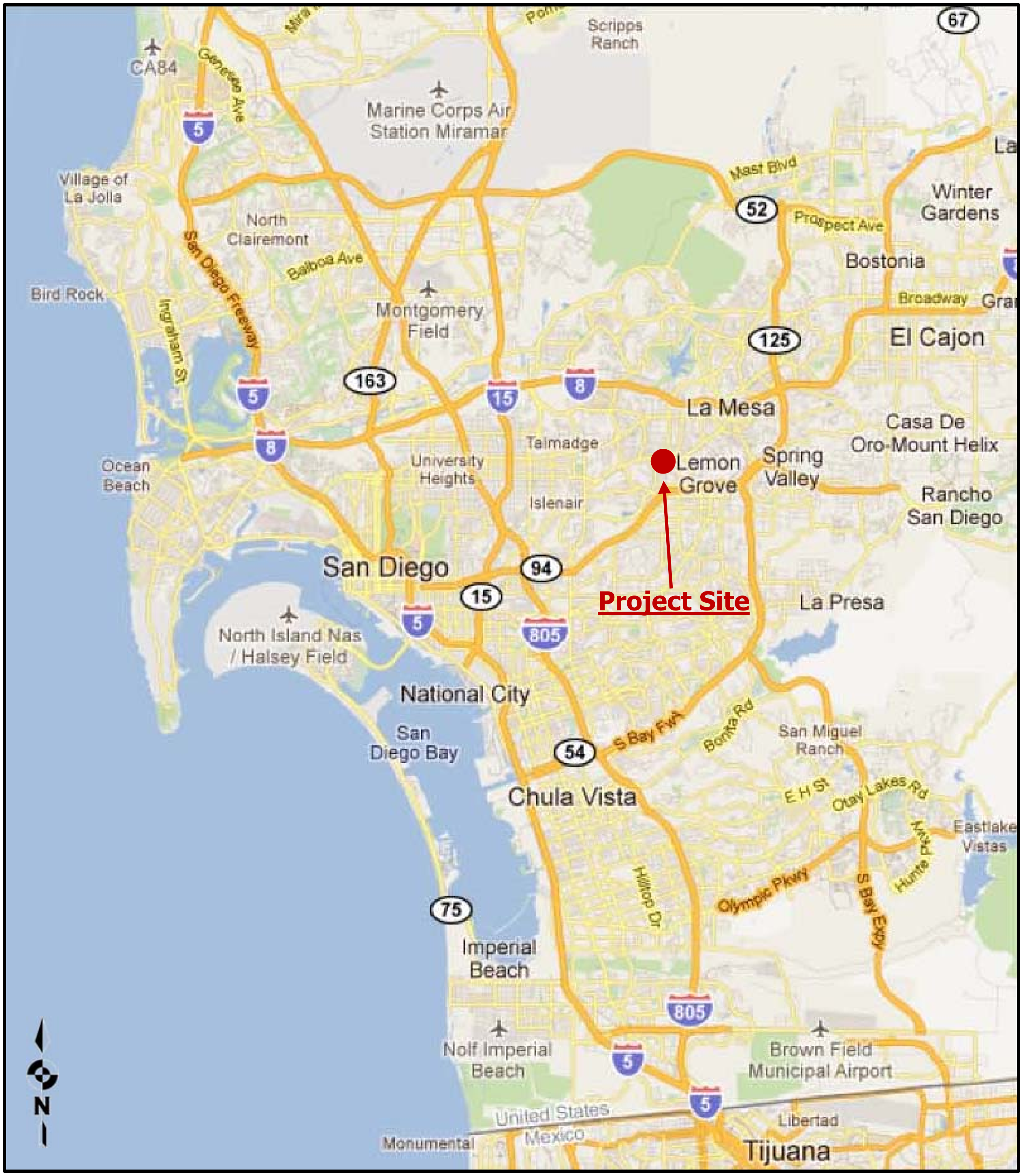
1.2 Project Location

The proposed 12.32-acre site is in the CC 5-3 zone within the Mid-City, Eastern Community Plan area located at 6605-6845 University Avenue in the City of San Diego, CA. A project vicinity map is shown in Figure 1-1 on the following page.

1.3 Project Description

The Project proposes the development of a 73,409-square-foot recreation building and an elevated sports deck structure with parking underneath. The facility will provide general membership to the local community and offer exercise/workout rooms, and outdoor sports deck. The general operating hours are Monday - Friday 5:00 am to 10:00 PM and Sat / Sun: 7 am - 9 pm for the Indoor facilities and Monday - Friday 8 am - 10 pm and Sat / Sun: 8 am - 9 pm at the outdoor sports deck. The overall project site plan is shown in Figure 1-2. The outdoor sports deck and building configuration is provided in Figure 1-3.

Figure 1-1: Project Vicinity Map



Source: Google Maps

Figure 1-2: Project Site Plan

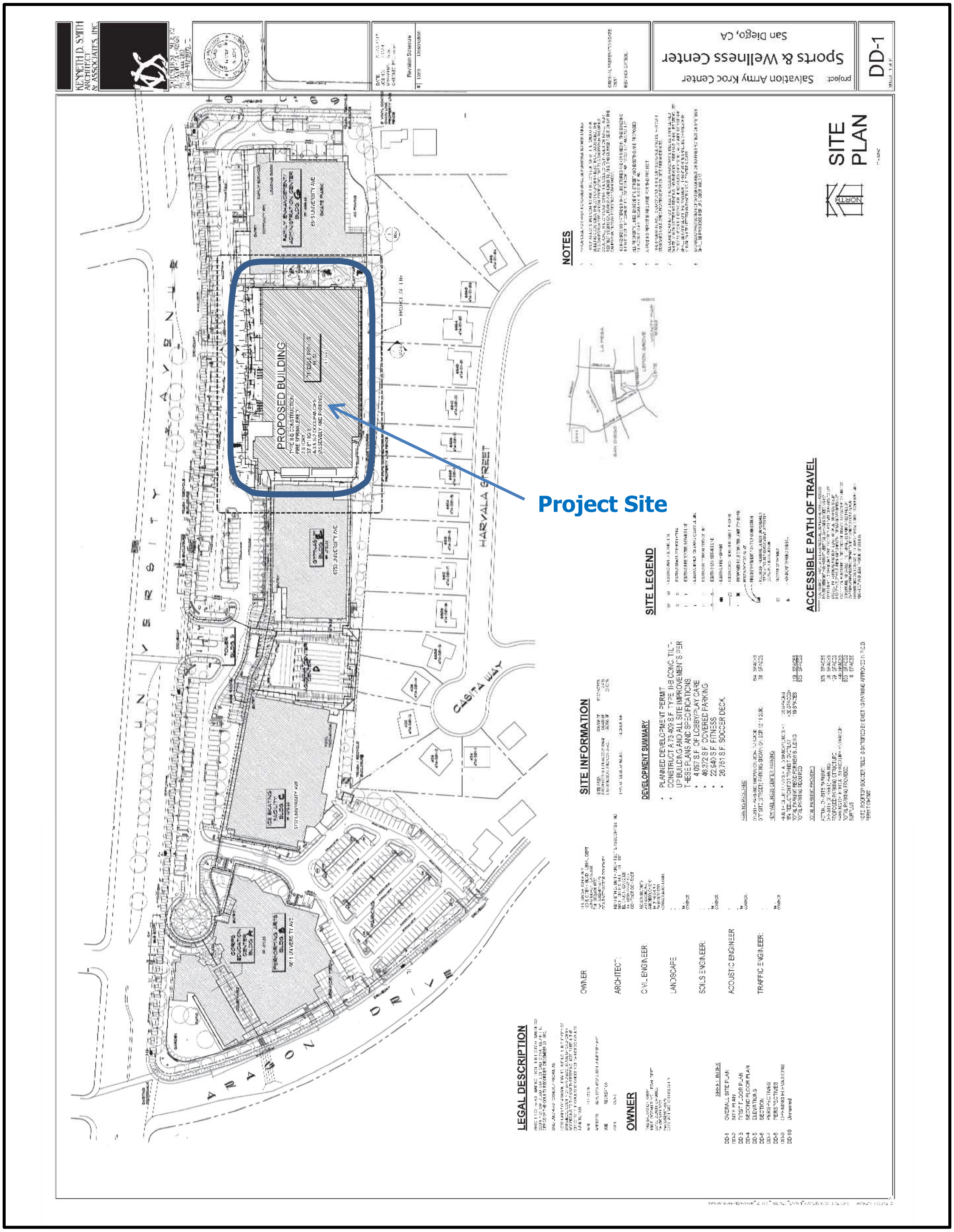
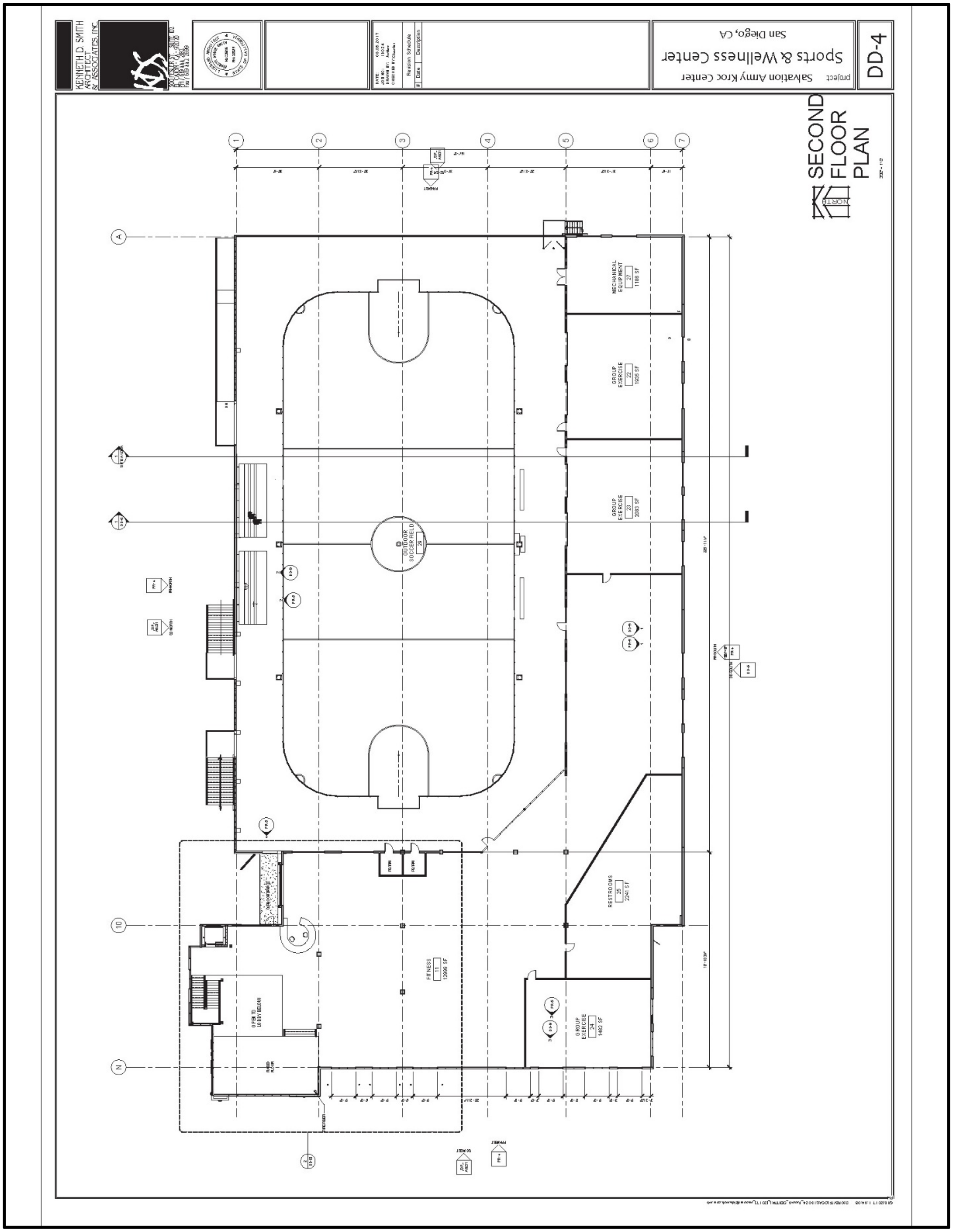


Figure 1-3: Building and Sports Deck Configuration


KENNETH D. SMITH
ARCHITECT
& ASSOCIATES, INC.
Revision Schedule
Date Description
project Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA
DD-4
SECOND FLOOR PLAN
NORTH
1
2
3
4
5
6
7
A
10
N
MECHANICAL EQUIPMENT 27 1186 SF
GROUP EXERCISE 22 1935 SF
GROUP EXERCISE 23 2083 SF
OUTDOOR SOCCER FIELD 29
RESTROOMS 25 2341 SF
FITNESS 11 12099 SF
GROUP EXERCISE 24 1482 SF
OPEN TO LOBBY BELOW

2.0 ACOUSTICAL FUNDAMENTALS

Noise is defined as unwanted or annoying sound which interferes with or disrupts normal activities. Exposure to high noise levels has been demonstrated to cause hearing loss. The individual human response to environmental noise is base on the sensitivity of that individual, the type of noise that occurs and when the noise occurs.

Sound is measured on a logarithmic scale consisting of sound pressure levels known as a decibel (dB). The sounds heard by humans typically do not consist of a single frequency but of a broadband of frequencies having different sound pressure levels. The method for evaluating all the frequencies of the sound is to apply an A-weighting to reflect how the human ear responds to the different sound levels at different frequencies. The A-weighted sound level adequately describes the instantaneous noise whereas the equivalent sound level depicted as Leq represents a steady sound level containing the same total acoustical energy as the actual fluctuating sound level over a given time interval.

The Community Noise Equivalent Level (CNEL) is the 24 hour A-weighted average for sound, with corrections for evening and nighttime hours. The corrections require an addition of 5 decibels to sound levels in the evening hours between 7 p.m. and 10 p.m. and an addition of 10 decibels to sound levels at nighttime hours between 10 p.m. and 7 a.m. These additions are made to account for the increased sensitivity during the evening and nighttime hours when sound appears louder.

A vehicles noise level is from a combination of the noise produced by the engine, exhaust and tires. The cumulative traffic noise levels along a roadway segment are based on three primary factors: the amount of traffic, the travel speed of the traffic, and the vehicle mix ratio or number of medium and heavy trucks. The intensity of traffic noise is increased by higher traffic volumes, greater speeds and increased number of trucks.

Because mobile/traffic noise levels are calculated on a logarithmic scale, a doubling of the traffic noise or acoustical energy results in a noise level increase of 3 dBA. Therefore the doubling of the traffic volume, without changing the vehicle speeds or mix ratio, results in a noise increase of 3 dBA. Mobile noise levels radiant in an almost oblique fashion from the source and drop off at a rate of 3 dBA for each doubling of distance under hard site conditions and at a rate of 4.5 dBA for soft site conditions.

Hard site conditions consist of concrete, asphalt and hard pack dirt while soft site conditions exist in areas having slight grade changes, landscaped areas and vegetation. On the other hand, fixed/point sources radiate outward uniformly as it travels away from the source. Their sound levels attenuate or drop off at a rate of 6 dBA for each doubling of distance.

The most effective noise reduction methods consist of controlling the noise at the source, blocking the noise transmission with barriers. Any or all of these methods may be required to reduce noise levels to an acceptable level. To be effective, a noise barrier must have enough mass to prevent significant noise transmission through it and high enough and long enough to shield the receiver from the noise source. A safe minimum surface weight for a noise barrier is 3.5 pounds/square foot (equivalent to 3/4-inch plywood), and the barrier must be carefully constructed so that there are no cracks or openings.

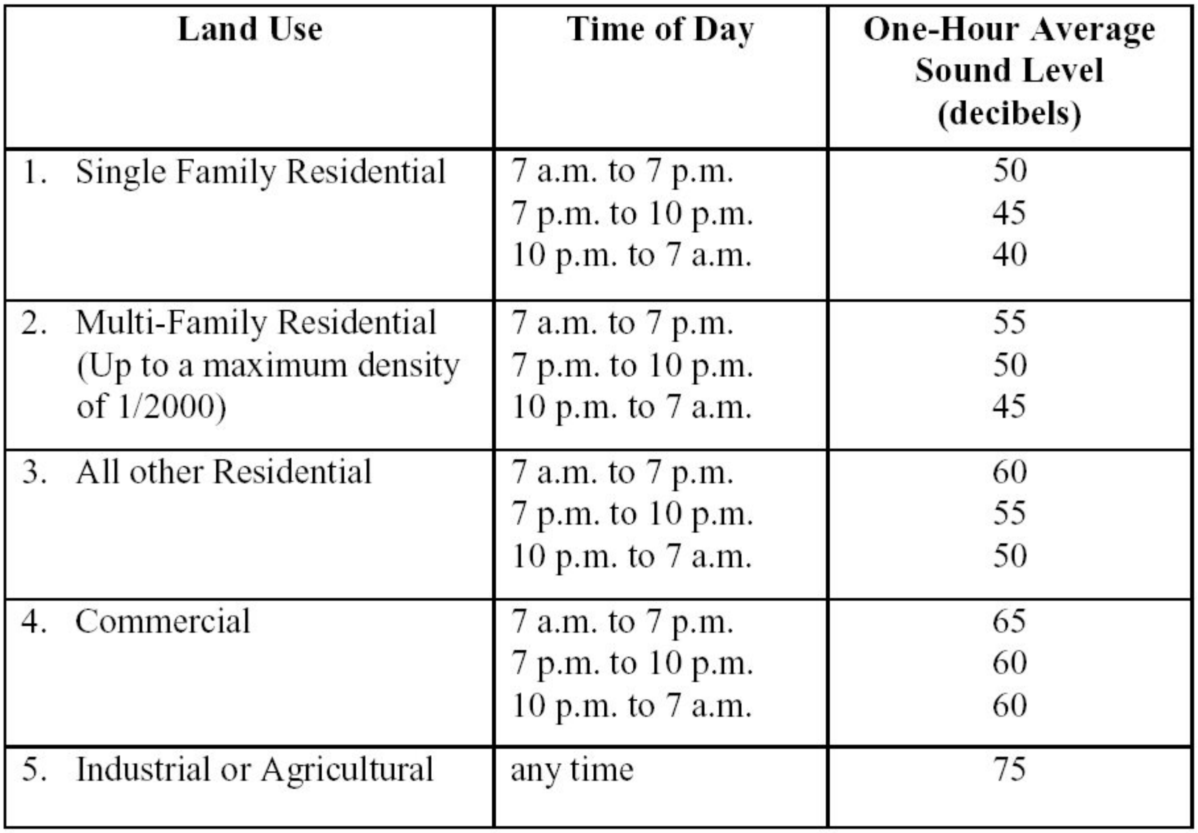
Barriers constructed of wood or as a wooden fence must have minimum design considerations as follows: the boards must be ¾ inch thick and free of any gaps or knot holes. The design must also incorporate either overlapping the boards at least 1 inch or utilizing a tongue-and-grove design for this to be achieved.

3.0 SIGNIFICANCE THRESHOLDS AND STANDARDS

3.1 Operational Noise

The generation of noise for certain types of land uses could cause potential land use incompatibility. A project which would generate noise levels at the property line which exceed Section 59.5.0401 of the City's Municipal Code is considered potentially significant which are identified in Table 3-1 below. The sound level limit at a location on a boundary between two zoning districts is the arithmetic mean of the respective limits for the two districts.

Table 3-1: City of San Diego Sound Level Limits in Decibels (dBA)



Land Use	Time of Day	One-Hour Average Sound Level (decibels)
1. Single Family Residential	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	50 45 40
2. Multi-Family Residential (Up to a maximum density of 1/2000)	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	55 50 45
3. All other Residential	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	60 55 50
4. Commercial	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	65 60 60
5. Industrial or Agricultural	any time	75

Source: City of San Diego Noise Ordinance Section 59.5.0401

The project site is zoned CC-5-3, the properties located immediately south of the project site are zoned the OR-1-1 and RS-1-7. The portions of the properties directly south of the proposed building are zoned open space maintained and are not considered residential. Based on the lands use categories identified in Table 3-1, the applicable noise limits between the project site and the neighboring uses are 57.5 dBA Leq between 7:00 A.M. and 7:00 P.M., and 52.5 dBA Leq between 7:00 P.M. and 10:00 P.M., and 50 dBA Leq between 10:00 P.M. and 7:00 A.M.

3.2 Construction Noise

Section 59.5.0404 of the City of San Diego Municipal Code addresses the limits of disturbing or offensive construction noise. It shall be unlawful for any person, between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, or on legal holidays as specified in Section 21.04 of the San Diego Municipal Code, with exception of Columbus Day and Washington's Birthday, or on Sundays, to erect, construct, demolish, excavate for, alter or repair any building or structure in such a manner as to create disturbing, excessive or offensive noise unless a permit has been applied for and granted beforehand by the Noise Abatement and Control Administrator.

In granting such permit, the Administrator shall consider whether the construction noise in the vicinity of the proposed work site would be less objectionable at night than during the daytime because of different population densities or different neighboring activities; whether obstruction and interference with traffic particularly on streets of major importance, would be less objectionable at night than during the daytime; whether the type of work to be performed emits noises at such a low level as to not cause significant disturbances in the vicinity of the work site; the character and nature of the neighborhood of the proposed work site; whether great economic hardship would occur if the work were spread over a longer time; whether proposed night work is in the general public interest; and he shall prescribe such conditions, working times, types of construction equipment to be used, and permissible noise levels as he deems to be required in the public interest.

Section 59.5.0404 of the Municipal Code also states that with the exception of an emergency, it should be unlawful to conduct any construction activity so as to cause, at or beyond the property lines of any property zoned residential, an average sound level greater than 75 decibels during the 12–hour period from 7:00 a.m. to 7:00 p.m.

4.0 OPERATIONAL NOISE LEVELS

This section examines the potential operational noise source levels associated with the development and operation of the proposed project. Noise from a fixed or point source drops off at a rate of 6 dBA for each doubling of distance. Which means a noise level of 70 dBA at 5-feet would be 64 dBA at 10-feet and 58 dBA at 20-feet.

The project site is zoned CC-5-3, the properties located immediately south of the project site are zoned the OR-1-1 and RS-1-7. The portions of the properties directly south of the proposed building are zoned open space maintained and are not considered residential. Based on the lands use categories identified above in Table 3-1, the applicable noise limits between the project site and the neighboring uses are 57.5 dBA Leq between 7:00 A.M. and 7:00 P.M., and 52.5 dBA Leq between 7:00 P.M. and 10:00 P.M., and 50 dBA Leq between 10:00 P.M. and 7:00 A.M.

4.1 Reference Noise Levels

This section provides a detailed description of the reference noise level measurement results. Noise levels from the proposed operation activities were modeled with SoundPLAN Essential, version 4.0, a three-dimensional acoustical modeling software package (Braunstein + Berndt GmbH 2017). Propagation of modeled stationary noise sources was based on ISO Standard 9613-2, "Attenuation of Sound during Propagation Outdoors, Part 2: General Method of Calculation." The model includes digital terrain modeling, which allows the calculation to take topography into account. The terrain model was developed from project specific topographical data. The ISO Standard 9613-2 assumes that all receptors would be downwind of stationary sources. This is a worst-case assumption for total noise impacts, since, in reality, only some receptors will be downwind at any one time.

Typical increases or decreases of sound levels depend on the ground absorption factor between the source and receiver. Acoustically hard sites include surfaces, such as pavement, bare hard ground, water, and ice, with high reflectivity (i.e., 0.0 absorption). A higher ground factor defines more absorptive ground, such as vegetation or tilled and loose soil (typically 0.5 to 1.0). Based on field observations, portions of the site and offsite uses are considered acoustically soft, or absorptive, therefore, an acoustic ground factor of 0.5 was used for modeling.

Modeled noise levels are based on a database of sporting events, which includes referees, spectators, as well as several types of sporting events ranging from soccer games to ice hockey games. All reference noise levels were taken from the database included in the SoundPLAN model. The modeled source noise levels are presented in Table 4-1.

Table 4-1: Modeled Source Sound Power Levels

Source	Power Level Data							
	125	250	500	1K	2K	4K	8K	Sound Power Level dB
Spectators	73.7	78.3	93.0	91.9	85.6	77.6	62.3	96.2
Game	70.2	78.7	79.6	81.4	78.1	70.0	56.1	92.6

4.2 Property Line Noise Levels

Organized sporting events would be a loudest on-site noise source associated with the project. Other sporadic and daily activities within the field would typically be quieter as there would be fewer spectators and less intensity.

Elevations were taken from the project plans. Based on project plans, the sports field would be located centrally within the building with bleachers on the northern end of the building, facing south. The sports field would be located 12 feet 3 inches above the existing grade the bleachers and are assumed to be approximately 6 feet above the field. The upper level of the building would shield properties to the south and west of the field and would rise another 20 feet higher than the field surface. The modeled receptor locations along with the zoning is provided in Figure 4-1.

The results of the modeling are shown in Figure 4-2 for the operation. No differentiation was assumed for daytime/evening/nighttime operation. Results of the noise modeling at specific points are shown in Table 4-2.

Figure 4-1: Modeled Receptors and Zoning Information

Figure 4-2: Modeling Results

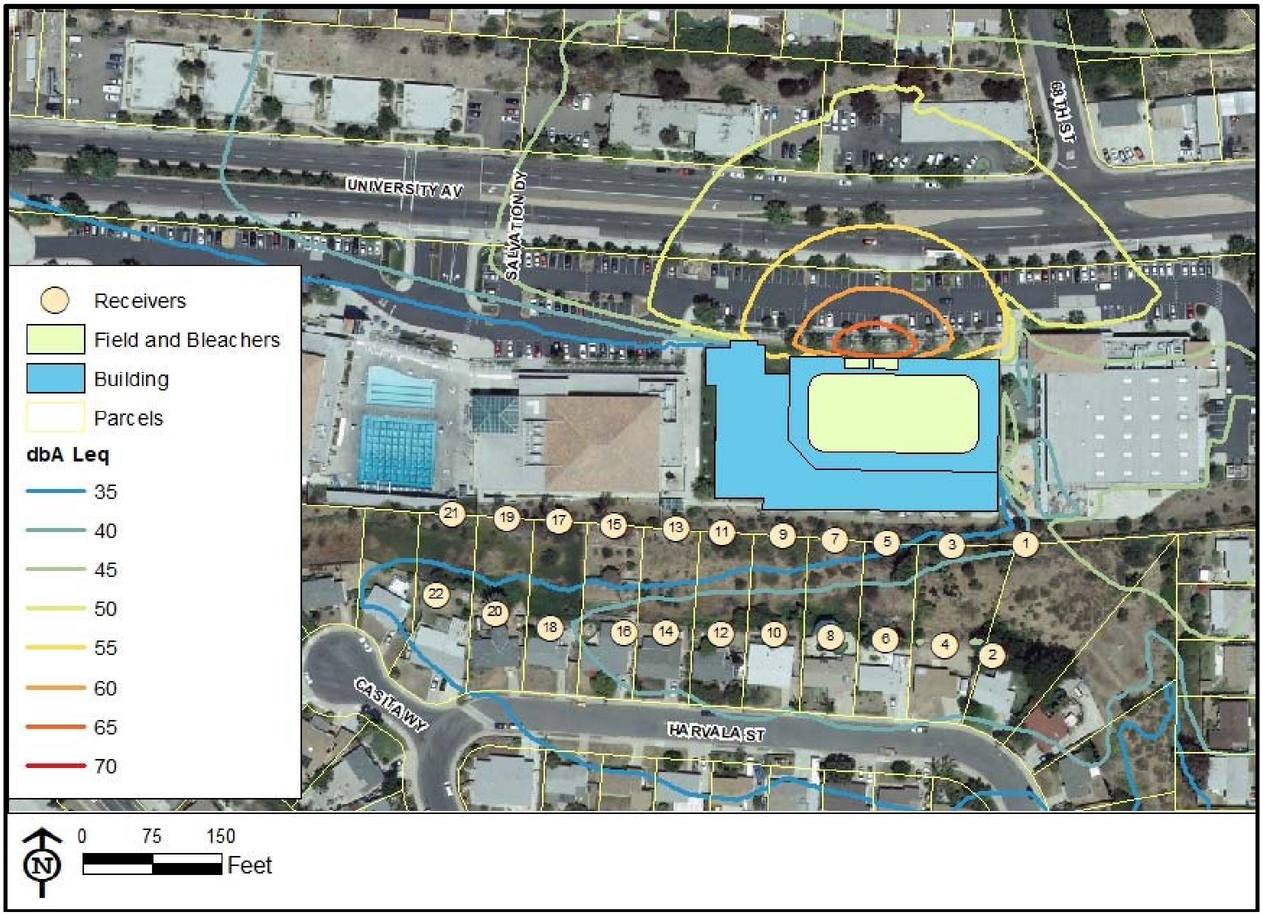


Table 4-2: Modeled Noise Levels

Receiver	Address	Noise Level Limits	Noise Level (PL/Edge of Zone)
1-2	6860 Harvala Street	57.5/52.5/50	39/44
3-4	6854 Harvala Street	57.5/52.5/50	36/43
5-6	6848 Harvala Street	57.5/52.5/50	33/44
7-8	6842 Harvala Street	57.5/52.5/50	31/44
9-10	6836 Harvala Street	57.5/52.5/50	30/44
11-12	6830 Harvala Street	57.5/52.5/50	29/43
13-14	6824 Harvala Street	57.5/52.5/50	28/42
15-16	6818 Harvala Street	57.5/52.5/50	31/42
17-18	6812 Harvala Street	57.5/52.5/50	29/39
19-20	6806 Harvala Street	57.5/52.5/50	29/38
21-22	6800 Harvala Street	57.5/52.5/50	28/36
Notes: PL = Property Line; Edge of Zone = Line between OR-1-1 and RS-1-7.			

4.3 Conclusions

As shown in Table 4-2 and Figure 4-2, noise levels at receivers along the property line closest to the proposed building, represented by the odd numbered receiver points, would experience lower noise levels than receptors higher up the hillside near the houses. This is due to the noise shadow, which is the location immediately adjacent to an obstruction where the building is providing greater noise level reductions than it does further away.

As shown in Table 4-2, noise levels at the property line of the adjacent residential properties would be less than the apparent noise level limits. However, these receivers are located on a property line that does not include a residential zone and there is no open space noise level limit. Thus, the assessment also looked at the boundary between the residential zoning and the open space zoning. Noise levels at the property boundary of the OR-1-1 and RS-1-7 zoning, represented by each of the even numbered receiver points, would not exceed the daytime, evening, or nighttime noise level limits at the property line. Therefore, operational noise levels comply with the City's noise standards and no impacts are anticipated and no mitigation is required.

5.0 CONSTRUCTION NOISE LEVELS

Construction noise represents a short-term impact on the ambient noise levels. Noise generated by construction equipment includes haul trucks, water trucks, graders, dozers, loaders and scrapers can reach relatively high levels. Grading activities typically represent one of the highest potential sources for noise impacts. The most effective method of controlling construction noise is through local control of construction hours and by limiting the hours of construction to normal weekday working hours. Division 4 of Article 9.5 of the City of San Diego Municipal Code (SDMC) addresses the limits of disturbing or offensive construction noise. The SDMC that with the exception of an emergency, it is unlawful to conduct any construction activity as to cause, at or beyond the property lines of any property zoned residential, an average sound level greater than 75 decibels during the 12-hour period from 7:00 a.m. to 7:00 p.m.

The U.S. Environmental Protection Agency (U.S. EPA) compiled data regarding the noise generating characteristics of specific types of construction equipment. Noise levels generated by heavy construction equipment can range from 60 dBA to 100 dBA when measured at 50 feet. However, these noise levels diminish rapidly with distance from the construction site at a rate of approximately 6 dBA per doubling of distance. For example, a noise level of 75 dBA measured at 50 feet from the noise source to the receptor would be reduced to 69 dBA at 100 feet and be reduced to 63 dBA at 200 feet from the source. Using a point-source noise prediction model, calculations of the expected construction noise levels were completed. The essential model input data for these performance equations include the source levels of the equipment, source to receiver horizontal and vertical separations, the amount of time the equipment is operating in a given day.

5.1 Potential Noise Impact Identification

Based on EPA noise emissions, empirical data and the amount of equipment needed, worst-case noise levels from the construction equipment would occur during demolition and grading activities. The anticipated construction list for the construction activities includes a dozer, two backhoes/tractors, two cranes, a water truck, a trencher and a grader. Due to physical constraints and normal site preparation operations, the equipment will be spread out over the site. Based upon the site plan, the construction operations may occur near the property line while other operations are located over 200-feet from the same property line with and average distance of 115-feet from the center of the construction operations to the property lines.

Not all the equipment will operate continuously over an 8 hour period, the equipment was assumed continuous to be conservative and determine the worst-case noise levels. As can be seen in Table 5-1 below, if all the equipment was operating in the same location, which is not physically possible, at an average distance of 115-feet from the nearest property line the point source noise attenuation from construction activities is 7.2 dBA. This would result in an anticipated worst-case combined noise level of less than 75 dBA at the property line. This would result in an anticipated worst-case combined noise level of 73.3 dBA over a 12-hour average at the property line. Given this and the spatial separation of the equipment, the noise levels will comply with the City's average 75 dBA 12-hour standard at all property lines.

Table 5-1: Construction Noise Levels

Construction Equipment	Quantity	Source Level @ 50-Feet (dBA)*	Duty Cycle (Hours/Day)	Cumulative 12-Hour Noise Level (dBA)
Graders	1	74	8	72.2
Rubber Tired Dozers	1	72	8	70.2
Water Truck	1	70	8	68.2
Tractors/Loaders/Backhoes	2	73	8	74.2
Trencher	1	72	8	70.2
Cranes	2	75	8	76.2
Cumulative Noise Levels @ 50-Feet (dBA)				**80.5**
Nearest Average Distance (Feet)				**115**
Anticipated Property Line Noise Level @ 100-Feet (dBA)				**73.3**
*Source: U.S. Environmental Protection Agency (U.S. EPA) and Empirical Data				

5.2 Conclusions

The construction related equipment will be spread out over the project site as close as 30-feet to the nearest property line while other operations are located as far as 200-feet from the same property line. Based upon the findings even if all the equipment was located, at a distance as close as 115-feet from the nearest property line, which is not physically possible, the combined noise level would be less than 75 dBA. Given this and the spatial separation of the equipment, the noise levels from the demolition activities and construction activities will comply with the City of San Diego's average 75 dBA 12-hour standard and no impacts will occur and no mitigation measures are required.

R·E·C

100-YEAR ROUTING ANALYSIS

For

RAY & JOAN KROC COMMUNITY CENTER

SAN DIEGO, CA

Prepared For:

The Salvation Army

April, 2017

REC Consultants
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CIVIL
STATE OF CALIFORNIA

TABLE OF CONTENTS

CHAPTER 1 - EXECUTIVE SUMMARY

1.1 - Introduction

The Kroc Community Center project site is located within the existing Salvation Army Kroc Center at the intersection of Aragon Drive and University Avenue within the City of San Diego, California.

The project site drains to one (1) point of discharge located at the existing storm drain located to the northwest of the proposed improvements within the project site.

This study performs rational method hydrologic analysis and a modified-puls detention routing of developed condition 100-year peak flowrates from the project site to the receiving offsite storm drain infrastructure.

Treatment of storm water runoff from the site has been addressed in a separate report - the “Storm Water Quality Management Plan for the Kroc Community Center” by REC. Hydromodification (HMP) analysis has been presented within the “Technical Memorandum: SWMM Modeling for Kroc Community Center”, dated April, 2017 by REC.

Per 1984 City of San Diego drainage criteria, the Modified Rational Method should be used to determine peak design flowrates when the contributing drainage area is less than 1.0 square mile.

Methodology used for the computation of hydrographs is consistent with criteria set forth in the “2003 County of San Diego Drainage Design Manual.” A more detailed explanation of methodology used for this analysis is listed in Chapter 2 of this report.

Hydraulic Modified-Puls detention basin routing of the modified rational method hydrology was performed using the Army Corps of Engineers HEC-HMS 4.0 software.

1.2 – Summary of Pre-Developed Conditions

In current existing conditions, the overall Salvation Army Kroc Center is a fully developed community use facility including structures, pavements and open space landscaped areas. The project site incorporates a private storm drain system that conveys flows generated by the project site to receiving offsite storm drain systems.

Per the 1984 City of San Diego Drainage Design Manual, a land use runoff coefficient of 0.68 was determined for the existing condition (0.35 for pervious surfaces and 0.9 for impervious areas). A maximum internal flow length of 900 feet was used to determine a time of concentration of 17 minutes. Per the 1984 City of San Diego’s Intensity Duration Frequency (IDF) Curve, a corresponding runoff intensity of 2.6 in/hr has been assumed. Table 1 summarizes the pre-developed condition rational method analysis. Calculations are provided in Chapter 3 of this report.

TABLE 1 – SUMMARY OF PRE-DEVELOPED CONDITIONS 100-YEAR EVENT FLOW

Drainage Area	Drainage Area (Ac)	Runoff Coefficient (C)	Intensity (in/hr)	Tc (min)	100-Year Peak Flow (cfs)
Existing Site	14.72	0.68	2.6	17	26.02

1.3 – Summary of Developed Conditions

The Kroc Community Center project comprises of a proposed triple story parking structure incorporating a soccer field constructed on the roof of the structure development. The parking structure is to be constructed on a currently vegetated open space/soccer field site within the Salvation Army Kroc Center campus.

Storm water runoff from the proposed project site is routed to one (1) point of discharge located to the northwest corner of the project site. Runoff from the developed project site is drained to one (1) onsite receiving multi-purpose HMP and Q100 detention facility. Once flows are routed via the proposed detention vault, developed onsite flows are then conveyed to the existing storm drain located within the project site.

Per the 1984 City of San Diego Drainage Design Manual, land use runoff coefficients of 0.71 and 0.68 have been assumed for the existing Salvation Army Kroc Center campus and the proposed parking structure improvements respectively. Due to the limited overland flow length of the parking structure, the minimum allowable time of concentration of 5 minutes has been used. The remaining existing Salvation Army Kroc Center will use the same time of concentration calculated in pre-developed conditions given that this area remains untouched by the proposed improvements.

Per the 1984 City of San Diego's Intensity Duration Frequency (IDF) Curve, a corresponding runoff intensity of 4.4 in/hr has been assumed. Table 2 on the following page summarizes the developed condition rational method analysis. Calculations are provided in Chapter 3 of this report.

TABLE 2 – SUMMARY OF DEVELOPED CONDITION 100-YEAR EVENT FLOW

Drainage Area	Drainage Area (Ac)	Runoff Coefficient (C)	Intensity (in/hr)	Tc (min)	100-Year Peak Flow (cfs)
Existing Site	13.36	0.71(1)	2.6	17	24.66
Improvement Area	1.36	0.68	4.4	5	4.07
TOTAL	14.72	--	--	--	28.73

Note: (1) Impervious percentage increases given the removal of the soccer field area.

Prior to discharging from the site, first flush runoff will be treated via a BMP in accordance with standards set forth by the Regional Water Quality Control Board and the City of San Diego's Standards (see "Storm Water Quality Management Plan for Kroc Community Center" by REC).

One (1) dual purpose HMP and peak flow detention basin is located within the project site and is responsible for handling hydromodification & peak flow requirements for the project. In developed conditions, the basin vault will have a depth of 4 feet and a riser spillway structure set to 3.5 ft (see dimensions in Tables 3 & 4). Flows will then discharge from the basin via the outlet structure. The riser structure will act as a spillway such that peak flows can be safely discharged to the receiving storm drain system.

TABLE 3 – SUMMARY OF DEVELOPED DUAL PURPOSE DETENTION BASIN

BMP	Tributary Area (Ac)	DIMENSIONS					
		HMP Area(1), (ft^2)	Vault Depth (ft)	Vault Volume (ft^3)	Depth Riser Invert (ft)(2)	Weir Length(3) (ft)	Total Depth(4) (ft)
BASIN 1	2.41	800	4.0	3,200	3.5-ft	3-ft	4.0

Notes:
(1): Area of vault base footprint.
(2): Depth of ponding beneath riser structure's surface spillway.
(3): Overflow length of the internal emergency spillway weir.
(4): Total surface depth of BMP from top crest elevation to surface invert.

TABLE 4 – SUMMARY OF RISER DETAILS:

BMP	Lower Orifice			Lower Slot			Upper Slot		
	Diam. (in)	Number	Elev.(1) (ft)	Width (ft)	Height (ft)	Elev.(1) (ft)	Width (ft)	Height (ft)	Elev.(1) (ft)
BR-1	0.675	2	0.00	0.75	0.083	2.25	1.667	0.083	2.75

Notes: (1): Basin ground surface elevation assumed to be 0.00 ft elevation.

The developed condition peak flows calculated using modified rational method were then routed through the detention facility on the project site in HEC-HMS. The HMS Modified-Puls results are summarized in Table 5.

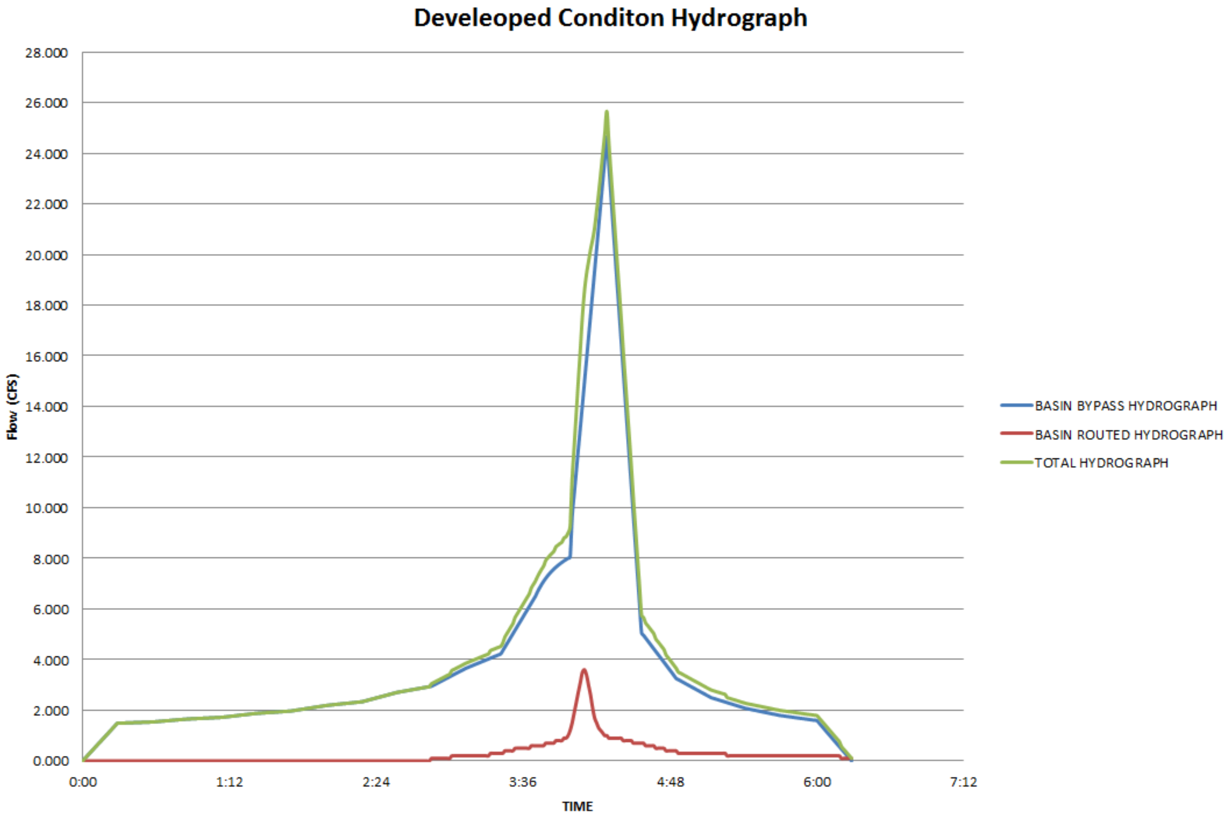
TABLE 5 – SUMMARY OF DETENTION BASIN ROUTING

Detention Basin	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)	Tc (min)	Peak Water Surface Elevation (ft)
BMP-1	4.1	3.6	6	3.9

Input hydrographs for the HMS analysis were generated using the method set forth in the *"2003 County of San Diego Drainage Design Manual"* and are provided in Chapter 3 of this report.

The outflow hydrograph from the detention basin was then confluenced with the offsite hydrograph to determine a total peak flow of 25.66 cfs as identified in Figure 1.

Figure 1 – Developed Conditions Hydrographs



Rational method hydrographs, stage-storage, stage-discharge relationships and HEC-HMS model output is provided in Chapter 3 of this report.

1.4 - Summary of Results

Table 6 below summarizes developed and existing condition drainage areas and resultant 100-year peak flow rates from the Salvation Army Kroc Center.

TABLE 7 – SUMMARY OF PEAK FLOWS

Condition	Drainage Area (Ac)	100 Year Peak Discharge (cfs)
Existing Condition	14.72	26.02
Developed Condition	14.72	25.66
Difference	**0.0**	**- 0.36**

As shown in the above table, the improvements of the Kroc Community Center project site will not increase peak when compared to the existing condition.

All developed runoff will receive water quality treatment in accordance with the site specific SWQMP. Additionally, the project is HMP compliant as analyzed in the Hydromodification Technical Memo.

1.5 - References

City of San Diego Drainage Design Manual, April 1984

County of San Diego Design Hydrology Manual, June 2003

"*Storm Water Quality Management Plan for Kroc Community Center*", REC Consulatnts, April, 2017.

"*Technical Memorandum: SWMM Modeling for Kroc Community Center*", REC Consultants, April, 2017.

CHAPTER 2

METHODOLOGY

2.1 – City of San Diego Intensity Duration Frequency Curve & Runoff Coefficients

RAINFALL
INTENSITY - DURATION - FREQUENC
CURVES
for
COUNTY OF SAN DIEGO

APPENDIX I

ELEV.	FACTOR
0–1500	1.00
1500–3000	1.25
3000–4000	1.42
4000–5000	1.60
5000–6000	1.70
DESERT	1.25

To obtain correct intensity, multiply intensity on chart by factor for design elevation.

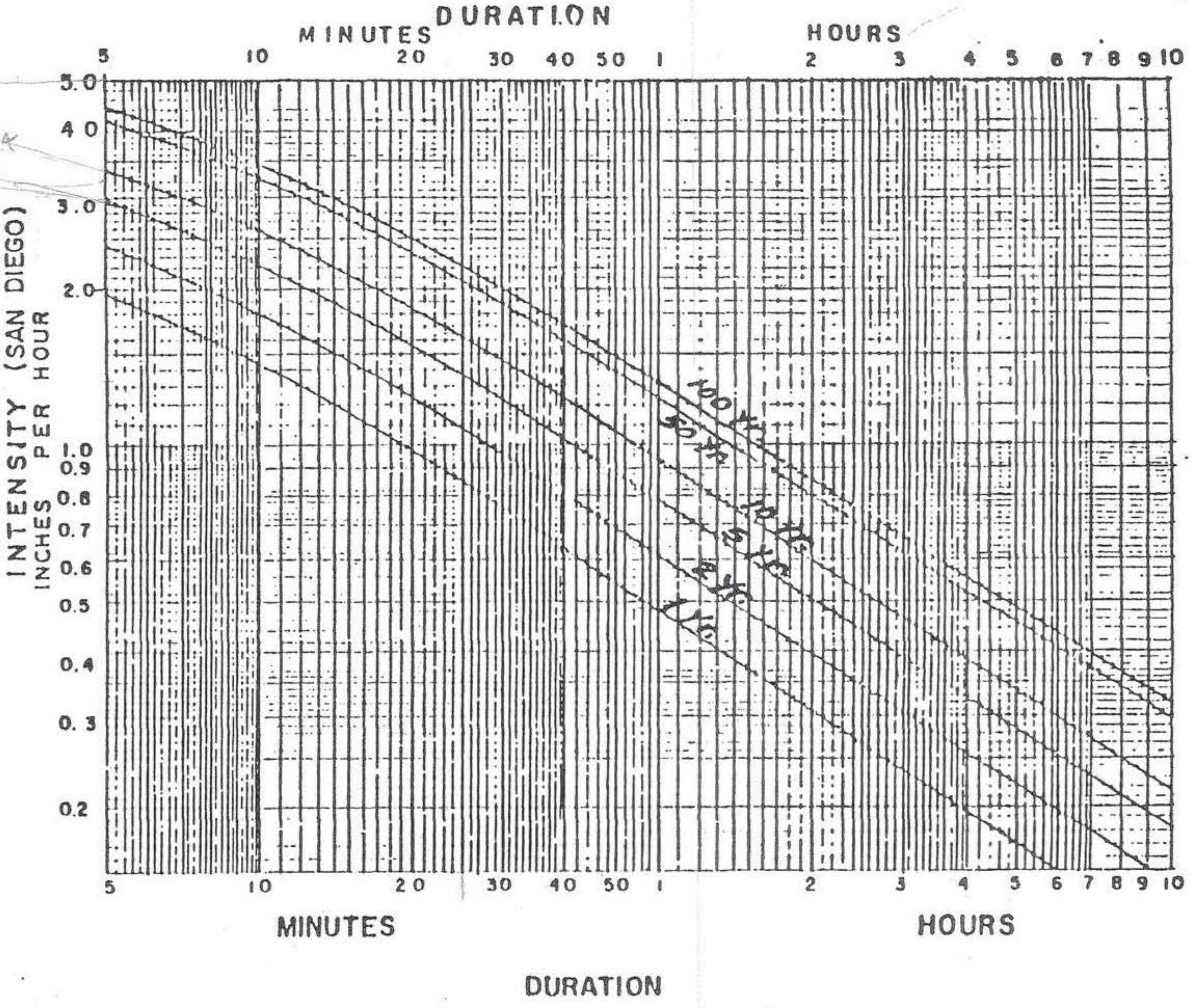


TABLE 2

RUNOFF COEFFICIENTS (RATIONAL METHOD)

DEVELOPED AREAS (URBAN)

Land Use	Coefficient, C Soil Type (1)
Residential:	D
Single Family	.55
Multi-Units	.70
Mobile Homes	.65
Rural (lots greater than 1/2 acre)	.45
Commercial (2) 80% Impervious	.85
Industrial (2) 90% Impervious	.95

NOTES:

(1) Type D soil to be used for all areas.

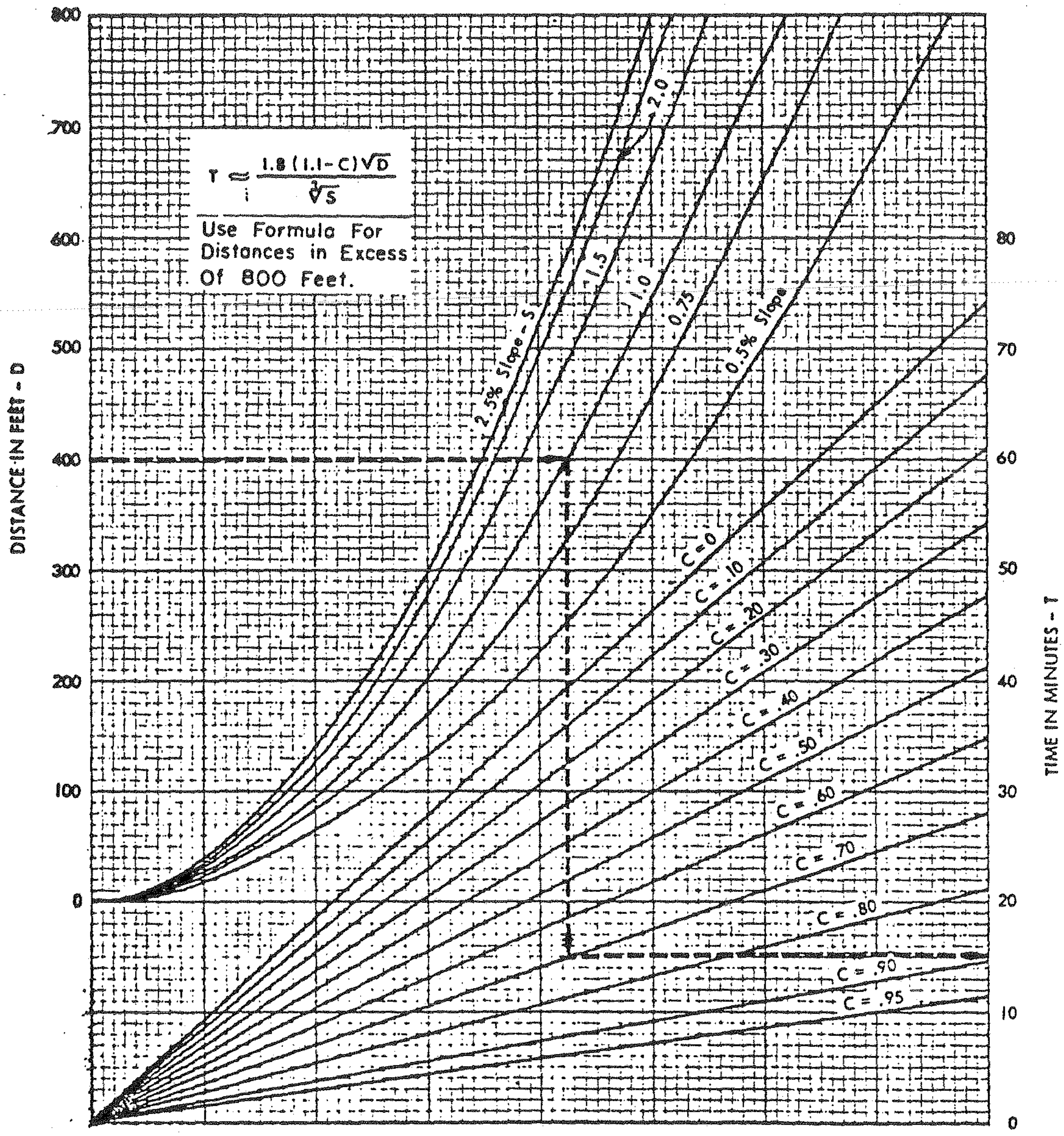
(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in no case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%

Tabulated imperviousness = 80%

$$\text{Revised C} = \frac{50}{80} \times 0.85 = 0.53$$

URBAN AREAS OVERLAND TIME OF FLOW CURVES



Surface Flow Time Curves

EXAMPLE:

GIVEN: LENGTH OF FLOW = 400 FT.
SLOPE = 1.0 %
COEFFICIENT OF RUNOFF C = .70

READ: OVERLAND FLOWTIME = 15 MINUTES

CHAPTER 2

METHODOLOGY

2.2 – Hydrograph Development Summary (from San Diego County Hydrology Manual)

SECTION 6
RATIONAL METHOD HYDROGRAPH PROCEDURE

6.1 INTRODUCTION

The procedures in this section are for the development of hydrographs from RM study results for study areas up to approximately 1 square mile in size. The RM, discussed in Section 3, is a mathematical formula used to determine the maximum runoff rate from a given rainfall. It has particular application in urban storm drainage, where it is used to estimate peak runoff rates from small urban and rural watersheds for the design of storm drains and small drainage structures. However, in some instances such as for design of detention basins, the peak runoff rate is insufficient information for the design, and a hydrograph is needed. Unlike the NRCS hydrologic method (discussed in Section 4), the RM itself does not create hydrographs. The procedures for detention basin design based on RM study results were first developed as part of the East Otay Mesa Drainage Study. Rick Engineering Company performed this study under the direction of County Flood Control. The procedures in this section may be used for the development of hydrographs from RM study results for study areas up to approximately 1 square mile in size.

6.2 HYDROGRAPH DEVELOPMENT

The concept of this hydrograph procedure is based on the RM formula:

$$Q = C\ I\ A$$

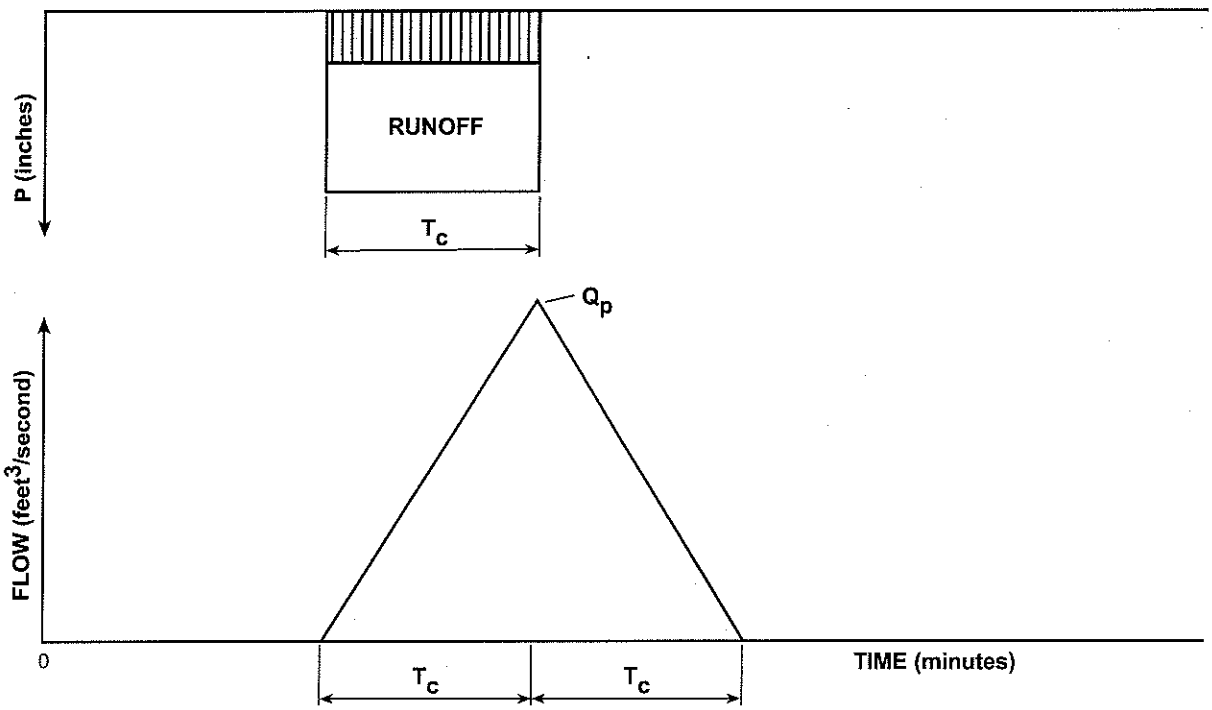
Where: Q = peak discharge, in cubic feet per second (cfs)
C = runoff coefficient, proportion of the rainfall that runs off the surface (no units)
I = average rainfall intensity for a duration equal to the T_c for the area, in inches per hour
A = drainage area contributing to the design location, in acres

The RM formula is discussed in more detail in Section 3.

An assumption of the RM is that discharge increases linearly over the T_c for the drainage area until reaching the peak discharge as defined by the RM formula, and then decreases linearly. A linear hydrograph can be developed for the peak flow occurring over the T_c as shown in Figure 6-1. However, for designs that are dependent on the total storm volume, it is not sufficient to consider a single hydrograph for peak flow occurring over the T_c at the beginning of a 6-hour storm event because the hydrograph does not account for the entire volume of runoff from the storm event. The volume under the hydrograph shown in Figure 6-1 is equal to the rainfall intensity multiplied by the duration for which that intensity occurs (T_c), the drainage area (A) contributing to the design location, and the runoff coefficient (C) for the drainage area. For designs that are dependent on the total storm volume, a hydrograph must be generated to account for the entire volume of runoff from the 6-hour storm event. The hydrograph for the entire 6-hour storm event is generated by creating a rainfall distribution consisting of blocks of rain, creating an incremental hydrograph for each block of rain, and adding the hydrographs from each block of rain. This process creates a hydrograph that contains runoff from all the blocks of rain and accounts for the entire volume of runoff from the 6-hour storm event. The total volume under the resulting hydrograph is equal to the following equation:

$$VOL = CP_6A \qquad \text{(Eq. 6-1)}$$

Where: VOL = volume of runoff (acre-inches)
P_6 = 6-hour rainfall (inches)
C = runoff coefficient
A = area of the watershed (acres)



Triangular Hydrograph

FIGURE

6-1

6.2.1 Rainfall Distribution

Figure 6-2 shows a 6-hour rainfall distribution consisting of blocks of rain over increments of time equal to T_c. The number of blocks is determined by rounding T_c to the nearest whole number of minutes, dividing 360 minutes (6 hours) by T_c, and rounding again to the nearest whole number. The blocks are distributed using a (2/3, 1/3) distribution in which the peak rainfall block is placed at the 4-hour time within the 6-hour rainfall duration. The additional blocks are distributed in a sequence alternating two blocks to the left and one block to the right of the 4-hour time (see Figure 6-2). The total amount of rainfall ($P_{T(N)}$) for any given block (N) is determined as follows:

$$P_{T(N)} = (I_{T(N)}\ T_{T(N)}) / 60$$

Where: $P_{T(N)}$ = total amount of rainfall for any given block (N)

$I_{T(N)}$ = average rainfall intensity for a duration equal to $T_{T(N)}$ in inches per hour

$T_{T(N)}$ = NT_c in minutes (N is an integer representing the given block number of rainfall)

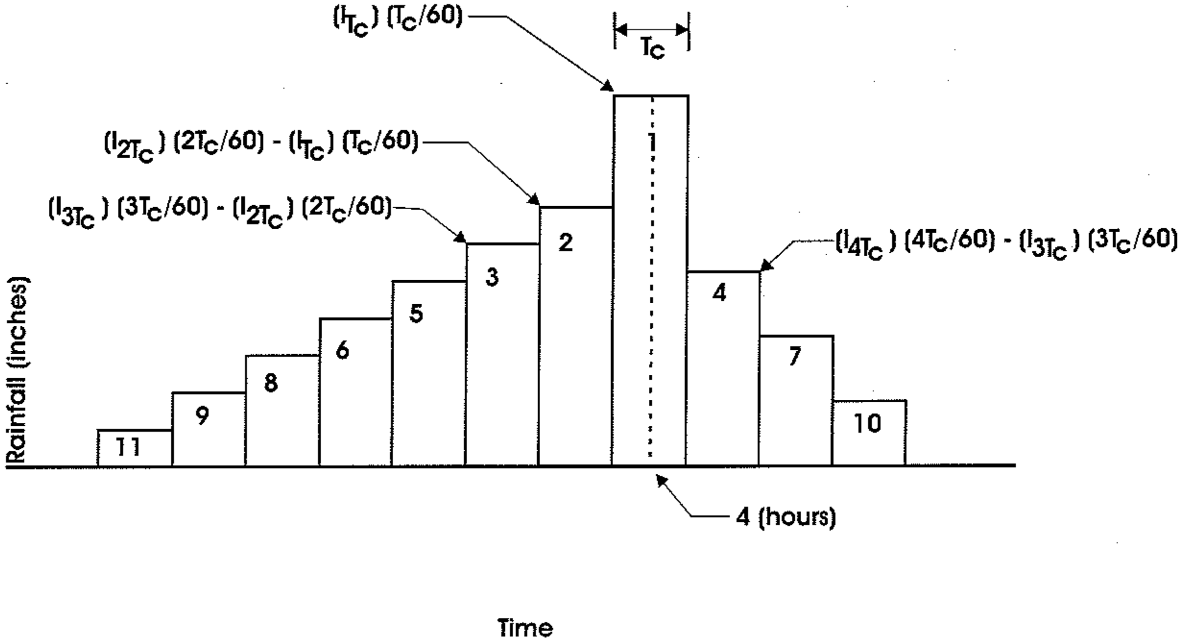
Intensity is calculated using the following equation (described in detail in Section 3):

$$I = 7.44\ P_6\ D^{-0.645}$$

Where: I = average rainfall intensity for a duration equal to D in inches per hour

P_6 = adjusted 6-hour storm rainfall

D = duration in minutes



Rainfall Distribution

FIGURE

6-2

Substituting the equation for I in the equation above for $P_{T(N)}$ and setting the duration (D) equal to $T_{T(N)}$ yields:

$$P_{T(N)} = [(7.44\ P_6/T_{T(N)}{}^{0.645})(T_{T(N)})] / 60$$
$$P_{T(N)} = 0.124\ P_6 T_{T(N)}{}^{0.355}$$

Substituting NT_c for T_T (where N equals the block number of rainfall) in the equation above yields:

$$P_{T(N)} = 0.124\ P_6\ (NT_c)^{0.355} \qquad \text{(Eq. 6-2)}$$

Equation 6-2 represents the total rainfall amount for a rainfall block with a time base equal to $T_{T(N)}$ (NT_c). The actual time base of each rainfall block in the rainfall distribution is T_c, as shown in Figure 6-2. The actual rainfall amount (P_N) for each block of rain is equal to P_T at N ($P_{T(N)}$) minus the previous P_T at N–1 ($P_{T(N-1)}$) at any given multiple of T_c (any NT_c). For example, the rainfall for block 2 is equal to $P_{T(N)}$ at $T_{T(N)} = 2T_c$ minus the $P_{T(N)}$ at $T_{T(N)} = 1T_c$, and the rainfall for block 3 equals $P_{T(N)}$ at $T_{T(N)} = 3T_c$ minus the $P_{T(N)}$ at $T_{T(N)} = 2T_c$, or P_N can be represented by the following equation:

$$P_N = P_{T(N)} - P_{T(N-1)} \qquad \text{(Eq. 6-3)}$$

For the rainfall distribution, the rainfall at block N = 1, ($1T_c$), is centered at 4 hours, the rainfall at block N = 2, ($2T_c$), is centered at 4 hours – $1T_c$, the rainfall at block N = 3, ($3T_c$), is centered at 4 hours – $2T_c$, and the rainfall at at block N = 4, ($4T_c$), is centered at 4 hours + $1T_c$. The sequence continues alternating two blocks to the left and one block to the right (see Figure 6-2).

6.2.2 Construction of Incremental Hydrographs

Figure 6-1 shows the relationship of a single block of rain to a single hydrograph. Figure 6-3 shows the relationship of the rainfall distribution to the overall hydrograph for the storm event. The peak flow amount from each block of rain is determined by the RM formula, Q = CIA, where I equals I_N (the actual rainfall intensity for the rainfall block). I_N is determined by dividing P_N by the actual time base of the block, T_c. The following equation shows this relationship:

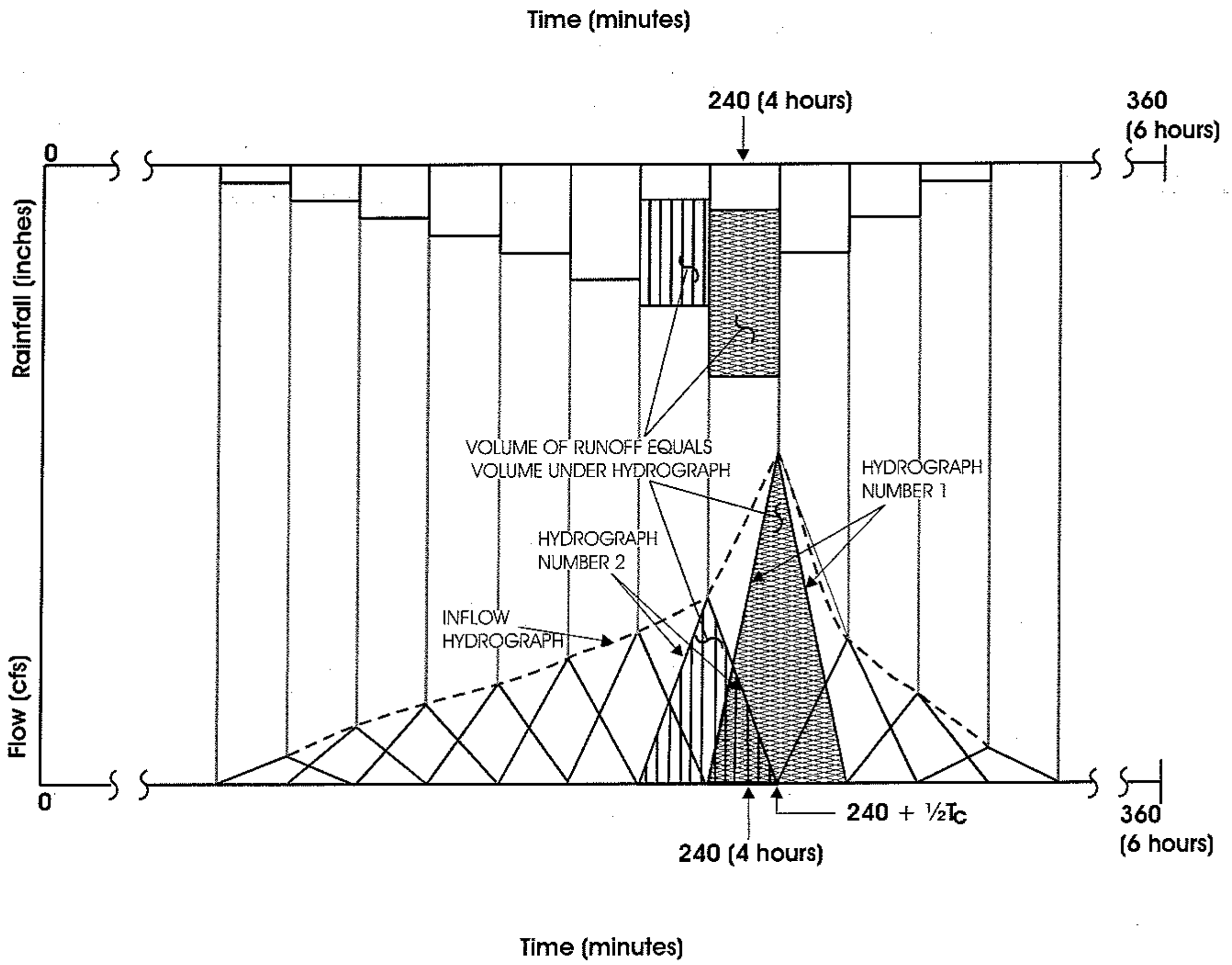
$$I_N = 60\ P_N/T_c \qquad \text{(Eq. 6-4)}$$

Where: I_N = average rainfall intensity for a duration equal to T_c in inches per hour
P_N = rainfall amount for the block in inches
T_c = time of concentration in minutes

By substituting equation 6-4 into the rational equation, the following relationship is obtained:

$$Q_N = 60\ CAP_N/T_c\ \text{(cfs)} \qquad \text{(Eq. 6-5)}$$

Finally, the overall hydrograph for the storm event is determined by adding all the hydrographs from each block of rain. Since the peak flow amount for each incremental hydrograph corresponds to a zero flow amount from the previous and proceeding hydrographs, as shown in Figure 6-3, the inflow hydrograph can be plotted by connecting the peak flow amounts (see the dashed line in Figure 6-3).



6-Hour Rational Method Hydrograph

FIGURE

6-3

6.3 GENERATING A HYDROGRAPH USING RATHYDRO

The rainfall distribution and related hydrographs can be developed using the RATHYDRO computer program provided to the County by Rick Engineering Company. A copy of this program is available at no cost from the County. The output from this computer program may be used with HEC-1 or other software for routing purposes.

The design storm pattern used by the RATHYDRO program is based on the (2/3, 1/3) distribution described in Sections 4.1.1 and 6.2.1. The ordinates on the hydrograph are calculated based on the County of San Diego Intensity-Duration Design Chart (Figure 3-1), which uses the intensity equation described in Sections 3.1.3 and 6.2.1 to relate the intensity (I) of the storm to T_c, $I = 7.44\ P_6 D^{-0.645}$. The computer program uses equations 6-2 and 6-3 described above and calculates I_N directly. The intensity at any given multiple of T_c is calculated by the following equation:

$$I_N = [(I_{T(N)})\ (T_{T(N)}) - (I_{T(N-1)})\ (T_{T(N-1)})] \ /\ T_c \qquad \text{(Eq. 6-6)}$$

Where: N = number of rainfall blocks

$T_{T(N)}$ = time of concentration at rainfall block N in minutes (equal to NT_c)

I_N = actual rainfall intensity at rainfall block N in inches per hour

$I_{T(N)}$ = rainfall intensity at time of concentration $T_{T(N)}$ in inches per hour

Figure 6-2 shows the rainfall distribution used in the RM hydrograph, computed at multiples of T_c. The rainfall at block N = 1, ($1T_c$), is centered at 4 hours, the rainfall at block N = 2, ($2T_c$), is centered at 4 hours – $1T_c$, the rainfall at block N = 3, ($3T_c$), is centered at 4 hours – $2T_c$, and the rainfall at at block N = 4, ($4T_c$), is centered at 4 hours + $1T_c$. The sequence continues alternating two blocks to the left and one block to the right (see Figure 6-2).

As described in Section 6.2.2, the peak discharge (Q_N) of the hydrograph for any given rainfall block (N) is determined by the RM formula Q = CIA, where $I = I_N$ = the actual rainfall intensity for the rainfall block. The RATHYDRO program substitutes equation 6-6 into the RM formula to determine Q_N yielding the following equation:

$$Q_N = [(I_{T(N)})\ (T_{T(N)}) - (I_{T(N-1)})\ (T_{T(N-1)})]\ CA\ /\ T_c \qquad \text{(Eq. 6-7)}$$

Where: Q_N = peak discharge for rainfall block N in cubic feet per second (cfs)
N = number of rainfall blocks
$T_{T(N)}$ = time of concentration at rainfall block N in minutes (equal to NT_c)
$I_{T(N)}$ = rainfall intensity at time of concentration $T_{T(N)}$ in inches per hour
C = RM runoff coefficient
A = area of the watershed (acres)

To develop the hydrograph for the 6-hour design storm, a series of triangular hydrographs with ordinates at multiples of the given T_c are created and added to create the hydrograph. This hydrograph has its peak at 4 hours plus ½ of the T_c. The total volume under the hydrograph is equal to the following equation (equation 6-1):

$$VOL = CP_6A$$

Where: VOL = volume of runoff (acre-inches)
P_6 = 6-hour rainfall (inches)
C = runoff coefficient
A = area of the watershed (acres)

CHAPTER 3

MODIFIED-PULS DETENTION ROUTING

3.1 – Rational Method Calculations & Hydrographs

Weighted Runoff Coefficient Calculations

Pre-Developed Conditions

Note: Impervious Area C = 0.9, Pervious Area C = 0.35)

Impervious Area = 8.82 Ac
Pervious Area = 5.9 Ac
Total 14.72 Ac

Weighted C = 0.68

Post-Developed Conditions

Basin Bypass Area

Impervious Area = 8.82 Ac
Pervious Area = 4.54 Ac
Total 13.36 Ac

Weighted C = 0.71

Basin Tributary Area

Impervious Area = 0.82 Ac
Pervious Area = 0.54 Ac
Total 1.36 Ac

Weighted C = 0.68

Time of Concentration Calculation

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

Where:
C = 0.68
D = 900 ft
s = 2.3 %

T = 17 minutes

Rational Method Calculations

Pre-Developed Conditions

Area	14.72	Ac	
C	0.68		
Tc	17	min	
Intensity	2.6	in/hr	(per 1984 City of San Diego IDF)

Q	26.02	cfs

Post-Developed Conditions

Basin Bypass Area

Area	13.36	Ac	
C	0.71		
Tc	17	min	
Intensity	2.6	in/hr	(per 1984 City of San Diego IDF)

Q	24.66	cfs

Basin Tributary Area

Area	1.36	Ac	
C	0.68		
Tc	5	min	
Intensity	4.4	in/hr	(per 1984 City of San Diego IDF)

Q	4.07	cfs

DETERMINATION OF 100 YR - 6 HR RUNOFF HYDROGRAPH - ONSITE

KROC CENTER - POST-DEV CONDITIONS

A: 1.36 acres
Tc: 5 min
C: 0.68
Q: 4.07 cfs

I: 4.400 in/hr
Δt: 5 min

time	P (in)	I (in/hr)	Position
5	0.370	4.440	49
10	0.570	2.404	48
15	0.710	1.682	47
20	0.820	1.313	50
25	0.911	1.089	46
30	0.989	0.937	45
35	1.058	0.827	51
40	1.120	0.744	44
45	1.176	0.679	43
50	1.228	0.625	52
55	1.277	0.581	42
60	1.322	0.544	41
65	1.365	0.513	53
70	1.405	0.485	40
75	1.444	0.461	39
80	1.480	0.439	54
85	1.515	0.420	38
90	1.549	0.403	37
95	1.581	0.388	55
100	1.612	0.374	36
105	1.642	0.361	35
110	1.672	0.349	56
115	1.700	0.338	34
120	1.727	0.328	33
125	1.754	0.318	57
130	1.779	0.310	32
135	1.804	0.302	31
140	1.829	0.294	58
145	1.853	0.287	30
150	1.876	0.280	29
155	1.899	0.274	59
160	1.921	0.268	28
165	1.943	0.262	27
170	1.965	0.257	60
175	1.986	0.252	26
180	2.006	0.247	25
185	2.026	0.242	61
190	2.046	0.238	24
195	2.065	0.233	23
200	2.085	0.229	62
205	2.103	0.225	22
210	2.122	0.222	21
215	2.140	0.218	63
220	2.158	0.215	20
225	2.176	0.211	19
230	2.193	0.208	64
235	2.210	0.205	18
240	2.227	0.202	17
245	2.244	0.199	65

time	I (in/hr)	Position	Q (cfs)	
0	0	0	0.000	
5	0.154	1	0.143	
10	0.155	2	0.145	
15	0.158	3	0.147	
20	0.160	4	0.149	
25	0.163	5	0.152	
30	0.165	6	0.154	
35	0.168	7	0.157	
40	0.170	8	0.159	
45	0.174	9	0.162	
50	0.176	10	0.164	
55	0.180	11	0.168	
60	0.182	12	0.170	
65	0.187	13	0.174	
70	0.189	14	0.176	
75	0.194	15	0.181	
80	0.197	16	0.183	
85	0.202	17	0.189	
90	0.205	18	0.191	
95	0.211	19	0.197	
100	0.215	20	0.200	
105	0.222	21	0.207	
110	0.225	22	0.210	
115	0.233	23	0.218	
120	0.238	24	0.222	
125	0.247	25	0.230	
130	0.252	26	0.235	
135	0.262	27	0.244	
140	0.268	28	0.250	
145	0.280	29	0.261	
150	0.287	30	0.267	
155	0.302	31	0.281	
160	0.310	32	0.289	
165	0.328	33	0.306	
170	0.338	34	0.315	
175	0.361	35	0.336	
180	0.374	36	0.348	
185	0.403	37	0.376	
190	0.420	38	0.392	
195	0.461	39	0.430	
200	0.485	40	0.452	
205	0.544	41	0.508	
210	0.581	42	0.542	
215	0.679	43	0.633	
220	0.744	44	0.694	
225	0.937	45	0.874	
230	1.089	46	1.015	
235	1.682	47	1.568	
240	2.404	48	2.241	
245	4.440	49	4.070	**Max Q**

250	2.260	0.197	16
255	2.276	0.194	15
260	2.292	0.192	66
265	2.308	0.189	14
270	2.323	0.187	13
275	2.339	0.184	67
280	2.354	0.182	12
285	2.369	0.180	11
290	2.384	0.178	68
295	2.398	0.176	10
300	2.413	0.174	9
305	2.427	0.172	69
310	2.441	0.170	8
315	2.455	0.168	7
320	2.469	0.166	70
325	2.483	0.165	6
330	2.497	0.163	5
335	2.510	0.161	71
340	2.523	0.160	4
345	2.536	0.158	3
350	2.549	0.157	72
355	2.562	0.155	2
360	2.575	0.154	1

250	1.313	50	1.225
255	0.827	51	0.772
260	0.625	52	0.583
265	0.513	53	0.478
270	0.439	54	0.410
275	0.388	55	0.361
280	0.349	56	0.325
285	0.318	57	0.297
290	0.294	58	0.274
295	0.274	59	0.255
300	0.257	60	0.239
305	0.242	61	0.226
310	0.229	62	0.214
315	0.218	63	0.203
320	0.208	64	0.194
325	0.199	65	0.186
330	0.192	66	0.179
335	0.184	67	0.172
340	0.178	68	0.166
345	0.172	69	0.160
350	0.166	70	0.155
355	0.161	71	0.150
360	0.157	72	0.146

DETERMINATION OF 100 YR - 6 HR RUNOFF HYDROGRAPH - BASIN BYPASS

KROC CENTER - POST-DEV CONDITIONS

I: 2.6 in/hr

Δt: 17 min

A: 13.36 acres

Tc: 17 min

C: 0.71

Q: 24.66 cfs

time	P (in)	I (in/hr)	Position
17	0.760	2.661	15.00
34	1.048	1.008	14.00
51	1.243	0.680	13.00
69	1.394	0.530	16.00
86	1.520	0.442	12.00
103	1.630	0.383	11.00
120	1.727	0.341	17.00
137	1.815	0.308	10.00
154	1.896	0.283	9.00
171	1.971	0.262	18.00
189	2.040	0.244	8.00
206	2.106	0.230	7.00
223	2.168	0.217	19.00
240	2.227	0.206	6.00
257	2.283	0.196	5.00
274	2.337	0.188	20.00
291	2.388	0.180	4.00
309	2.437	0.173	3.00
326	2.485	0.167	21.00
343	2.531	0.161	2.00
360	2.575	0.155	1.00

time	I (in/hr)	Position	Q (cfs)
0	0	0	0.000
17	0.155	1	1.487
34	0.161	2	1.537
51	0.173	3	1.653
69	0.180	4	1.720
86	0.196	5	1.877
103	0.206	6	1.970
120	0.230	7	2.197
137	0.244	8	2.338
154	0.283	9	2.703
171	0.308	10	2.948
189	0.383	11	3.664
206	0.442	12	4.227
223	0.680	13	6.503
240	1.008	14	9.644
257	2.600	15	24.660
274	0.530	16	5.069
291	0.341	17	3.258
309	0.262	18	2.504
326	0.217	19	2.076
343	0.188	20	1.794
360	0.167	21	1.593

SUMMATIONOF 100 YR - 6 HR RUNOFF HYDROGRAPHS - DEVELOPED CONDITION

BASIN BYPASS HYDROGRAH

t	Q (cfs)
0:00	0.000
0:01	0.087
0:02	0.175
0:03	0.262
0:04	0.350
0:05	0.437
0:06	0.525
0:07	0.612
0:08	0.700
0:09	0.787
0:10	0.874
0:11	0.962
0:12	1.049
0:13	1.137
0:14	1.224
0:15	1.312
0:16	1.399
0:17	1.487
0:18	1.490
0:19	1.493
0:20	1.496
0:21	1.499
0:22	1.502
0:23	1.505
0:24	1.507
0:25	1.510
0:26	1.513
0:27	1.516
0:28	1.519
0:29	1.522
0:30	1.525
0:31	1.528
0:32	1.531
0:33	1.534
0:34	1.537
0:35	1.544
0:36	1.551
0:37	1.558
0:38	1.565
0:39	1.571
0:40	1.578
0:41	1.585
0:42	1.592
0:43	1.599
0:44	1.606
0:45	1.612

BASIN ROUTED HYDROGRAPH

t	Q (cfs)
0:00	0.0
0:01	0.0
0:02	0.0
0:03	0.0
0:04	0.0
0:05	0.0
0:06	0.0
0:07	0.0
0:08	0.0
0:09	0.0
0:10	0.0
0:11	0.0
0:12	0.0
0:13	0.0
0:14	0.0
0:15	0.0
0:16	0.0
0:17	0.0
0:18	0.0
0:19	0.0
0:20	0.0
0:21	0.0
0:22	0.0
0:23	0.0
0:24	0.0
0:25	0.0
0:26	0.0
0:27	0.0
0:28	0.0
0:29	0.0
0:30	0.0
0:31	0.0
0:32	0.0
0:33	0.0
0:34	0.0
0:35	0.0
0:36	0.0
0:37	0.0
0:38	0.0
0:39	0.0
0:40	0.0
0:41	0.0
0:42	0.0
0:43	0.0
0:44	0.0
0:45	0.0

TOTAL DEVELOPED HYDROGRAPH

t	Q (cfs)
0:00	0.000
0:01	0.087
0:02	0.175
0:03	0.262
0:04	0.350
0:05	0.437
0:06	0.525
0:07	0.612
0:08	0.700
0:09	0.787
0:10	0.874
0:11	0.962
0:12	1.049
0:13	1.137
0:14	1.224
0:15	1.312
0:16	1.399
0:17	1.487
0:18	1.490
0:19	1.493
0:20	1.496
0:21	1.499
0:22	1.502
0:23	1.505
0:24	1.507
0:25	1.510
0:26	1.513
0:27	1.516
0:28	1.519
0:29	1.522
0:30	1.525
0:31	1.528
0:32	1.531
0:33	1.534
0:34	1.537
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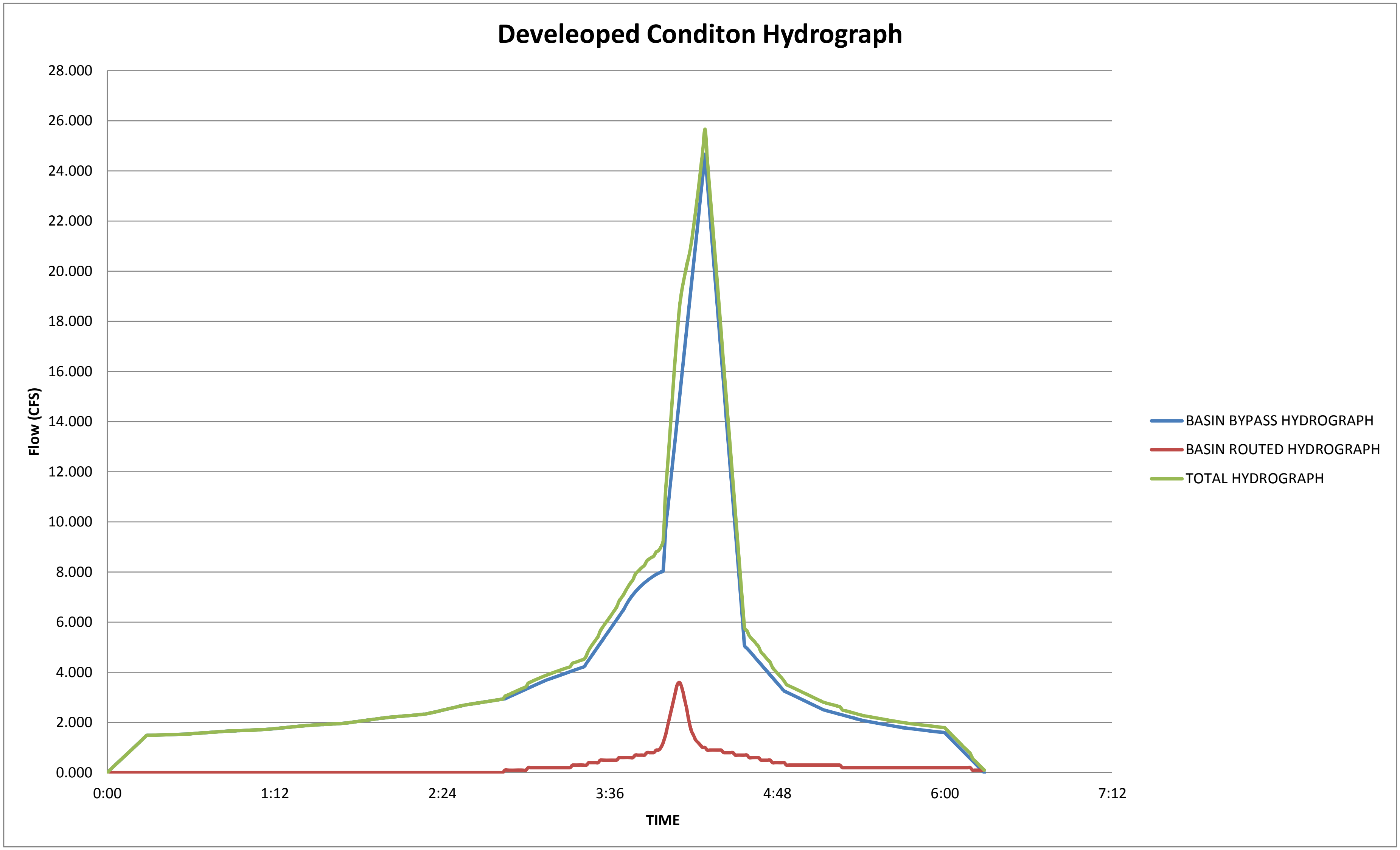
5:42	0.2
5:43	0.2
5:44	0.2
5:45	0.2
5:46	0.2
5:47	0.2
5:48	0.2
5:49	0.2
5:50	0.2
5:51	0.2
5:52	0.2
5:53	0.2
5:54	0.2
5:55	0.2
5:56	0.2
5:57	0.2

5:06	2.892
5:07	2.848
5:08	2.804
5:09	2.779
5:10	2.753
5:11	2.728
5:12	2.703
5:13	2.678
5:14	2.653
5:15	2.627
5:16	2.502
5:17	2.477
5:18	2.452
5:19	2.427
5:20	2.401
5:21	2.376
5:22	2.351
5:23	2.326
5:24	2.301
5:25	2.276
5:26	2.259
5:27	2.242
5:28	2.226
5:29	2.209
5:30	2.193
5:31	2.176
5:32	2.160
5:33	2.143
5:34	2.127
5:35	2.110
5:36	2.093
5:37	2.077
5:38	2.060
5:39	2.044
5:40	2.027
5:41	2.011
5:42	1.994
5:43	1.983
5:44	1.972
5:45	1.961
5:46	1.949
5:47	1.938
5:48	1.927
5:49	1.916
5:50	1.905
5:51	1.893
5:52	1.882
5:53	1.871
5:54	1.860
5:55	1.849
5:56	1.837
5:57	1.826

5:58	1.615
5:59	1.604
6:00	1.593
6:01	1.499
6:02	1.405
6:03	1.312
6:04	1.218
6:05	1.124
6:06	1.031
6:07	0.937
6:08	0.843
6:09	0.749
6:10	0.656
6:11	0.562
6:12	0.468
6:13	0.375
6:14	0.281
6:15	0.187
6:16	0.094
6:17	0.000

5:58	0.2
5:59	0.2
6:00	0.2
6:01	0.2
6:02	0.2
6:03	0.2
6:04	0.2
6:05	0.2
6:06	0.2
6:07	0.2
6:08	0.2
6:09	0.2
6:10	0.2
6:11	0.2
6:12	0.1
6:13	0.1
6:14	0.1
6:15	0.1
6:16	0.1
6:17	0.1

5:58	1.815
5:59	1.804
6:00	1.793
6:01	1.699
6:02	1.605
6:03	1.512
6:04	1.418
6:05	1.324
6:06	1.231
6:07	1.137
6:08	1.043
6:09	0.949
6:10	0.856
6:11	0.762
6:12	0.568
6:13	0.475
6:14	0.381
6:15	0.287
6:16	0.194
6:17	0.100



Develeoped Conditon Hydrograph
28.000
26.000
24.000
22.000
20.000
18.000
16.000
14.000
12.000
10.000
8.000
6.000
4.000
2.000
0.000
Flow (CFS)
0:00
1:12
2:24
3:36
4:48
6:00
7:12
TIME
BASIN BYPASS HYDROGRAPH
BASIN ROUTED HYDROGRAPH
TOTAL HYDROGRAPH

CHAPTER 3

MODIFIED-PULS DETENTION ROUTING

3.2 – Stage-Storage & Stage-Discharge Relationships

Stage-Storage Calculations

Elev (ft)	Area (ft^2)	Area (Ac)	Volume (Ac-ft)
0	800	0.0183655	0.0000
1	800	0.0183655	0.0184
2	800	0.0183655	0.0367
3	800	0.0183655	0.0551
4	800	0.0183655	0.0735

Outlet structure for Underground Detention System

Discharge vs Elevation Table

Low orifice: 0.675 "
Number: 2
Cg-low: 0.61
Middle orifice: 1 "
number of orif: 0
Cg-middle: 0.61
invert elev: 0.25 ft

Lower slot
Invert: 2.250 ft
B 0.75 ft
h 0.083 ft
Upper slot
Invert: 2.750 ft
B: 1.667 ft
h 0.083 ft

Emergency Weir
Invert: 3.500 ft
B: 3 ft

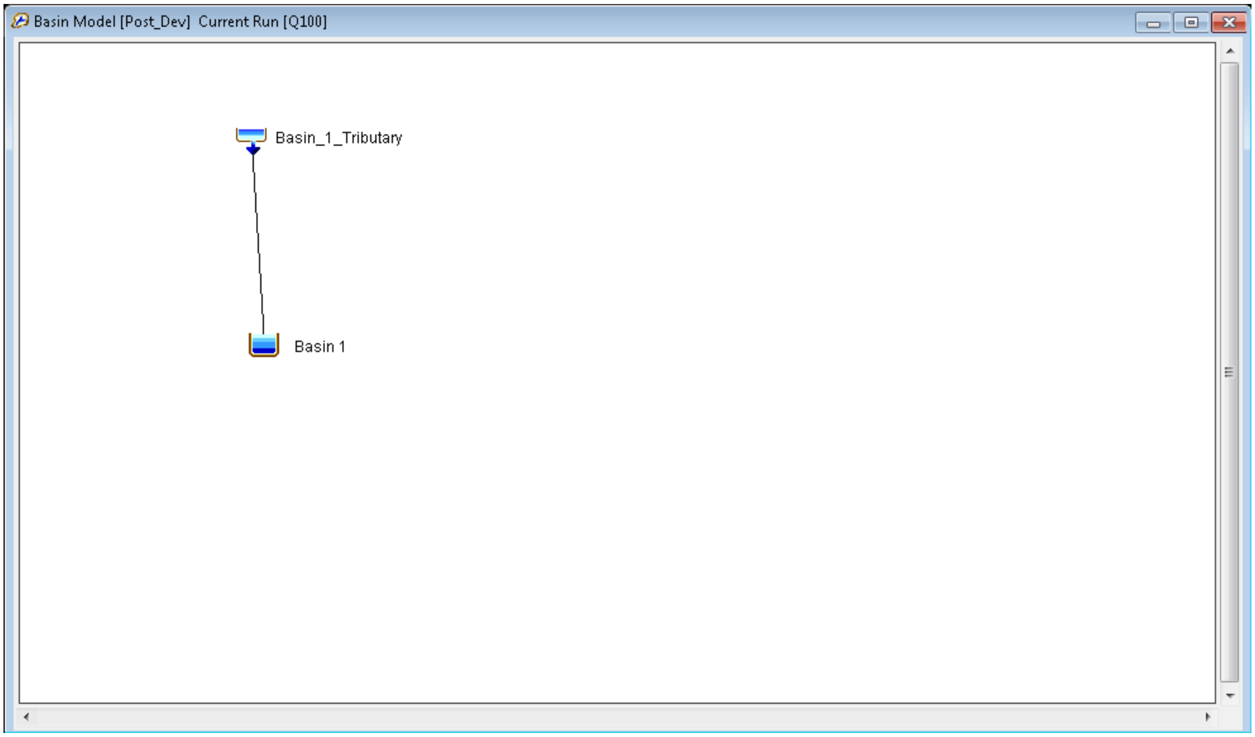
h (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qemer (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.100	1.778	0.000	0.007	0.008	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.200	3.556	0.000	0.010	0.012	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.010
0.300	5.333	0.600	0.013	0.113	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.400	7.111	1.800	0.015	0.148	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.015
0.500	8.889	3.000	0.017	0.167	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.017
0.600	10.667	4.200	0.018	0.184	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.018
0.700	12.444	5.400	0.020	0.199	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.020
0.800	14.222	6.600	0.021	0.214	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.900	16.000	7.800	0.023	0.227	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.023
1.000	17.778	9.000	0.024	0.240	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.024
1.100	19.556	10.200	0.025	0.252	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.025
1.200	21.333	11.400	0.026	0.263	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.026
1.300	23.111	12.600	0.027	0.274	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.027
1.400	24.889	13.800	0.028	0.285	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.028
1.500	26.667	15.000	0.030	0.295	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.030
1.600	28.444	16.200	0.031	0.305	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.031
1.700	30.222	17.400	0.031	0.315	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.031
1.800	32.000	18.600	0.032	0.324	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.032
1.900	33.778	19.800	0.033	0.333	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.033
2.000	35.556	21.000	0.034	0.342	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.034
2.100	37.333	22.200	0.035	0.350	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.035
2.200	39.111	23.400	0.036	0.359	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.036
2.300	40.889	24.600	0.037	0.367	0.037	0.000	0.000	0.000	0.026	0.000	0.000	0.063
2.400	42.667	25.800	0.037	0.375	0.037	0.000	0.000	0.000	0.101	0.000	0.000	0.138
2.500	44.444	27.000	0.038	0.383	0.038	0.000	0.000	0.000	0.140	0.000	0.000	0.178
2.600	46.222	28.200	0.039	0.390	0.039	0.000	0.000	0.000	0.170	0.000	0.000	0.209
2.700	48.000	29.400	0.040	0.398	0.040	0.000	0.000	0.000	0.196	0.000	0.000	0.235
2.800	49.778	30.600	0.041	0.405	0.041	0.000	0.000	0.000	0.218	0.058	0.000	0.316
2.900	51.556	31.800	0.041	0.412	0.041	0.000	0.000	0.000	0.239	0.224	0.000	0.504
3.000	53.333	33.000	0.042	0.419	0.042	0.000	0.000	0.000	0.257	0.310	0.000	0.610
3.100	55.111	34.200	0.043	0.426	0.043	0.000	0.000	0.000	0.275	0.378	0.000	0.695
3.200	56.889	35.400	0.043	0.433	0.043	0.000	0.000	0.000	0.292	0.434	0.000	0.769
3.300	58.667	36.600	0.044	0.440	0.044	0.000	0.000	0.000	0.307	0.485	0.000	0.836
3.400	60.444	37.800	0.045	0.447	0.045	0.000	0.000	0.000	0.322	0.530	0.000	0.897
3.500	62.222	39.000	0.045	0.453	0.045	0.000	0.000	0.000	0.336	0.572	0.000	0.954
3.600	64.000	40.200	0.046	0.460	0.046	0.000	0.000	0.000	0.350	0.611	0.294	1.301
3.700	65.778	41.400	0.047	0.466	0.047	0.000	0.000	0.000	0.363	0.648	0.832	1.890
3.800	67.556	42.600	0.047	0.473	0.047	0.000	0.000	0.000	0.376	0.683	1.528	2.634
3.900	69.333	43.800	0.048	0.479	0.048	0.000	0.000	0.000	0.388	0.716	2.353	3.504
4.000	71.111	45.000	0.048	0.485	0.048	0.000	0.000	0.000	0.400	0.747	3.288	4.484

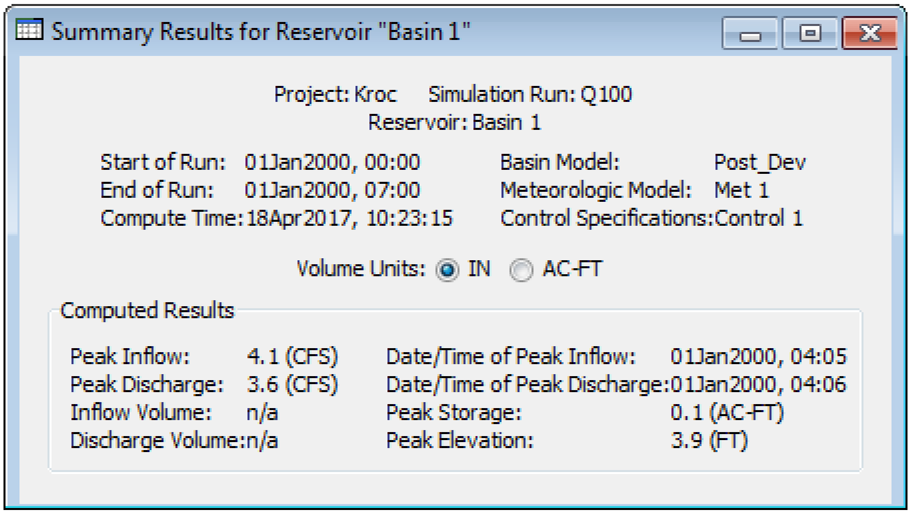
CHAPTER 3

MODIFIED-PULS DETENTION ROUTING

3.3 – HEC-HMS Modified-Puls Routing Results

HEC-HMS MODEL POC-1





Project: Kroc Simulation Run: Q100
Reservoir: Basin 1

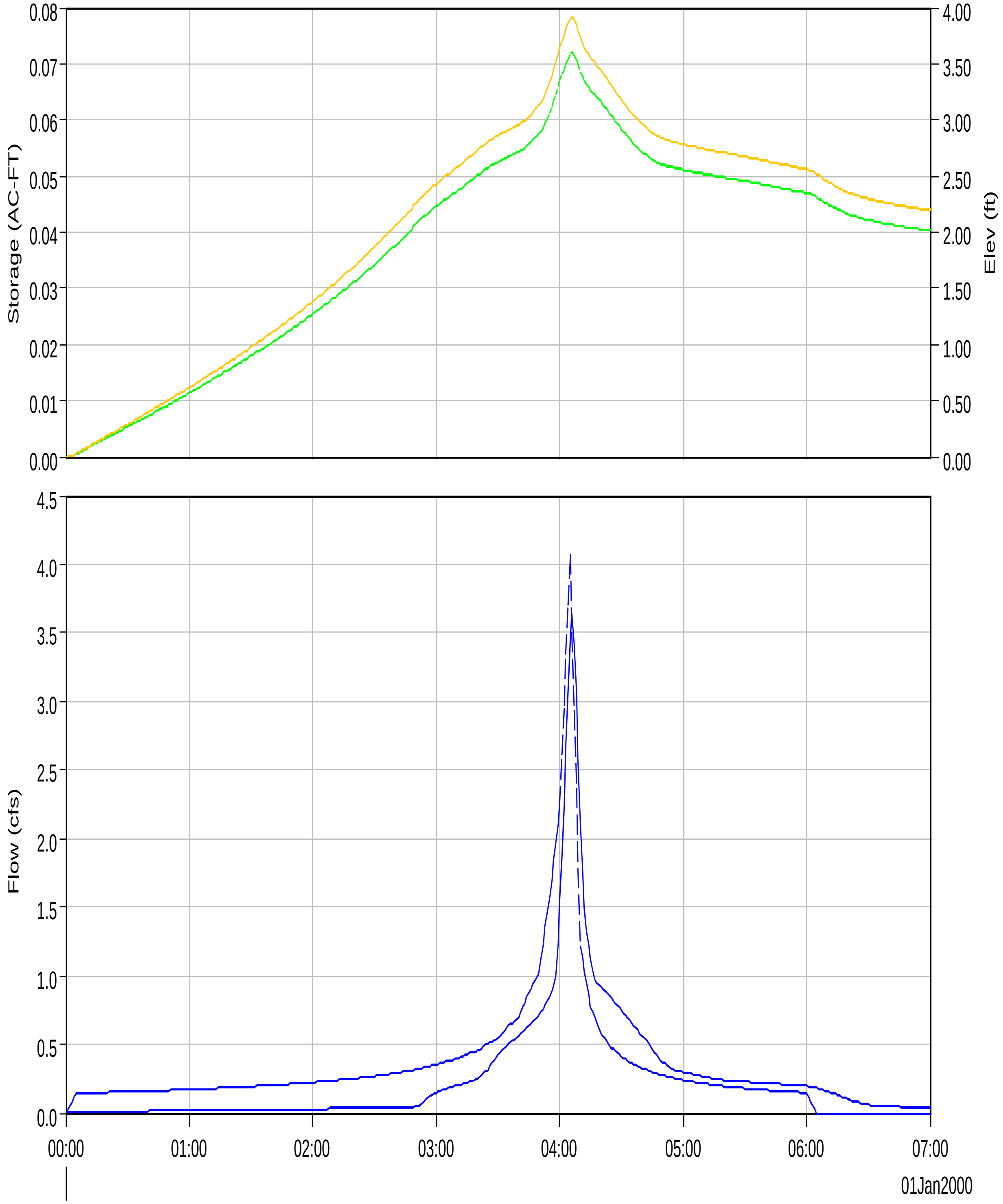
Start of Run:	01Jan2000, 00:00	Basin Model:	Post_Dev
End of Run:	01Jan2000, 07:00	Meteorologic Model:	Met 1
Compute Time:	18Apr2017, 10:23:15	Control Specifications:	Control 1

Volume Units: ● IN ○ AC-FT

Computed Results

Peak Inflow:	4.1 (CFS)	Date/Time of Peak Inflow:	01Jan2000, 04:05
Peak Discharge:	3.6 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:06
Inflow Volume:	n/a	Peak Storage:	0.1 (AC-FT)
Discharge Volume:	n/a	Peak Elevation:	3.9 (FT)

Reservoir "Basin 1" Results for Run "Q100"



Run:Q100 Element:Basin 1 Result:Storage

Run:Q100 Element:Basin 1 Result:Pool Elevation

Run:Q100 Element:Basin 1 Result:Outflow

Run:Q100 Element:Basin 1 Result:Combined Flow

Project: Kroc Simulation Run: Q100
Reservoir: Basin 1

Start of Run: 01Jan2000, 00:00 Basin Model: Post_Dev
End of Run: 01Jan2000, 07:00 Meteorologic Model: Met 1
Compute Time: 18Apr2017, 10:23:15 Control Specifications: Control 1

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	00:00	0.0	0.0	0.0	0.0
01Jan2000	00:01	0.0	0.0	0.0	0.0
01Jan2000	00:02	0.1	0.0	0.0	0.0
01Jan2000	00:03	0.1	0.0	0.0	0.0
01Jan2000	00:04	0.1	0.0	0.0	0.0
01Jan2000	00:05	0.1	0.0	0.0	0.0
01Jan2000	00:06	0.1	0.0	0.0	0.0
01Jan2000	00:07	0.1	0.0	0.0	0.0
01Jan2000	00:08	0.1	0.0	0.1	0.0
01Jan2000	00:09	0.1	0.0	0.1	0.0
01Jan2000	00:10	0.1	0.0	0.1	0.0
01Jan2000	00:11	0.1	0.0	0.1	0.0
01Jan2000	00:12	0.1	0.0	0.1	0.0
01Jan2000	00:13	0.1	0.0	0.1	0.0
01Jan2000	00:14	0.1	0.0	0.1	0.0
01Jan2000	00:15	0.1	0.0	0.1	0.0
01Jan2000	00:16	0.1	0.0	0.1	0.0
01Jan2000	00:17	0.1	0.0	0.2	0.0
01Jan2000	00:18	0.1	0.0	0.2	0.0
01Jan2000	00:19	0.1	0.0	0.2	0.0
01Jan2000	00:20	0.1	0.0	0.2	0.0
01Jan2000	00:21	0.2	0.0	0.2	0.0
01Jan2000	00:22	0.2	0.0	0.2	0.0
01Jan2000	00:23	0.2	0.0	0.2	0.0
01Jan2000	00:24	0.2	0.0	0.2	0.0
01Jan2000	00:25	0.2	0.0	0.2	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	00:26	0.2	0.0	0.2	0.0
01Jan2000	00:27	0.2	0.0	0.3	0.0
01Jan2000	00:28	0.2	0.0	0.3	0.0
01Jan2000	00:29	0.2	0.0	0.3	0.0
01Jan2000	00:30	0.2	0.0	0.3	0.0
01Jan2000	00:31	0.2	0.0	0.3	0.0
01Jan2000	00:32	0.2	0.0	0.3	0.0
01Jan2000	00:33	0.2	0.0	0.3	0.0
01Jan2000	00:34	0.2	0.0	0.3	0.0
01Jan2000	00:35	0.2	0.0	0.3	0.0
01Jan2000	00:36	0.2	0.0	0.4	0.0
01Jan2000	00:37	0.2	0.0	0.4	0.0
01Jan2000	00:38	0.2	0.0	0.4	0.0
01Jan2000	00:39	0.2	0.0	0.4	0.0
01Jan2000	00:40	0.2	0.0	0.4	0.0
01Jan2000	00:41	0.2	0.0	0.4	0.0
01Jan2000	00:42	0.2	0.0	0.4	0.0
01Jan2000	00:43	0.2	0.0	0.4	0.0
01Jan2000	00:44	0.2	0.0	0.4	0.0
01Jan2000	00:45	0.2	0.0	0.4	0.0
01Jan2000	00:46	0.2	0.0	0.5	0.0
01Jan2000	00:47	0.2	0.0	0.5	0.0
01Jan2000	00:48	0.2	0.0	0.5	0.0
01Jan2000	00:49	0.2	0.0	0.5	0.0
01Jan2000	00:50	0.2	0.0	0.5	0.0
01Jan2000	00:51	0.2	0.0	0.5	0.0
01Jan2000	00:52	0.2	0.0	0.5	0.0
01Jan2000	00:53	0.2	0.0	0.5	0.0
01Jan2000	00:54	0.2	0.0	0.5	0.0
01Jan2000	00:55	0.2	0.0	0.6	0.0
01Jan2000	00:56	0.2	0.0	0.6	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	00:57	0.2	0.0	0.6	0.0
01Jan2000	00:58	0.2	0.0	0.6	0.0
01Jan2000	00:59	0.2	0.0	0.6	0.0
01Jan2000	01:00	0.2	0.0	0.6	0.0
01Jan2000	01:01	0.2	0.0	0.6	0.0
01Jan2000	01:02	0.2	0.0	0.6	0.0
01Jan2000	01:03	0.2	0.0	0.7	0.0
01Jan2000	01:04	0.2	0.0	0.7	0.0
01Jan2000	01:05	0.2	0.0	0.7	0.0
01Jan2000	01:06	0.2	0.0	0.7	0.0
01Jan2000	01:07	0.2	0.0	0.7	0.0
01Jan2000	01:08	0.2	0.0	0.7	0.0
01Jan2000	01:09	0.2	0.0	0.7	0.0
01Jan2000	01:10	0.2	0.0	0.7	0.0
01Jan2000	01:11	0.2	0.0	0.7	0.0
01Jan2000	01:12	0.2	0.0	0.8	0.0
01Jan2000	01:13	0.2	0.0	0.8	0.0
01Jan2000	01:14	0.2	0.0	0.8	0.0
01Jan2000	01:15	0.2	0.0	0.8	0.0
01Jan2000	01:16	0.2	0.0	0.8	0.0
01Jan2000	01:17	0.2	0.0	0.8	0.0
01Jan2000	01:18	0.2	0.0	0.8	0.0
01Jan2000	01:19	0.2	0.0	0.8	0.0
01Jan2000	01:20	0.2	0.0	0.9	0.0
01Jan2000	01:21	0.2	0.0	0.9	0.0
01Jan2000	01:22	0.2	0.0	0.9	0.0
01Jan2000	01:23	0.2	0.0	0.9	0.0
01Jan2000	01:24	0.2	0.0	0.9	0.0
01Jan2000	01:25	0.2	0.0	0.9	0.0
01Jan2000	01:26	0.2	0.0	0.9	0.0
01Jan2000	01:27	0.2	0.0	0.9	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	01:28	0.2	0.0	0.9	0.0
01Jan2000	01:29	0.2	0.0	1.0	0.0
01Jan2000	01:30	0.2	0.0	1.0	0.0
01Jan2000	01:31	0.2	0.0	1.0	0.0
01Jan2000	01:32	0.2	0.0	1.0	0.0
01Jan2000	01:33	0.2	0.0	1.0	0.0
01Jan2000	01:34	0.2	0.0	1.0	0.0
01Jan2000	01:35	0.2	0.0	1.0	0.0
01Jan2000	01:36	0.2	0.0	1.1	0.0
01Jan2000	01:37	0.2	0.0	1.1	0.0
01Jan2000	01:38	0.2	0.0	1.1	0.0
01Jan2000	01:39	0.2	0.0	1.1	0.0
01Jan2000	01:40	0.2	0.0	1.1	0.0
01Jan2000	01:41	0.2	0.0	1.1	0.0
01Jan2000	01:42	0.2	0.0	1.1	0.0
01Jan2000	01:43	0.2	0.0	1.1	0.0
01Jan2000	01:44	0.2	0.0	1.2	0.0
01Jan2000	01:45	0.2	0.0	1.2	0.0
01Jan2000	01:46	0.2	0.0	1.2	0.0
01Jan2000	01:47	0.2	0.0	1.2	0.0
01Jan2000	01:48	0.2	0.0	1.2	0.0
01Jan2000	01:49	0.2	0.0	1.2	0.0
01Jan2000	01:50	0.2	0.0	1.2	0.0
01Jan2000	01:51	0.2	0.0	1.3	0.0
01Jan2000	01:52	0.2	0.0	1.3	0.0
01Jan2000	01:53	0.2	0.0	1.3	0.0
01Jan2000	01:54	0.2	0.0	1.3	0.0
01Jan2000	01:55	0.2	0.0	1.3	0.0
01Jan2000	01:56	0.2	0.0	1.3	0.0
01Jan2000	01:57	0.2	0.0	1.3	0.0
01Jan2000	01:58	0.2	0.0	1.4	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	01:59	0.2	0.0	1.4	0.0
01Jan2000	02:00	0.2	0.0	1.4	0.0
01Jan2000	02:01	0.2	0.0	1.4	0.0
01Jan2000	02:02	0.2	0.0	1.4	0.0
01Jan2000	02:03	0.2	0.0	1.4	0.0
01Jan2000	02:04	0.2	0.0	1.4	0.0
01Jan2000	02:05	0.2	0.0	1.5	0.0
01Jan2000	02:06	0.2	0.0	1.5	0.0
01Jan2000	02:07	0.2	0.0	1.5	0.0
01Jan2000	02:08	0.2	0.0	1.5	0.0
01Jan2000	02:09	0.2	0.0	1.5	0.0
01Jan2000	02:10	0.2	0.0	1.5	0.0
01Jan2000	02:11	0.2	0.0	1.5	0.0
01Jan2000	02:12	0.2	0.0	1.6	0.0
01Jan2000	02:13	0.2	0.0	1.6	0.0
01Jan2000	02:14	0.2	0.0	1.6	0.0
01Jan2000	02:15	0.2	0.0	1.6	0.0
01Jan2000	02:16	0.2	0.0	1.6	0.0
01Jan2000	02:17	0.2	0.0	1.6	0.0
01Jan2000	02:18	0.2	0.0	1.7	0.0
01Jan2000	02:19	0.2	0.0	1.7	0.0
01Jan2000	02:20	0.2	0.0	1.7	0.0
01Jan2000	02:21	0.3	0.0	1.7	0.0
01Jan2000	02:22	0.3	0.0	1.7	0.0
01Jan2000	02:23	0.3	0.0	1.7	0.0
01Jan2000	02:24	0.3	0.0	1.8	0.0
01Jan2000	02:25	0.3	0.0	1.8	0.0
01Jan2000	02:26	0.3	0.0	1.8	0.0
01Jan2000	02:27	0.3	0.0	1.8	0.0
01Jan2000	02:28	0.3	0.0	1.8	0.0
01Jan2000	02:29	0.3	0.0	1.8	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	02:30	0.3	0.0	1.9	0.0
01Jan2000	02:31	0.3	0.0	1.9	0.0
01Jan2000	02:32	0.3	0.0	1.9	0.0
01Jan2000	02:33	0.3	0.0	1.9	0.0
01Jan2000	02:34	0.3	0.0	1.9	0.0
01Jan2000	02:35	0.3	0.0	2.0	0.0
01Jan2000	02:36	0.3	0.0	2.0	0.0
01Jan2000	02:37	0.3	0.0	2.0	0.0
01Jan2000	02:38	0.3	0.0	2.0	0.0
01Jan2000	02:39	0.3	0.0	2.0	0.0
01Jan2000	02:40	0.3	0.0	2.0	0.0
01Jan2000	02:41	0.3	0.0	2.1	0.0
01Jan2000	02:42	0.3	0.0	2.1	0.0
01Jan2000	02:43	0.3	0.0	2.1	0.0
01Jan2000	02:44	0.3	0.0	2.1	0.0
01Jan2000	02:45	0.3	0.0	2.1	0.0
01Jan2000	02:46	0.3	0.0	2.2	0.0
01Jan2000	02:47	0.3	0.0	2.2	0.0
01Jan2000	02:48	0.3	0.0	2.2	0.0
01Jan2000	02:49	0.3	0.0	2.2	0.0
01Jan2000	02:50	0.3	0.0	2.2	0.0
01Jan2000	02:51	0.3	0.0	2.3	0.1
01Jan2000	02:52	0.3	0.0	2.3	0.1
01Jan2000	02:53	0.3	0.0	2.3	0.1
01Jan2000	02:54	0.3	0.0	2.3	0.1
01Jan2000	02:55	0.3	0.0	2.3	0.1
01Jan2000	02:56	0.3	0.0	2.4	0.1
01Jan2000	02:57	0.3	0.0	2.4	0.1
01Jan2000	02:58	0.3	0.0	2.4	0.1
01Jan2000	02:59	0.3	0.0	2.4	0.1
01Jan2000	03:00	0.3	0.0	2.4	0.1

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	03:01	0.4	0.0	2.4	0.2
01Jan2000	03:02	0.4	0.0	2.5	0.2
01Jan2000	03:03	0.4	0.0	2.5	0.2
01Jan2000	03:04	0.4	0.0	2.5	0.2
01Jan2000	03:05	0.4	0.0	2.5	0.2
01Jan2000	03:06	0.4	0.0	2.5	0.2
01Jan2000	03:07	0.4	0.0	2.5	0.2
01Jan2000	03:08	0.4	0.0	2.5	0.2
01Jan2000	03:09	0.4	0.0	2.6	0.2
01Jan2000	03:10	0.4	0.0	2.6	0.2
01Jan2000	03:11	0.4	0.0	2.6	0.2
01Jan2000	03:12	0.4	0.0	2.6	0.2
01Jan2000	03:13	0.4	0.0	2.6	0.2
01Jan2000	03:14	0.4	0.0	2.6	0.2
01Jan2000	03:15	0.4	0.0	2.7	0.2
01Jan2000	03:16	0.4	0.0	2.7	0.2
01Jan2000	03:17	0.4	0.0	2.7	0.2
01Jan2000	03:18	0.4	0.0	2.7	0.2
01Jan2000	03:19	0.4	0.0	2.7	0.2
01Jan2000	03:20	0.5	0.1	2.7	0.3
01Jan2000	03:21	0.5	0.1	2.7	0.3
01Jan2000	03:22	0.5	0.1	2.8	0.3
01Jan2000	03:23	0.5	0.1	2.8	0.3
01Jan2000	03:24	0.5	0.1	2.8	0.3
01Jan2000	03:25	0.5	0.1	2.8	0.3
01Jan2000	03:26	0.5	0.1	2.8	0.3
01Jan2000	03:27	0.5	0.1	2.8	0.4
01Jan2000	03:28	0.5	0.1	2.8	0.4
01Jan2000	03:29	0.5	0.1	2.9	0.4
01Jan2000	03:30	0.5	0.1	2.9	0.4
01Jan2000	03:31	0.6	0.1	2.9	0.4

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	03:32	0.6	0.1	2.9	0.5
01Jan2000	03:33	0.6	0.1	2.9	0.5
01Jan2000	03:34	0.6	0.1	2.9	0.5
01Jan2000	03:35	0.6	0.1	2.9	0.5
01Jan2000	03:36	0.6	0.1	2.9	0.5
01Jan2000	03:37	0.7	0.1	2.9	0.5
01Jan2000	03:38	0.7	0.1	2.9	0.5
01Jan2000	03:39	0.7	0.1	2.9	0.5
01Jan2000	03:40	0.7	0.1	3.0	0.6
01Jan2000	03:41	0.7	0.1	3.0	0.6
01Jan2000	03:42	0.8	0.1	3.0	0.6
01Jan2000	03:43	0.8	0.1	3.0	0.6
01Jan2000	03:44	0.8	0.1	3.0	0.6
01Jan2000	03:45	0.9	0.1	3.0	0.6
01Jan2000	03:46	0.9	0.1	3.0	0.6
01Jan2000	03:47	0.9	0.1	3.1	0.7
01Jan2000	03:48	1.0	0.1	3.1	0.7
01Jan2000	03:49	1.0	0.1	3.1	0.7
01Jan2000	03:50	1.0	0.1	3.1	0.7
01Jan2000	03:51	1.1	0.1	3.2	0.7
01Jan2000	03:52	1.2	0.1	3.2	0.8
01Jan2000	03:53	1.3	0.1	3.2	0.8
01Jan2000	03:54	1.5	0.1	3.3	0.8
01Jan2000	03:55	1.6	0.1	3.3	0.8
01Jan2000	03:56	1.7	0.1	3.4	0.9
01Jan2000	03:57	1.8	0.1	3.4	0.9
01Jan2000	03:58	2.0	0.1	3.5	1.0
01Jan2000	03:59	2.1	0.1	3.6	1.2
01Jan2000	04:00	2.2	0.1	3.6	1.5
01Jan2000	04:01	2.6	0.1	3.7	1.9
01Jan2000	04:02	3.0	0.1	3.8	2.3

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	04:03	3.3	0.1	3.8	2.7
01Jan2000	04:04	3.7	0.1	3.9	3.1
01Jan2000	04:05	4.1	0.1	3.9	3.5
01Jan2000	04:06	3.5	0.1	3.9	3.6
01Jan2000	04:07	2.9	0.1	3.9	3.4
01Jan2000	04:08	2.4	0.1	3.9	3.0
01Jan2000	04:09	1.8	0.1	3.8	2.6
01Jan2000	04:10	1.2	0.1	3.7	2.1
01Jan2000	04:11	1.1	0.1	3.7	1.7
01Jan2000	04:12	1.0	0.1	3.6	1.5
01Jan2000	04:13	1.0	0.1	3.6	1.3
01Jan2000	04:14	0.9	0.1	3.6	1.2
01Jan2000	04:15	0.8	0.1	3.6	1.1
01Jan2000	04:16	0.7	0.1	3.5	1.0
01Jan2000	04:17	0.7	0.1	3.5	1.0
01Jan2000	04:18	0.7	0.1	3.5	0.9
01Jan2000	04:19	0.6	0.1	3.5	0.9
01Jan2000	04:20	0.6	0.1	3.4	0.9
01Jan2000	04:21	0.6	0.1	3.4	0.9
01Jan2000	04:22	0.5	0.1	3.4	0.9
01Jan2000	04:23	0.5	0.1	3.4	0.9
01Jan2000	04:24	0.5	0.1	3.3	0.9
01Jan2000	04:25	0.5	0.1	3.3	0.8
01Jan2000	04:26	0.5	0.1	3.3	0.8
01Jan2000	04:27	0.5	0.1	3.3	0.8
01Jan2000	04:28	0.4	0.1	3.2	0.8
01Jan2000	04:29	0.4	0.1	3.2	0.8
01Jan2000	04:30	0.4	0.1	3.2	0.7
01Jan2000	04:31	0.4	0.1	3.2	0.7
01Jan2000	04:32	0.4	0.1	3.1	0.7
01Jan2000	04:33	0.4	0.1	3.1	0.7

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	04:34	0.4	0.1	3.1	0.7
01Jan2000	04:35	0.4	0.1	3.1	0.7
01Jan2000	04:36	0.4	0.1	3.0	0.6
01Jan2000	04:37	0.3	0.1	3.0	0.6
01Jan2000	04:38	0.3	0.1	3.0	0.6
01Jan2000	04:39	0.3	0.1	3.0	0.6
01Jan2000	04:40	0.3	0.1	3.0	0.6
01Jan2000	04:41	0.3	0.1	2.9	0.5
01Jan2000	04:42	0.3	0.1	2.9	0.5
01Jan2000	04:43	0.3	0.1	2.9	0.5
01Jan2000	04:44	0.3	0.1	2.9	0.5
01Jan2000	04:45	0.3	0.1	2.9	0.5
01Jan2000	04:46	0.3	0.1	2.9	0.4
01Jan2000	04:47	0.3	0.1	2.9	0.4
01Jan2000	04:48	0.3	0.1	2.9	0.4
01Jan2000	04:49	0.3	0.1	2.8	0.4
01Jan2000	04:50	0.3	0.1	2.8	0.4
01Jan2000	04:51	0.3	0.1	2.8	0.4
01Jan2000	04:52	0.3	0.1	2.8	0.3
01Jan2000	04:53	0.3	0.1	2.8	0.3
01Jan2000	04:54	0.3	0.1	2.8	0.3
01Jan2000	04:55	0.3	0.1	2.8	0.3
01Jan2000	04:56	0.3	0.1	2.8	0.3
01Jan2000	04:57	0.2	0.1	2.8	0.3
01Jan2000	04:58	0.2	0.1	2.8	0.3
01Jan2000	04:59	0.2	0.1	2.8	0.3
01Jan2000	05:00	0.2	0.1	2.8	0.3
01Jan2000	05:01	0.2	0.1	2.8	0.3
01Jan2000	05:02	0.2	0.1	2.8	0.3
01Jan2000	05:03	0.2	0.1	2.8	0.3
01Jan2000	05:04	0.2	0.1	2.8	0.3

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	05:05	0.2	0.1	2.8	0.3
01Jan2000	05:06	0.2	0.1	2.8	0.3
01Jan2000	05:07	0.2	0.1	2.8	0.3
01Jan2000	05:08	0.2	0.1	2.8	0.3
01Jan2000	05:09	0.2	0.1	2.7	0.3
01Jan2000	05:10	0.2	0.1	2.7	0.3
01Jan2000	05:11	0.2	0.1	2.7	0.3
01Jan2000	05:12	0.2	0.1	2.7	0.3
01Jan2000	05:13	0.2	0.1	2.7	0.3
01Jan2000	05:14	0.2	0.1	2.7	0.3
01Jan2000	05:15	0.2	0.1	2.7	0.3
01Jan2000	05:16	0.2	0.0	2.7	0.2
01Jan2000	05:17	0.2	0.0	2.7	0.2
01Jan2000	05:18	0.2	0.0	2.7	0.2
01Jan2000	05:19	0.2	0.0	2.7	0.2
01Jan2000	05:20	0.2	0.0	2.7	0.2
01Jan2000	05:21	0.2	0.0	2.7	0.2
01Jan2000	05:22	0.2	0.0	2.7	0.2
01Jan2000	05:23	0.2	0.0	2.7	0.2
01Jan2000	05:24	0.2	0.0	2.7	0.2
01Jan2000	05:25	0.2	0.0	2.7	0.2
01Jan2000	05:26	0.2	0.0	2.7	0.2
01Jan2000	05:27	0.2	0.0	2.7	0.2
01Jan2000	05:28	0.2	0.0	2.7	0.2
01Jan2000	05:29	0.2	0.0	2.7	0.2
01Jan2000	05:30	0.2	0.0	2.7	0.2
01Jan2000	05:31	0.2	0.0	2.7	0.2
01Jan2000	05:32	0.2	0.0	2.7	0.2
01Jan2000	05:33	0.2	0.0	2.7	0.2
01Jan2000	05:34	0.2	0.0	2.7	0.2
01Jan2000	05:35	0.2	0.0	2.7	0.2

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	05:36	0.2	0.0	2.7	0.2
01Jan2000	05:37	0.2	0.0	2.6	0.2
01Jan2000	05:38	0.2	0.0	2.6	0.2
01Jan2000	05:39	0.2	0.0	2.6	0.2
01Jan2000	05:40	0.2	0.0	2.6	0.2
01Jan2000	05:41	0.2	0.0	2.6	0.2
01Jan2000	05:42	0.2	0.0	2.6	0.2
01Jan2000	05:43	0.2	0.0	2.6	0.2
01Jan2000	05:44	0.2	0.0	2.6	0.2
01Jan2000	05:45	0.2	0.0	2.6	0.2
01Jan2000	05:46	0.2	0.0	2.6	0.2
01Jan2000	05:47	0.2	0.0	2.6	0.2
01Jan2000	05:48	0.2	0.0	2.6	0.2
01Jan2000	05:49	0.2	0.0	2.6	0.2
01Jan2000	05:50	0.2	0.0	2.6	0.2
01Jan2000	05:51	0.2	0.0	2.6	0.2
01Jan2000	05:52	0.2	0.0	2.6	0.2
01Jan2000	05:53	0.2	0.0	2.6	0.2
01Jan2000	05:54	0.2	0.0	2.6	0.2
01Jan2000	05:55	0.2	0.0	2.6	0.2
01Jan2000	05:56	0.2	0.0	2.6	0.2
01Jan2000	05:57	0.1	0.0	2.6	0.2
01Jan2000	05:58	0.1	0.0	2.6	0.2
01Jan2000	05:59	0.1	0.0	2.6	0.2
01Jan2000	06:00	0.1	0.0	2.6	0.2
01Jan2000	06:01	0.1	0.0	2.6	0.2
01Jan2000	06:02	0.1	0.0	2.5	0.2
01Jan2000	06:03	0.1	0.0	2.5	0.2
01Jan2000	06:04	0.0	0.0	2.5	0.2
01Jan2000	06:05	0.0	0.0	2.5	0.2
01Jan2000	06:06	0.0	0.0	2.5	0.2

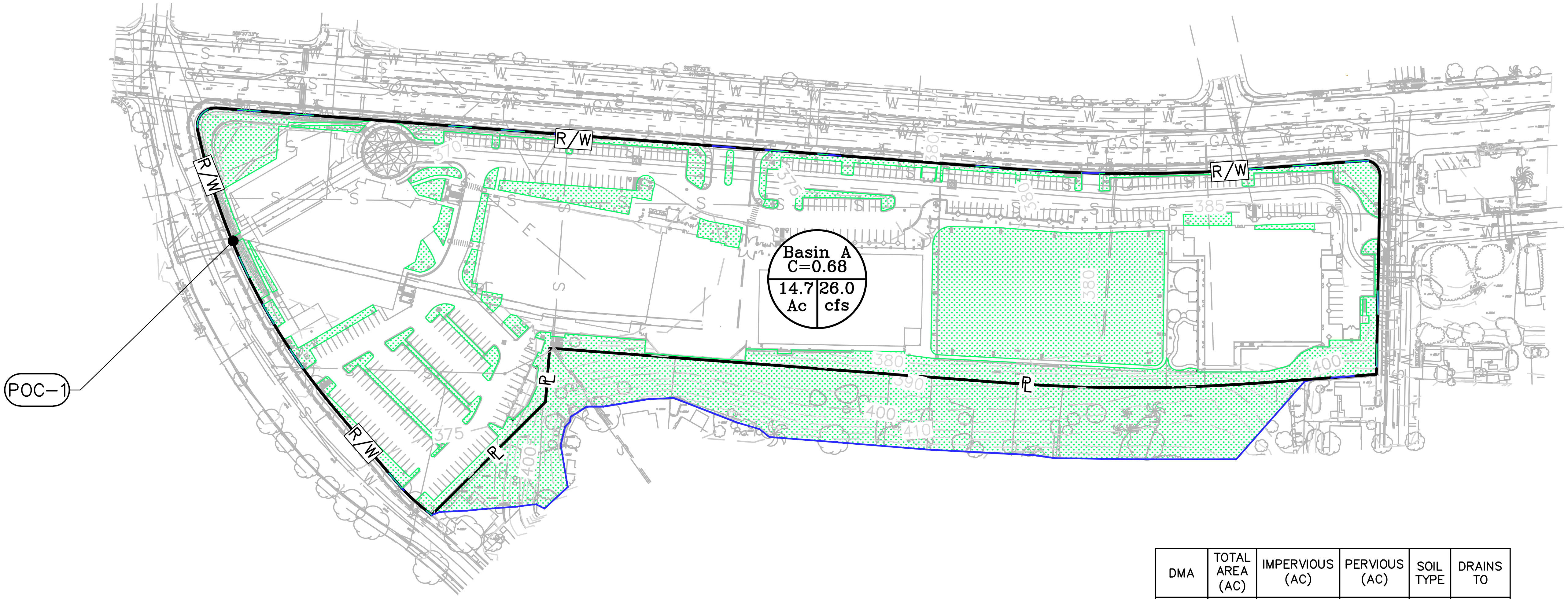
Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	06:07	0.0	0.0	2.5	0.2
01Jan2000	06:08	0.0	0.0	2.5	0.2
01Jan2000	06:09	0.0	0.0	2.5	0.2
01Jan2000	06:10	0.0	0.0	2.5	0.2
01Jan2000	06:11	0.0	0.0	2.4	0.2
01Jan2000	06:12	0.0	0.0	2.4	0.1
01Jan2000	06:13	0.0	0.0	2.4	0.1
01Jan2000	06:14	0.0	0.0	2.4	0.1
01Jan2000	06:15	0.0	0.0	2.4	0.1
01Jan2000	06:16	0.0	0.0	2.4	0.1
01Jan2000	06:17	0.0	0.0	2.4	0.1
01Jan2000	06:18	0.0	0.0	2.4	0.1
01Jan2000	06:19	0.0	0.0	2.4	0.1
01Jan2000	06:20	0.0	0.0	2.4	0.1
01Jan2000	06:21	0.0	0.0	2.3	0.1
01Jan2000	06:22	0.0	0.0	2.3	0.1
01Jan2000	06:23	0.0	0.0	2.3	0.1
01Jan2000	06:24	0.0	0.0	2.3	0.1
01Jan2000	06:25	0.0	0.0	2.3	0.1
01Jan2000	06:26	0.0	0.0	2.3	0.1
01Jan2000	06:27	0.0	0.0	2.3	0.1
01Jan2000	06:28	0.0	0.0	2.3	0.1
01Jan2000	06:29	0.0	0.0	2.3	0.1
01Jan2000	06:30	0.0	0.0	2.3	0.1
01Jan2000	06:31	0.0	0.0	2.3	0.1
01Jan2000	06:32	0.0	0.0	2.3	0.1
01Jan2000	06:33	0.0	0.0	2.3	0.1
01Jan2000	06:34	0.0	0.0	2.3	0.1
01Jan2000	06:35	0.0	0.0	2.3	0.1
01Jan2000	06:36	0.0	0.0	2.3	0.1
01Jan2000	06:37	0.0	0.0	2.3	0.1

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	06:38	0.0	0.0	2.3	0.1
01Jan2000	06:39	0.0	0.0	2.3	0.1
01Jan2000	06:40	0.0	0.0	2.3	0.0
01Jan2000	06:41	0.0	0.0	2.3	0.0
01Jan2000	06:42	0.0	0.0	2.2	0.0
01Jan2000	06:43	0.0	0.0	2.2	0.0
01Jan2000	06:44	0.0	0.0	2.2	0.0
01Jan2000	06:45	0.0	0.0	2.2	0.0
01Jan2000	06:46	0.0	0.0	2.2	0.0
01Jan2000	06:47	0.0	0.0	2.2	0.0
01Jan2000	06:48	0.0	0.0	2.2	0.0
01Jan2000	06:49	0.0	0.0	2.2	0.0
01Jan2000	06:50	0.0	0.0	2.2	0.0
01Jan2000	06:51	0.0	0.0	2.2	0.0
01Jan2000	06:52	0.0	0.0	2.2	0.0
01Jan2000	06:53	0.0	0.0	2.2	0.0
01Jan2000	06:54	0.0	0.0	2.2	0.0
01Jan2000	06:55	0.0	0.0	2.2	0.0
01Jan2000	06:56	0.0	0.0	2.2	0.0
01Jan2000	06:57	0.0	0.0	2.2	0.0
01Jan2000	06:58	0.0	0.0	2.2	0.0
01Jan2000	06:59	0.0	0.0	2.2	0.0
01Jan2000	07:00	0.0	0.0	2.2	0.0

APPENDIX 1

Developed Conditions Exhibit

SAVE DATE: 4/7/2017 ~ PLOT DATE: 4/18/2017 ~ FILE NAME: P:\Acad\1290 Kroc Center\Reports\Drainage Study\PRE-Condition Map.dwg



DMA	TOTAL AREA (AC)	IMPERVIOUS (AC)	PERVIOUS (AC)	SOIL TYPE	DRAINS TO
1	14.72	8.82	5.90		

LEGEND

PERVIOUS AREA	🟩	PROPERTY BOUNDARY	—PL— — — ——
SOILS BOUNDARY	▬ ▬ ▬ ▬	NODE NUMBER	●⟋(1)
BASIN LIMITS	──	FLOW-LINE	←←←
SUB-BASIN BOUNDARY	▬ ▬ ▬ ▬		

SCALE: 1" = 100'

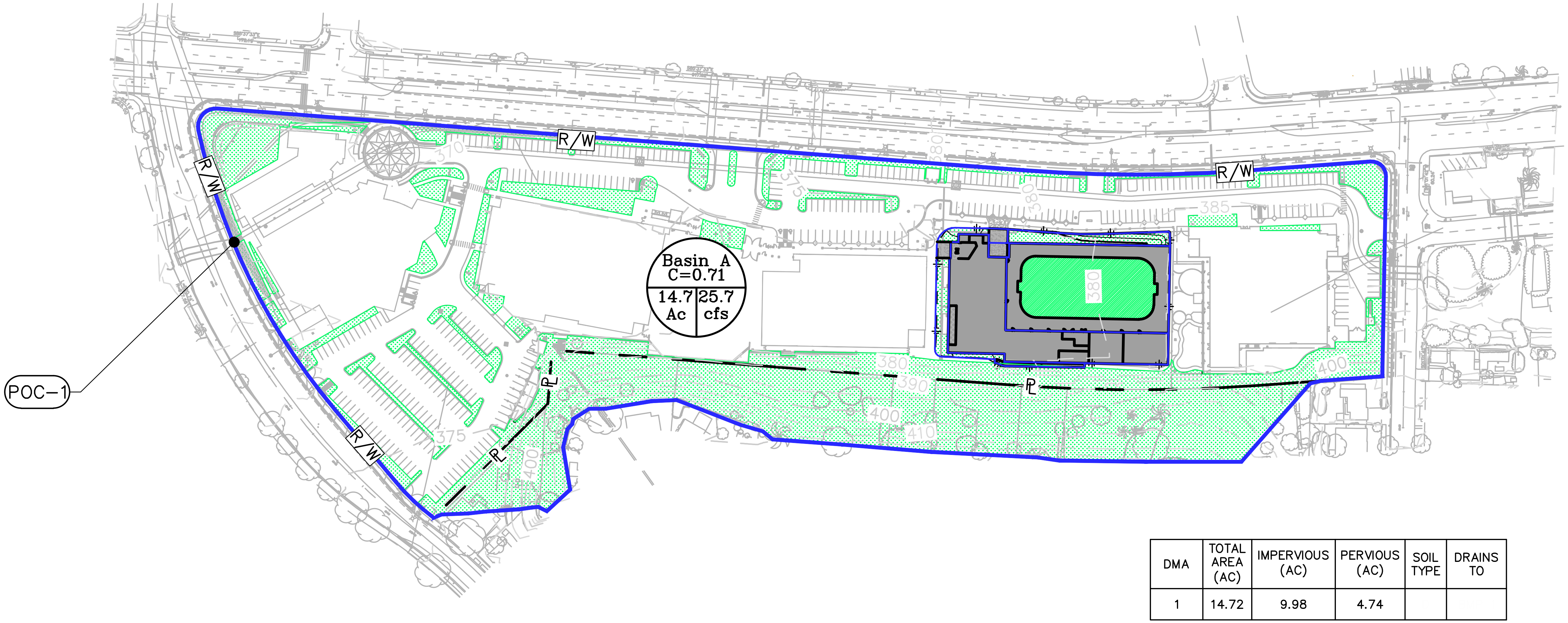
R·E·C
Consultants, Inc.

Civil Engineering·Environmental
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

PRE CONDITIONS

KROC CENTER
SAN DIEGO CALIFORNIA

SAVE DATE: 4/7/2017 ~ PLOT DATE: 4/18/2017 ~ FILE NAME: P:\Acad\1290 Kroc Center\Reports\Drainage Study\POST-Condition Map.dwg



DMA	TOTAL AREA (AC)	IMPERVIOUS (AC)	PERVIOUS (AC)	SOIL TYPE	DRAINS TO
1	14.72	9.98	4.74		

LEGEND

TURF AREA	🟩	NEW IMPERVIOUS AREA	▨
PERVIOUS AREA	▨	PROPERTY BOUNDARY	—℄— — — ——
SOILS BOUNDARY	▬ ▬ ▬ ▬	NODE NUMBER	●—(1)
BASIN LIMITS	━━━━	FLOW–LINE	←·←·←·
SUB–BASIN BOUNDARY	▬ ▬ ▬ ▬		

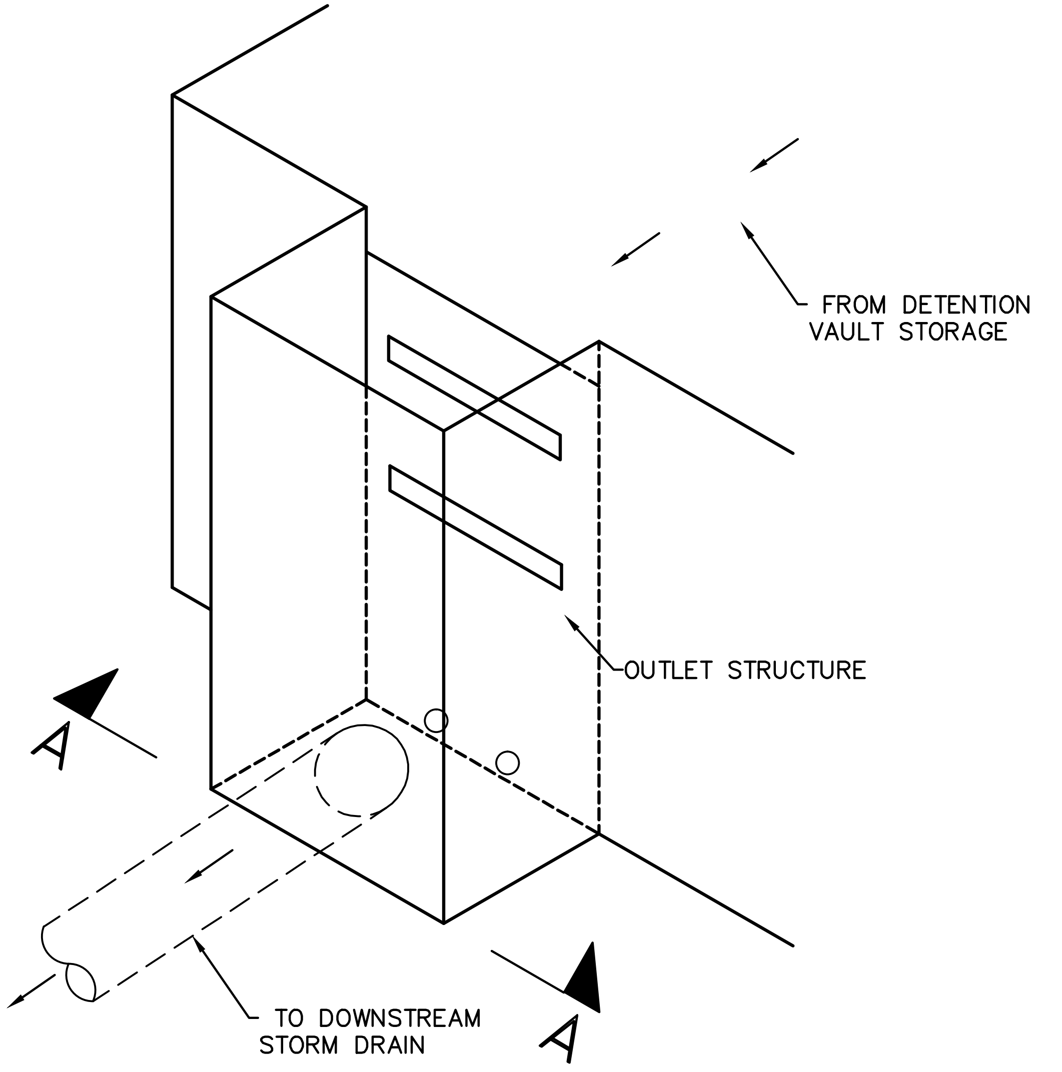
SCALE: 1" = 100'

R·E·C
Consultants, Inc.

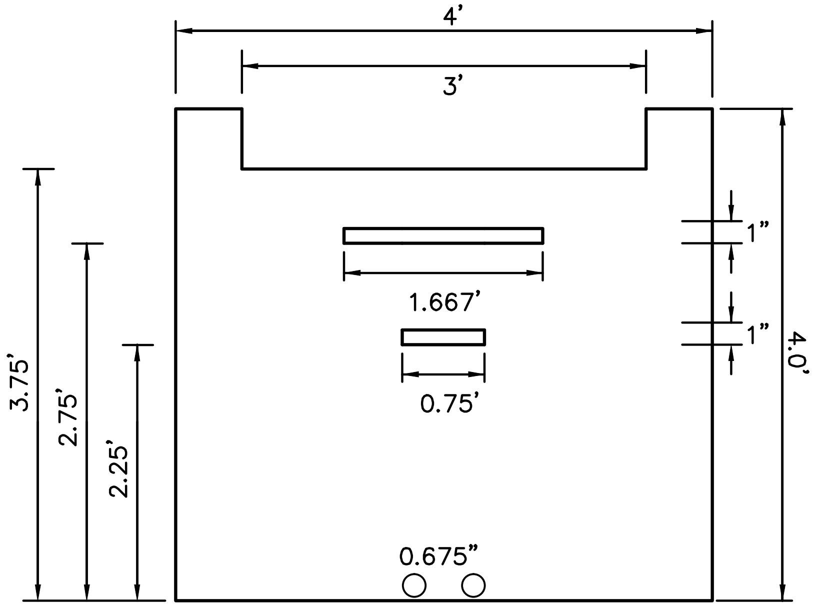
Civil Engineering·Environmental
2442 Second Avenue
San Diego, CA 92101
(619)232–9200 (619)232–9210 Fax

PROPOSED CONDITIONS

KROC CENTER
SAN DIEGO CALIFORNIA



BASIN 1
(N.T.S.)



SECTION A–A
(N.T.S.)

BASIN 1 DETAIL

NTS

R·E·C
Consultants, Inc.
Civil Engineering Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

SAVE DATE: 4/18/2017 ~ PLOT DATE: 4/18/2017 ~ FILE NAME: P:\Acad\7001 JRoberts-KARN\7001.8 Sanyo Ave in Otay Mesa\Drawings\BMP structure sections.dwg

Priority Development Project (PDP)
Storm Water Quality Management Plan (SWQMP)

The Salvation Army - Ray and Joan Kroc Center

Permit Application No.552436

Internal Order No. 24007306

☐ **Check if electing for offsite alternative compliance**

Engineer of Work:

JASON MICHAEL EVANS
C74792
EXP. 12/31/19
CIVIL

Jason M. Evans, P.E. C74792, Expires 12/31/2019
Provide Wet Signature and Stamp Above Line

Prepared For:

The Salvation Army
6760 University Avenue, Suite 240
San Diego, California 92115
(619) 231-9200

Prepared By:

R·E·C
Consultants, Inc.

REC Consultants, Inc.
2442 Second Avenue
San Diego, California 92101
(619) 232-9200

Date:
May 4, 2018

Approved by: City of San Diego

Date

The City of
SAN
DIEGO

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Project Name: The Salvation Army, Ray and Joan Kroc Center

Table of Contents

- Attachment 3: Structural BMP Maintenance Plan
    - Maintenance Agreement (Form DS-3247) (when applicable)
- Attachment 4: Copy of Plan Sheets Showing Permanent Storm Water BMPs
- Attachment 5: Project's Drainage Report
- Attachment 6: Project's Geotechnical and Groundwater Investigation Report

Acronyms

APN	Assessor's Parcel Number
ASBS	Area of Special Biological Significance
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CGP	Construction General Permit
DCV	Design Capture Volume
DMA	Drainage Management Areas
ESA	Environmentally Sensitive Area
GLU	Geomorphic Landscape Unit
GW	Ground Water
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
HU	Harvest and Use
INF	Infiltration
LID	Low Impact Development
LUP	Linear Underground/Overhead Projects
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
POC	Pollutant of Concern
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWPPP	Stormwater Pollutant Protection Plan
SWQMP	Storm Water Quality Management Plan
TMDL	Total Maximum Daily Load
WMAA	Watershed Management Area Analysis
WPCP	Water Pollution Control Program
WQIP	Water Quality Improvement Plan

Certification Page

Project Name: The Salvation Army, Ray and Joan Kroc Community Center
Permit Application 552436

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water Standards. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable source control and site design BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by the City Engineer is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

Engineer of Work's Signature

C74792
PE#

12/31/2019
Expiration Date

Jason M. Evans
Print Name

REC Consultants, Inc.
Company

May 4, 2018
Date

JASON MICHAEL EVANS
C74792
EXP. 12/31/19
CIVIL

Engineer's Stamp

Submittal Record

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In last column indicate changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments.

Submittal Number	Date	Project Status	Changes
1	4/20/17	☑ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	**Initial Submittal**
2	2/8/2018	☐ **Preliminary Design/Planning/CEQA** ☑ **Final Design**	Response to City of San Diego Comments
3	5/4/2018	☐ **Preliminary Design/Planning/CEQA** ☑ **Final Design**	Response to new comments from City of San Diego
4	8/8/2018	☐ **Preliminary Design/Planning/CEQA** ☑ **Final Design**	Response to new comments from City of San Diego

Project Vicinity Map

Project Name: The Salvation Army, Ray and Joan Kroc Community Center
Permit Application 552436

City of San Diego Form DS-560 Storm Water Requirements Applicability Checklist

Attach DS-560 form.

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

Storm Water Requirements Applicability Checklist

FORM
DS-560
OCTOBER 2016

Project Address: 6845 University Avenue, San Diego, CA 92115

Project Number *(for City Use Only)*:

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1], which is administered by the State Water Resources Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: 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, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

☒ Yes; SWPPP required, skip questions 2-4 ☐ No; next question

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and contact with storm water runoff?

☐ Yes; WPCP required, skip 3-4 ☐ No; next question

3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)

☐ Yes; WPCP required, skip 4 ☐ No; next question

4. Does the project only include the following Permit types listed below?

- Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
- Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
- Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, pot holing, curb and gutter replacement, and retaining wall encroachments.

☐ Yes; no document required

Check one of the boxes below, and continue to PART B:

☒ If you checked "Yes" for question 1,
a SWPPP is REQUIRED. Continue to PART B

☐ If you checked "No" for question 1, and checked "Yes" for question 2 or 3,
a WPCP is REQUIRED. If the project proposes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to PART B.**

☐ If you checked "No" for all questions 1-3, and checked "Yes" for question 4
PART B **does not apply and no document is required. Continue to Section 2.**

---

[1] More information on the City's construction BMP requirements as well as CGP requirements can be found at: www.sandiego.gov/stormwater/regulations/index.shtml

PART B: Determine Construction Site Priority

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **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.

Complete PART B and continued to Section 2

1. ☐ **ASBS**

a. Projects located in the ASBS watershed.

2. ☐ **High Priority**

a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.

b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.

3. ☒ **Medium Priority**

a. Projects 1 acre or more but not subject to an ASBS or high priority designation.

b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.

4. ☐ **Low Priority**

a. Projects requiring a Water Pollution Control Plan but not subject to ASBS, high, or medium priority designation.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the Storm Water Standards Manual.

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1.	Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water?	☐ Yes ☒ No
2.	Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?	☐ Yes ☒ No
3.	Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair).	☐ Yes ☒ No

PART D: PDP Exempt Requirements.

PDP Exempt projects are required to implement site design and source control BMPs.

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."

If "no" was checked for all questions in Part D, continue to Part E.

1. **Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:**
   - **Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;**
   - **Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;**
   - **Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?**

   ☐ Yes; PDP exempt requirements apply ☒ No; next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Storm Water Standards Manual?

   ☐ Yes; PDP exempt requirements apply ☒ No; project not exempt.

PART E: Determine if Project is a Priority Development Project (PDP).

Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".

If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard Development Project".

1. **New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ☐ Yes ☒ No

2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ☒ Yes ☐ No

3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface. ☐ Yes ☒ No

4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ☐ Yes ☒ No

5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).** ☒ Yes ☐ No

6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site). ☐ Yes ☒ No

7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). ☐ Yes ☒ No

8. **New development or redevelopment projects of a retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (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

9. **New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539. ☐ Yes ☒ No

10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include 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 of if they sheet flow to surrounding pervious surfaces. ☐ Yes ☒ No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1. The project is **NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS**. ☐
2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐
3. The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐
4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires a hydromodification plan management ☒

Arthur Stillwell, Salvation Army	Project Director
Name of Owner or Agent *(Please Print)*	Title
	08/10/2018
Signature	Date

Applicability of Permanent, Post-Construction Storm Water BMP Requirements

Form I-1

Project Identification

Project Name: The Salvation Army Ray and Joan Kroc Community Center

Permit Application Number: 552436

Date: May 4, 2018

Determination of Requirements

The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements.

Answer each step below, starting with **Step 1** and progressing through each step until reaching "Stop". Refer to the manual sections and/or separate forms referenced in each step below.

Step	Answer	Progression
Step 1: Is the project a "development project"? See Section 1.3 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Go to **Step 2**.
	☐ No	**Stop**. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.

Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):

Step 2: Is the project a Standard Project, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, Storm Water Requirements Applicability Checklist.	☐ Standard Project	**Stop.** Standard Project requirements apply
	☑ PDP	PDP requirements apply, including PDP SWQMP. Go to **Step 3**.
	☐ PDP Exempt	**Stop.** Standard Project requirements apply. Provide discussion and list any additional requirements below.

Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:

Project Name: The Salvation Army, Ray and Joan Kroc Center

Form I-1 Page 2 of 2		
Step	Answer	Progression
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to **Step 4**.
	☑ No	BMP Design Manual PDP requirements apply. Go to **Step 4**.
Discussion / justification of prior lawful approval, and identify requirements (<u>not required if prior lawful approval does not apply</u>):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to **Step 5**.
	☐ No	**Stop**. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do <u>not</u> apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). **Stop**.
	☑ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. **Stop**.
Discussion / justification if protection of critical coarse sediment yield areas does <u>not</u> apply:		

Project Name: The Salvation Army, Ray and Joan Kroc Center

HMP Exemption Exhibit

Attach a HMP Exemption Exhibit that shows direct storm water runoff discharge from the project site to HMP exempt area. Include project area, applicable underground storm drain line and/or concrete lined channels, outfall information and exempt waterbody.
Reference applicable drawing number(s).

Exhibit must be provided on 11"x17" or larger paper.

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Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	The Salvation Army Ray and Joan Kroc Center
Project Address	6845 University Avenue, San Diego, California 92115
Assessor's Parcel Number(s) (APN(s))	474-130-16
Permit Application Number	552436
Project Watershed	Select One: ☐San Dieguito River ☐Penasquitos ☐Mission Bay ☐San Diego River ☐San Diego Bay (Pueblo San Diego) ☐Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	Pueblo San Diego 908.00, San Diego Mesa HA 908.20, Chollas HSA 908.22
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	1.48 Acres (64,445 Square Feet)
Area to be disturbed by the project (Project Footprint)	1.48 Acres (64,445 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	0.96 Acres (41,981 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	0.52 Acres (22,464 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition	737 %

Project Name: The Salvation Army, Ray and Joan Kroc Center

Form I-3B Page 2 of 11

Description of Existing Site Condition and Drainage Patterns

Current Status of the Site (select all that apply):

☑Existing development
☐Previously graded but not built out
☐Agricultural or other non-impervious use
☐Vacant, undeveloped/natural

Description / Additional Information:

The project site is currently a soccer field.

Existing Land Cover Includes (select all that apply):

☑Vegetative Cover
☐Non-Vegetated Pervious Areas
☐Impervious Areas

Description / Additional Information:

Pervious area consists of mass graded vegetated (turf) soccer field.

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):

☐NRCS Type A
☐NRCS Type B
☐NRCS Type C
☑NRCS Type D

Approximate Depth to Groundwater:

☐Groundwater Depth < 5 feet
☐5 feet < Groundwater Depth < 10 feet
☐10 feet < Groundwater Depth < 20 feet
☐Groundwater Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

☐Watercourses
☐Seeps
☐Springs
☐Wetlands
☑None

Description / Additional Information:

There are no hydrologic features on or in the immediate vicinity of the subject property. Additionally, project site has been mass graded.

Form I-3B Page 3 of 11

Description of Existing Site Topography and Drainage

How is storm water runoff conveyed from the site? At a minimum, this description should answer:

1. Whether existing drainage conveyance is natural or urban;
2. If runoff from offsite is conveyed through the site? If yes, quantification of all offsite drainage areas, design flows, and locations where offsite flows enter the project site and summarize how such flows are conveyed through the site;
3. Provide details regarding existing project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels;
4. Identify all discharge locations from the existing project along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.

Descriptions/Additional Information

The site is currently a mass graded soccer field. The entire area is relatively flat with a slight slope from southeast to northwest. Runoff from project site overland flows from landscaped area and onto the adjacent parking lot immediately to the north. Runoff is collected by storm water conveyance system and connects to existing point of compliance (POC-1) located to the northwest.

Form I-3B Page 4 of 11

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

The proposed project consists of a 3-story parking structure. A soccer field will be built on the second level of the building. Propose soccer field will have engineered turf as surface.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):

Impervious features within proposed project consist of parking structure, driveways, and sidewalks.

List/describe proposed pervious features of the project (e.g., landscape areas):

Proposed pervious features are composed of landscaping and proposed DG areas.

Does the project include grading and changes to site topography?

☐ Yes

☐ No

Description / Additional Information:

Grading at the property will include cut and fill in order to allow for underground parking.

Project Name: The Salvation Army, Ray and Joan Kroc Center

Form I-3B Page 5 of 11

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

☐ Yes
☐ No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural and constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Description / Additional Information:

Runoff from proposed building and parking structures, as well as northwest, south and western sidewalk areas will be conveyed by storm water drainage system within the structure towards two (2) Filterra bioretention basins (or similar product), located on the western edge of project site. Runoff will then flow onto an underground detaining basin located within the proposed parking structure.
The proposed filterra basins and detaining systems will address water quality, hydromodification and flood control concerns prior to connecting to the existing onsite storm drain system on the northwest corner of the proposed building. Runoff from drainage management area (DMA) 1-4 to the north will be conveyed towards one (1) proposed Modular Wetland Basin (or similar product) prior to flowing onto POC-1. This basin will address water quality, hydromodification and flood control requirements. Sidewalk and landscape areas located to the east of the building will be a self-retaining DMA by directing runoff by overland flow to one (1) existing tree well located to the east of the project site. This tree will serve to meet water quality and hydromodification requirements.

Project Name: The Salvation Army, Ray and Joan Kroc Center

Form I-3B Page 6 of 11

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

☑Onsite storm drain inlets
☑Interior floor drains and elevator shaft sump pumps
☑Interior parking garages
☑Need for future indoor & structural pest control
☑Landscape/outdoor pesticide use
☑Pools, spas, ponds, decorative fountains, and other water features
☑Food service
☐Refuse areas
☐Industrial processes
☑Outdoor storage of equipment or materials
☐Vehicle and equipment cleaning
☐Vehicle/equipment repair and maintenance
☐Fuel dispensing areas
☐Loading docks
☑Fire sprinkler test water
☐Miscellaneous drain or wash water
☑Plazas, sidewalks, and parking lots

Description/Additional Information:

Description included in next page.

Continuation of Form I-3B

For Onsite storm drain inlets:

Mark all inlets with the words “No Dumping! Flows to Bay” or similar. Maintain and periodically repaint or replace inlet markings. Provide storm water pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs Fact Sheet SC-44, “Drainage System Maintenance”, in the CASQA Storm Water Quality Handbooks at www.casqa.org/resources/bmp handbooks/municipal-bmphandbook. Include the following in lease agreements: “Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains.”

For interior floor drains and elevator shaft sump pumps:

State that interior drains and elevator shaft sump pumps will de plumbed to sanitary sewer. Inspect and maintain drains to prevent blockages and overflow.

For interior parking garages:

State that parking garage floor drains will be plumbed to the sanitary sewer. Inspect and maintain drains to prevent blockages and overflow.

For need for future indoor and structural pest control:

Note building design features that discourage entry of pests. Provide integrated pest management information to owners, lessees, and operators.

For landscape/outdoor pesticide use:

Final landscape plans will accomplish all of the following: Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to storm water pollution. Where landscaped areas are used to retain or detain storm water, specify plants that are tolerant of periodic saturated soil conditions. Consider using pest-resistant plants, especially adjacent to hardscape. To ensure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions. Maintain landscaping using minimum or no pesticides.

For fire sprinkler Test Water:

Provide a means to drain fire sprinkler test water to the sanitary sewer.

For plazas, sidewalks, and parking lots:

Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.

Form I-3B Page 7 of 11

Identification and Narrative of Receiving Water

Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable)

Storm water runoff from drainage management areas (DMAs) 1-1, 1-2, 1-3, and 1-6 will drain onto two (2) Filterra Flow through basins (or similar product) located on the western border of the project site. Runoff will then be directed to an underground detention basin located within the parking structure immediately east of proposed propriety basins, which will connect via storm drain system onto existing POC-1 located to the northwest. Flow from DMA-1-4 will be directed by storm water conveyance system towards one (1) Modular Wetland basin (or similar product) located in the northern section of the project site. Runoff will then be directed towards POC-1. Runoff from DMA 1-5 will be treated for storm water quality with one existing tree located to the southeast of the project site. This portion of the city discharges onto Chollas Creek to the southwest, which in turn reaches the San Diego Bay to the west. According to the San Diego Region Hydrologic Basin Pan Area Map the site is located within the hydrologic unit, in the Pueblo San Diego Watershed.

Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations

Ground Waters: Municipal and domestic supply
Inland Surface Water: Non-contact water recreation, warm freshwater habitat, wildlife habitat.
Coastal Waters: Industrial service supply, navigations, contact water recreation, non-contact water recreation, estuarine habitat, wildlife habitat, commercial and sport fishing, rare, threatened, or endangered species, biological habitats of significance, marine habitat, migration of aquatic organisms, shellfish harvesting.

Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations

N/A according to the information available on the State Water Resources Control Board (SWRCB) ASBS webpage (http://www.waterboards.ca.gov/water_issues/programs/ocean/asbs_areas.shtml and http://cordc.ucsd.edu/projects/asbs/) there are only 2 ASBSs within San Diego region (near Scripps Beach and in La Jolla Shores), neither of which receive runoff from the site.

Provide distance from project outfall location to impaired or sensitive receiving waters

The site is approximately 2.4 miles northeast of Chollas Creek and 7.6 miles northeast of the San Diego Bay, both of which are impaired.

Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands

The site is approximately 2.4 miles northeast of non-city owned land identified as Multi-habitat Planning Area on Figure CE-2 within the City of San Diego General Plan – refer to https://www.sandiego/gov/sites/default/files/legacy/planning/genplan/pdf/generalplan/c 2multihab.pdf

Project Name: The Salvation Army, Ray and Joan Kroc Center

Form I-3B Page 8 of 11

Identification of Receiving Water Pollutants of Concern

List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body (Refer to Appendix K)	Pollutant(s)/Stressor(s) (Refer to Appendix K)	TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1)
Chollas Creek	Copper, Diazinon, indicator bacteria, lead	Copper, diazinon, indicator bacteria, lead
Chollas Creek (continued)	Phosphorus, total Nitrogen as N, trash , zinc	Phosphorus, total nitrogen as N, trash , zinc
San Diego Bay Shoreline @ Chollas Creek	Benthic Community Effect, Sediment	Benthic Community effects, indicator
San Diego Bay shoreline (continued)	toxicity, indicator bacteria	bacteria, sediment toxicity
San Diego Bay	PCBs	Copper, PCBs

Identification of Project Site Pollutants*

*Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated)

Identify pollutants anticipated from the project site based on all proposed use(s) of the site (see Appendix B.6):

Pollutant	Not Applicable to the Project Site	Anticipated from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment	☐	☐	☐
Nutrients	☐	☐	☐
Heavy Metals	☐	☐	☐
Organic Compounds	☐	☐	☐
Trash & Debris	☐	☐	☐
Oxygen Demanding Substances	☐	☐	☐
Oil & Grease	☐	☐	☐
Bacteria & Viruses	☐	☐	☐
Pesticides	☐	☐	☐

Project Name:

Form I-3B Page 9 of 11

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6)?

☑ Yes, hydromodification management flow control structural BMPs required.

☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

Description / Additional Information (to be provided if a 'No' answer has been selected above):

Note: If "No" answer has been selected the SWQMP must include an exhibit that shows the storm water conveyance system from the project site to an exempt water body. The exhibit should include details about the conveyance system and the outfall to the exempt water body.

Critical Coarse Sediment Yield Areas*

*This Section only required if hydromodification management requirements apply

Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint?

☐ Yes

☑ No

Discussion / Additional Information:

Based on Critical Coarse Sediment Yield Areas layer (PPCYA_082514 kmz file) for Google Earth, there are no CCSYAs on or contributing runoff to the subject property/ Please refer to HMP exhibits in Attachment 2 of SWQMP.

Form I-3B Page 10 of 11

Flow Control for Post-Project Runoff*

***This Section only required if hydromodification management requirements apply**

List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.

The project has only one point of compliance (POC-1) located near the northwest corner of the existing Salvation Army Kroc Community Center. The POC is the same as in existing conditions.

Has a geomorphic assessment been performed for the receiving channel(s)?

☑No, the low flow threshold is $0.1Q_2$ (default low flow threshold)

☐Yes, the result is the low flow threshold is $0.1Q_2$

☐Yes, the result is the low flow threshold is $0.3Q_2$

☐Yes, the result is the low flow threshold is $0.5Q_2$

If a geomorphic assessment has been performed, provide title, date, and preparer:

The hydromodification management analysis uses the low flow threshold of 0.1Q because a geomorphic assessment has not been performed.

Discussion / Additional Information: (optional)

For further details, please refer to the documentation included in Attachment 2 of this SWQMP report.

Project Name: The Salvation Army, Ray and Joan Kroc Center

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Other Site Requirements and Constraints

When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.

Site constraints influential to the storm water BMP design include the previous development of the site (i.e. all native vegetation and natural flow paths have been replaced with structures, driveways or have been mass graded, all native soils have been compacted as part of past construction. Propriety basins such as Filterra flow through basin, or a similar product and Modular Wetland Basin (or similar product) will be used to comply with storm water quality and hydromodification and flood control requirements. Underground detention basins will be used to meet flood control needs. Topographic constraints related to the surrounding site, and proper ventilation requirements for the parking structure also impacted the grading and drainage design.

Optional Additional Information or Continuation of Previous Sections As Needed

This space provided for additional information or continuation of information from previous sections as needed.

Source Control BMP Checklist for PDPs

Form I-4B

Source Control BMPs

All development projects must implement source control BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.

Source Control Requirement	Applied?		
4.2.1 Prevention of Illicit Discharges into the MS4	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.1 not implemented:			
4.2.2 Storm Drain Stenciling or Signage	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.2 not implemented:			
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.3 not implemented:			
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.4 not implemented:			
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.5 not implemented: Trash generated at the proposed improvements will be stored within the building such that it cannot come into direct contact with rainfall or runon and transferred to the existing dumpster onsite for pick-up.			

Project Name: The Salvation Army, Ray and Joan Kroc Center

Form I-4B Page 2 of 2			
Source Control Requirement	Applied?		
4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
On-site storm drain inlets	☑ Yes	☐ No	☐ N/A
Interior floor drains and elevator shaft sump pumps	☑ Yes	☐ No	☐ N/A
Interior parking garages	☑ Yes	☐ No	☐ N/A
Need for future indoor & structural pest control	☑ Yes	☐ No	☐ N/A
Landscape/Outdoor Pesticide Use	☑ Yes	☐ No	☐ N/A
Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	☑ N/A
Food service	☐ Yes	☐ No	☑ N/A
Refuse areas	☐ Yes	☐ No	☑ N/A
Industrial processes	☐ Yes	☐ No	☑ N/A
Outdoor storage of equipment or materials	☐ Yes	☐ No	☑ N/A
Vehicle/Equipment Repair and Maintenance	☐ Yes	☐ No	☑ N/A
Fuel Dispensing Areas	☐ Yes	☐ No	☑ N/A
Loading Docks	☐ Yes	☐ No	☑ N/A
Fire Sprinkler Test Water	☑ Yes	☐ No	☐ N/A
Miscellaneous Drain or Wash Water	☐ Yes	☐ No	☑ N/A
Plazas, sidewalks, and parking lots	☑ Yes	☐ No	☐ N/A
SC-6A: Large Trash Generating Facilities	☐ Yes	☐ No	☑ N/A
SC-6B: Animal Facilities	☐ Yes	☐ No	☑ N/A
SC-6C: Plant Nurseries and Garden Centers	☐ Yes	☐ No	☑ N/A
SC-6D: Automotive Facilities	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.			

Project Name: The Salvation Army, Ray and Joan Kroc Center

Site Design BMP Checklist for PDPs	Form I-5B

Site Design BMPs

All development projects must implement site design BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided.

A site map with implemented site design BMPs must be included at the end of this checklist.

Site Design Requirement	Applied?		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☐ No	☑ N/A

Discussion / justification if 4.3.1 not implemented:

The project site has been mass graded, there are no natural drainage pathways within the project site or in the area surrounding the subject matter. Nevertheless the overall flow pattern and point of discharge will remain unchanged by the proposed improvements.

1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☐ Yes	☐ No	☑ N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	☑ Yes	☐ No	☐ N/A
1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☑ Yes	☐ No	☐ N/A
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☑ Yes	☐ No	☐ N/A
4.3.2 Have natural areas, soils and vegetation been conserved?	☐ Yes	☐ No	☑ N/A

Discussion / justification if 4.3.2 not implemented:

There are no existing drainage pathways and hydrologic features to conserve as area has been mass graded. The proposed project is a redevelopment. Natural areas, soils and vegetation had been previously modified and replaced. Trees implemented are tree wells, which have been designed to receive and treat runoff from onsite area, not from street. Tree wells have been designed in accordance with City of San Diego requirements.

Project Name: The Salvation Army, Ray and Joan Kroc Center

Form I-5B Page 2 of 4			
Site Design Requirement	Applied?		
4.3.3 Minimize Impervious Area	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.3 not implemented: The proposed development design includes pervious areas where possible.			
4.3.4 Minimize Soil Compaction	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.4 not implemented: Soils onsite were compacted during the previous development of the site. The proposed project is a three story parking structure with one of the stories located underground. Adequate compaction needs to be performed for structural reasons. The design looks to implement limited compaction where possible (landscape areas).			
4.3.5 Impervious Area Dispersion	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.5 not implemented: Impervious surfaces within DMAs 1-3, 1-4, & 1-6 will discharge to permeable areas that include tree wells.			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☑ Yes	☐ No	☐ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☐ Yes	☑ No	☐ N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	☐ Yes	☑ No	☐ N/A

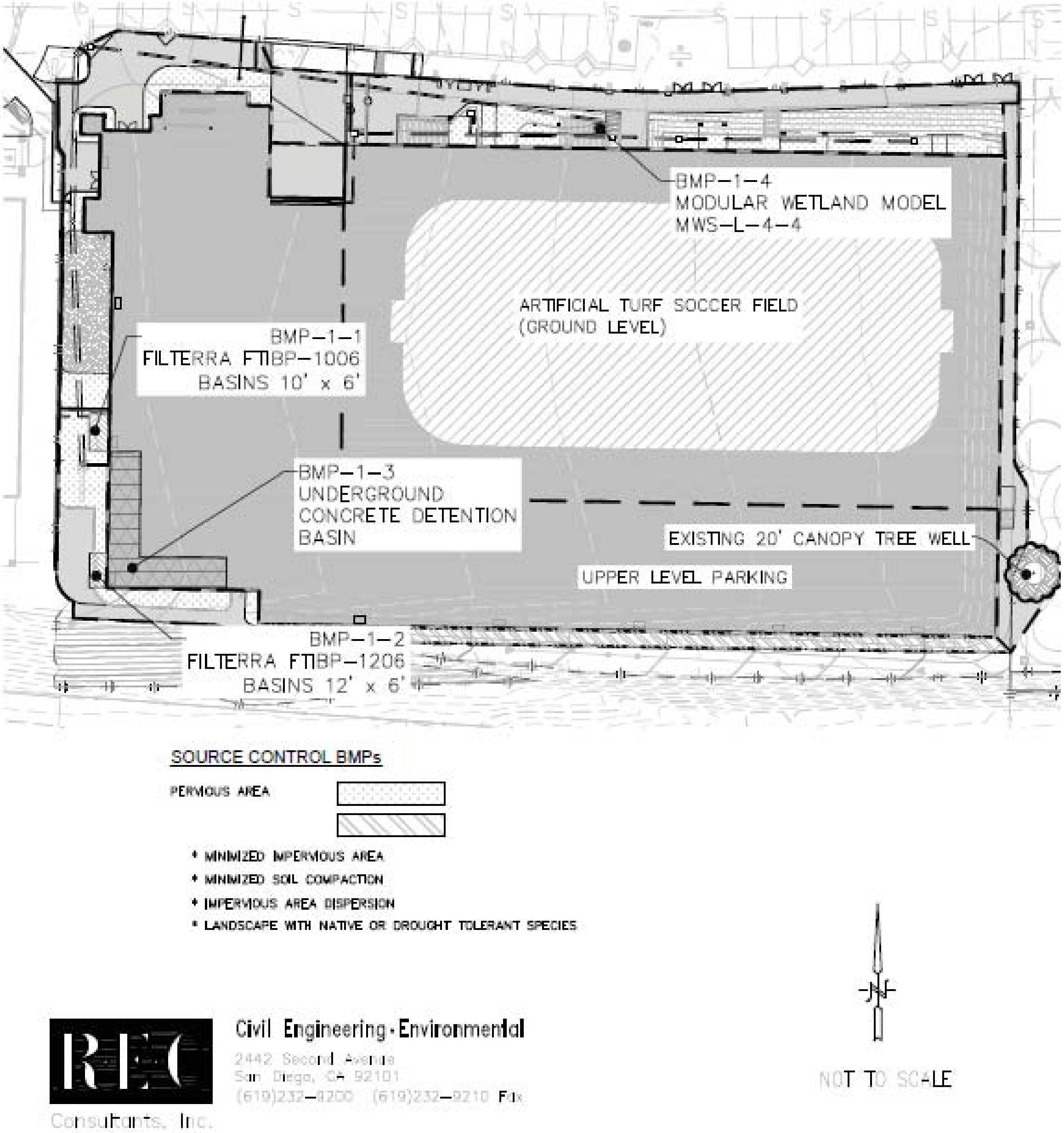
Form I-5B Page 3 of 4

Site Design Requirement	Applied?		
4.3.6 Runoff Collection	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.6 not implemented: All runoff from project will be directed to proprietary basins and one tree well.			
6a-1 Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
6a-2 Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
6b-2 Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
4.3.7 Landscaping with Native or Drought Tolerant Species	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.7 not implemented: Please refer to Landscape Plans for further details.			
4.3.8 Harvest and Use Precipitation	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.8 not implemented: Harvest and re-use is not implemented because entire site will flow onto propriety basins and one tree well. The results from Worksheet B.3-1, included under Attachment 1, indicate that the project qualifies as Feasiblity Category No. 5 (requiring standard lined biofiltration BMPs), and does not qualify for Feasibility Category No. 2 (requiring capture and use). In this case Flow through planters are used.			
8-1 Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
8-2 Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A

Form I-5B Page 4 of 4

Insert Site Map with all site design BMPs identified:

SITE MAP - THE SALVATION ARMY KROC CENTER



Project Name: The Salvation Army, Ray and Joan Kroc Center

Summary of PDP Structural BMPs	Form I-6

PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 7 of the BMP Design Manual).

Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

The site was designed to drain all impervious surfaces from proposed building and part of surrounding sidewalk to two (2) Filterra Flow through planter basins or similar product. Basins will be raised in order to accommodate for more depth. These basins will be used to meet water quality requirements. Runoff will then be retained at retention basin located within proposed building; which will meet flood control and hydromodification needs. The area north of the building will be directed towards one (1) Modular Wetland Basin which will meet water quality requirements. Landscape and sidewalks to east of the proposed building will be self-retaining areas with the use of one existing tree well located to the east of the project site which has been designed to meet water quality and hydromodification needs.

According to the results from Worksheet B.3-1, included under Attachment 1, the project design does not allow for harvest and reuse or for infiltration of runoff; additionally, there is not enough available area to implement traditional retention or biofiltration basins.

The percolation rates observed by geotechnical engineer are extremely small, for further details please refer to the Geotechnical Investigation for KROC II Wellness Center/Gymnasium prepared by Beocon (05/05/17), included under SWQMP Attachment 6.

(Continue on page 2 as necessary.)

Form I-6 Page 1 of 8 (Copy as many as needed)

Structural BMP Summary Information

Structural BMP ID No. BMP-1-1

Construction Plan Sheet No. 552436

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☑ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☑ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Jason Evans REC Consultants. Inc. 24442 Second Avenue, San Diego, CA 92101
Who will be the final owner of this BMP?	Salvation Army Kroc Center 6760 University Avenue, Suite 240, San Diego, CA
Who will maintain this BMP into perpetuity?	Salvation Army Kroc Center 6760 University Avenue, Suite 240, San Diego, CA
What is the funding mechanism for maintenance?	To be funded by owner - Salvation Army Kroc Center

Form I-6 Page 2 of 8 (Copy as many as needed)
Structural BMP ID No. BMP-1-1
Construction Plan Sheet No. 552436
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): Runoff from DMA-1-1 will be treated for water quality purposes by BMP-1-1 a 10' x 6' Filterra Flow through planter unit (or approved similar product. BMP-1-1 will also serve as pre-treatment device for the proposed underground detention basin BMP-1-3.

Form I-6 Page 3 of 8 (Copy as many as needed)

Structural BMP Summary Information

Structural BMP ID No. BMP-1-2

Construction Plan Sheet No. 552436

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☑ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☑ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Jason Evans REC Consultants. Inc. 24442 Second Avenue, San Diego, CA 92101
Who will be the final owner of this BMP?	Salvation Army Kroc Center 6760 University Avenue, Suite 240, San Diego, CA
Who will maintain this BMP into perpetuity?	Salvation Army Kroc Center 6760 University Avenue, Suite 240, San Diego, CA
What is the funding mechanism for maintenance?	To be funded by owner - Salvation Army Kroc Center

Form I-6 Page 4 of 8 (Copy as many as needed)

Structural BMP ID No. BMP-1-2

Construction Plan Sheet No. 552436

Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Runoff from DMA-1-2 will be treated for water quality purposes by BMP-1-1 a 12' x 6' Filterra Flow through planter unit (or approved similar product. BMP-1-2 will also serve as pre-treatment device for the proposed underground detention basin BMP-1-3.

Form I-6 Page 5 of 8 (Copy as many as needed)

Structural BMP Summary Information

Structural BMP ID No. BMP-1-3

Construction Plan Sheet No. 552436

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)

☐ Retention by infiltration basin (INF-1)

☐ Retention by bioretention (INF-2)

☐ Retention by permeable pavement (INF-3)

☐ Partial retention by biofiltration with partial retention (PR-1)

☐ Biofiltration (BF-1)

☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)

☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)

☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)

☑ Detention pond or vault for hydromodification management

☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only

☑ Hydromodification control only

☐ Combined pollutant control and hydromodification control

☐ Pre-treatment/forebay for another structural BMP

☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Jason Evans REC Consultants, Inc. 24442 Second Avenue, San Diego, CA 92101
Who will be the final owner of this BMP?	Salvation Army Kroc Center 6760 University Avenue, Suite 240, San Diego CA
Who will maintain this BMP into perpetuity?	Salvation Army Kroc Center= 6760 University Avenue, Suite 240, San Diego CA
What is the funding mechanism for maintenance?	To be funded by owner - Salvation Army Kroc Center

Form I-6 Page 6 of 8 (Copy as many as needed)
Structural BMP ID No. BMP-1-3
Construction Plan Sheet No. 552436
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP-3 is an underground detention basin. BMPs 1-1 and 1-2 will serve as pre-treatment devices for BMP-1-3

Form I-6 Page 7 of 8 (Copy as many as needed)

Structural BMP Summary Information

Structural BMP ID No. BMP-1-4

Construction Plan Sheet No. 552436

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☑ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☑ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Jason Evans REC Consultants. Inc. 24442 Second Avenue, San Diego, CA 92101
Who will be the final owner of this BMP?	Salvation Army Kroc Center 6760 University Avenue, Suite 240, San Diego, CA
Who will maintain this BMP into perpetuity?	Salvation Army Kroc Center 6760 University Avenue, Suite 240, San Diego, CA
What is the funding mechanism for maintenance?	To be funded by owner - Salvation Army Kroc Center

Form I-6 Page 8 of 8 (Copy as many as needed)
Structural BMP ID No. BMP-1-4
Construction Plan Sheet No. 552436
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): Runoff from DMA-1-4 A & B will be treated for water quality purposes by BMP-1-4 a Modular Wetland flow through planter unit Model MWS_L-4-4 (or approved similar product).

Compact (high rate) Biofiltration BMP Checklist | Form I-10

Compact (high rate) biofiltration BMPs have a media filtration rate greater than 5 in/hr. and a media surface area smaller than 3% of contributing area times adjusted runoff factor. Compact biofiltration BMPs are typically proprietary BMPs that may qualify as biofiltration.

A compact biofiltration BMP may satisfy the pollutant control requirements for a DMA onsite in some cases. This depends on the characteristics of the DMA **and** the performance certification/data of the BMP. If the pollutant control requirements for a DMA are met onsite, then the DMA is not required to participate in an offsite storm water alternative compliance program to meet its pollutant control obligations.

An applicant using a compact biofiltration BMP to meet the pollutant control requirements onsite must complete Section 1 of this form and include it in the PDP SWQMP. A separate form must be completed for each DMA. In instances where the City Engineer does not agree with the applicant's determination, Section 2 of this form will be completed by the City and returned to the applicant.

Section 1: Biofiltration Criteria Checklist (Appendix F)

Refer to Part 1 of the Storm Water Standards to complete this section. When separate forms/worksheets are referenced below, the applicant must also complete these separate forms/worksheets (as applicable) and include in the PDP SWQMP. The criteria numbers below correspond to the criteria numbers in Appendix F.

Criteria	Answer	Progression
Criteria 1 and 3: What is the infiltration condition of the DMA? Refer to Section 5.4.2 and Appendix C of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. Applicant must complete and include the following in the PDP SWQMP submittal to support the feasibility determination: • Infiltration Feasibility Condition Letter; or • Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B. Applicant must complete and include all applicable sizing worksheets in the SWQMP submittal	○ Full Infiltration Condition	**Stop**. Compact biofiltration BMP is not allowed.
	○ Partial Infiltration Condition	Compact biofiltration BMP is only allowed, if the target volume retention is met onsite (Refer to Table B.5-1 in Appendix B.5). Use Worksheet B.5-2 in Appendix B.5 to estimate the target volume retention (Note: retention in this context means reduction). If the required volume reduction is achieved **proceed to Criteria 2**. If the required volume reduction is not achieved, compact biofiltration BMP is not allowed. **Stop**.
	● No Infiltration Condition	Compact biofiltration BMP is allowed if volume retention criteria in Table B.5-1 in Appendix B.5 for the no infiltration condition is met. Compliance with this criterion must be documented in the PDP SWQMP. If the criteria in Table B.5-1 is met **proceed to Criteria 2**. If the criteria in Table B.5-1 is not met, compact biofiltration BMP is not allowed. **Stop**.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 1 and 3:

Feasibility Analysis:

Summarize findings and include either infiltration feasibility condition letter or Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B in the PDP SWQMP submittal.

If Partial Infiltration Condition:

Provide documentation that target volume retention is met (include Worksheet B.5-2 in the PDP SWQMP submittal). Worksheet B.5-7 in Appendix B.5 can be used to estimate volume retention benefits from landscape areas.

If No Infiltration Condition:

Provide documentation that the volume retention performance standard is met (include Worksheet B.5-2 in the PDP SWQMP submittal) in the PDP SWQMP submittal. Worksheet B.5-6 in Appendix B.5 can be used to document that the performance standard is met.

Proposed proprietary basins have been designed as flow-thru basins which will serve to meet water quality requirements only. In order to comply with detention requirements, a detention vault (BMP-3) has been specified downstream of BMPs 1-1 and 1-2. Such detention basin has an area of 800 sq-ft and a depth of 4 ft. Please refer to project's Drainage Report for detailed analysis.

Criteria	Answer	Progression
Criteria 2: Is the compact biofiltration BMP sized to meet the performance standard from the MS4 Permit? Refer to Appendix B.5 and Appendix F.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	● Meets Flow based Criteria	Use guidance from **Appendix F.2.2** to size the compact biofiltration BMP to meet the flow based criteria. Include the calculations in the PDP SWQMP. Use parameters for sizing consistent with manufacturer guidelines and conditions of its third party certifications (i.e. a BMP certified at a loading rate of 1 gpm/sq. ft. cannot be designed using a loading rate of 1.5 gpm/sq. ft.) **Proceed to Criteria 4.**
	○ Meets Volume based Criteria	Provide documentation that the compact biofiltration BMP has a total static (i.e. non-routed) storage volume, including pore-spaces and pre-filter detention volume (Refer to Appendix B.5 for a schematic) of at least 0.75 times the portion of the DCV not reliably retained onsite. **Proceed to Criteria 4.**
	○ Does not Meet either criteria	**Stop**. Compact biofiltration BMP is not allowed.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 2:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., loading rate, etc., as applicable).

Analysis is included in Attachment 1 of SWQMP

Criteria	Answer	Progression
Criteria 4: Does the compact biofiltration BMP meet the pollutant treatment performance standard for the projects most significant pollutants of concern? Refer to Appendix B.6 and Appendix F.1 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	● Yes, meets the TAPE certification.	Provide documentation that the compact BMP has an appropriate TAPE certification for the projects most significant pollutants of concern. **Proceed to Criteria 5.**
	○ Yes, through other third-party documentation	Acceptance of third-party documentation is at the discretion of the City Engineer. The City engineer will consider, (a) the data submitted; (b) representativeness of the data submitted; and (c) consistency of the BMP performance claims with pollutant control objectives in Table F.1-2 and Table F.1-1 while making this determination. If a compact biofiltration BMP is not accepted, a written explanation/ reason will be provided in Section 2. **Proceed to Criteria 5.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 4:

Provide documentation that identifies the projects most significant pollutants of concern and TAPE certification or other third party documentation that shows that the compact biofiltration BMP meets the pollutant treatment performance standard for the projects most significant pollutants of concern.

Manufacturer's specifications show that most significant pollutants are treated and standards are being met. Please refer to Appendix 3 of SWQMP.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 5: Is the compact biofiltration BMP designed to promote appropriate biological activity to support and maintain treatment process? Refer to Appendix F of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	● Yes	Provide documentation that the compact biofiltration BMP support appropriate biological activity. Refer to Appendix F for guidance. **Proceed to Criteria 6.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 5:

Provide documentation that appropriate biological activity is supported by the compact biofiltration BMP to maintain treatment process.

All documentation is included in manufacturer's specifications and product description. Please refer to Appendix 3 of SWQMP.

Criteria	Answer	Progression
Criteria 6: Is the compact biofiltration BMP designed with a hydraulic loading rate to prevent erosion, scour and channeling within the BMP?	● Yes	Provide documentation that the compact biofiltration BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification. **Proceed to Criteria 7.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 6:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).

The proposed proprietary basin-detention vault combination provides the required removal of pollutants and detention/loading rate requirements. Please refer to Appendix 3 of this report for specifications for flow through basin (proprietary basin) which is designed to meet water quality needs; and refer to project's drainage report for detention vault details, which serves to meet Q100 and hydromodification requirements.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 7: Is the compact biofiltration BMP maintenance plan consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies)?	● Yes, and the compact BMP is privately owned, operated and not in the public right of way.	Submit a maintenance agreement that will also include a statement that the BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification. **Stop**. The compact biofiltration BMP meets the required criteria.
	○ Yes, and the BMP is either owned or operated by the City or in the public right of way.	Approval is at the discretion of the City Engineer. The city engineer will consider maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business or other relevant factors while making the determination. **Stop**. Consult the City Engineer for a determination.
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 7:

Include copy of manufacturer guidelines and conditions of third-party certification in the maintenance agreement. PDP SWQMP must include a statement that the compact BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.

All documentation is included in Appendix 3 of SWQMP.

Compact (high rate) Biofiltration BMP Checklist	Form I-10
Section 2: Verification (For City Use Only)	
Is the proposed compact BMP accepted by the City Engineer for onsite pollutant control compliance for the DMA?	○ Yes ○ No, See explanation below
Explanation/reason if the compact BMP is not accepted by the City for onsite pollutant control compliance:	

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Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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Project Name: The Salvation Army, Ray and Joan Kroc Center

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☐ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☑ Included on DMA Exhibit in Attachment 1a ☐ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☑ Included ☐ Not included because the entire project will use infiltration BMPs
Attachment 1d	Infiltration Feasibility Information. Contents of Attachment 1d depend on the infiltration condition: • No Infiltration Condition: o Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*) o Form I-8A (optional) o Form I-8B (optional) • Partial Infiltration Condition: o Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*) o Form I-8A o Form I-8B • Full Infiltration Condition: o Form I-8A o Form I-8B o Worksheet C.4-3 o Form I-9 Refer to Appendices C and D of the BMP Design Manual for guidance.	☑ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☑ Included

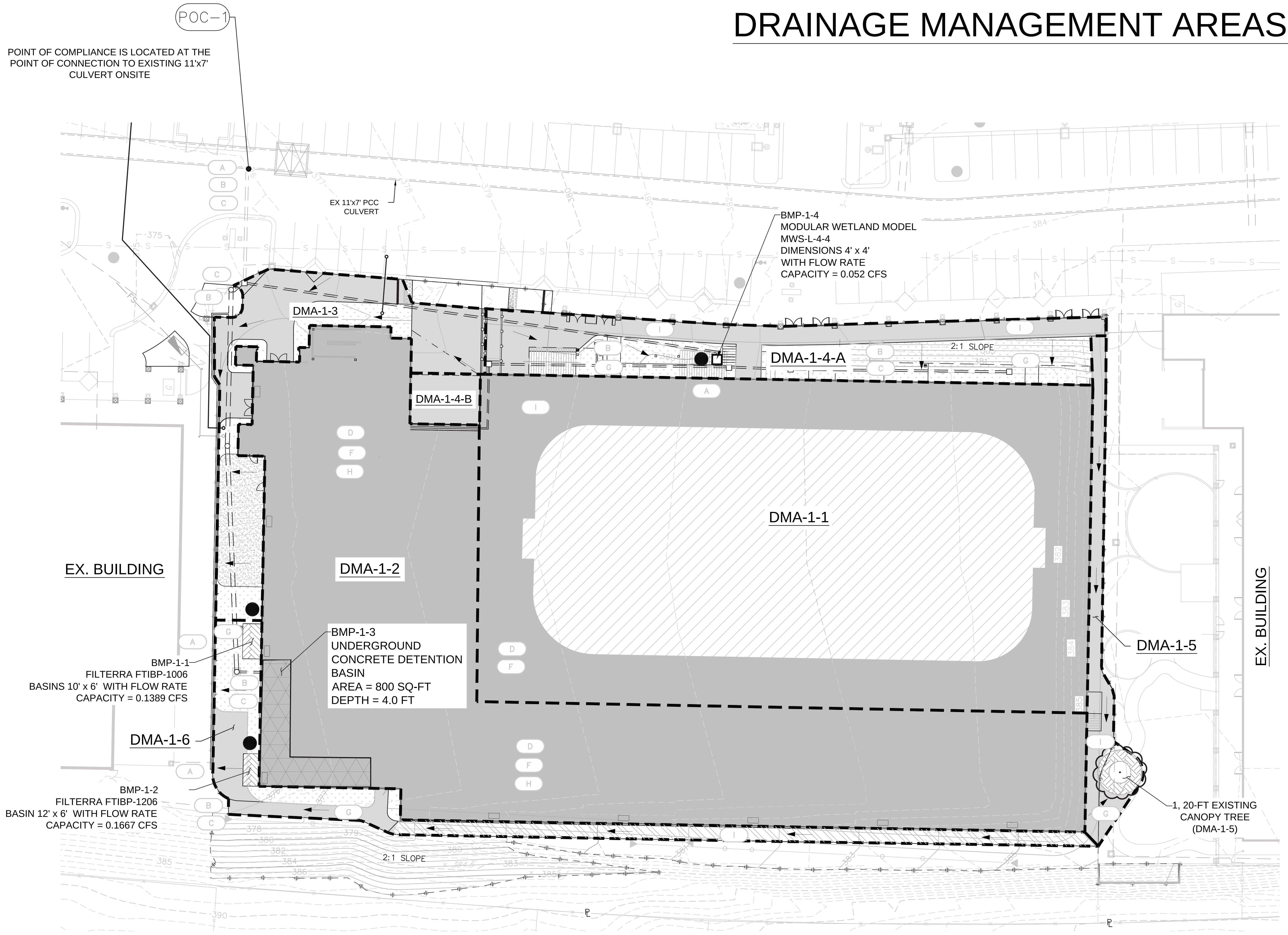
Project Name: The Salvation Army, Ray and Joan Kroc Center

Use this checklist to ensure the required information has been included on the DMA Exhibit:

The DMA Exhibit must identify:

- ☑ Underlying hydrologic soil group
- ☑ Approximate depth to groundwater
- ☑ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ☑ Critical coarse sediment yield areas to be protected
- ☑ Existing topography and impervious areas
- ☑ Existing and proposed site drainage network and connections to drainage offsite
- ☑ Proposed grading
- ☑ Proposed impervious features
- ☑ Proposed design features and surface treatments used to minimize imperviousness
- ☑ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
- ☑ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
- ☑ Structural BMPs (identify location, type of BMP, size/detail, and include cross-section)

DRAINAGE MANAGEMENT AREAS EXHIBIT



LEGEND

DESCRIPTION	SYMBOL
PROPERTY LINE	℄
DMA BOUNDARY	— — —
PROPOSED CONTOUR	630
EXISTING CONTOUR	630
DAYLIGHT	
RAISED PLANTAR BOX (FILTERRA UNIT)	▨
DRAINAGE VAULT	▨
MODULAR WETLAND	□
EX 20' CANOPY TREE WELL	○
TREE WELL AMENDED SOIL	◎
IMPERVIOUS AREA	▭
PROPOSED BUILDING (IMPERVIOUS)	▭
ARTIFICIAL TURF (PERVIOUS)	▨
PERVIOUS LANDSCAPE AREA	▭
DECOMPOSED GRANITE AREA (PERMEABLE)	▭
PROPOSED PERVIOUS CONCRETE	▨

SOURCE CONTROL BMPs

PROHIBITIVE SIGNAGE ●

- MINIMIZED IMPERVIOUS AREA
- MINIMIZED SOIL COMPACTION
- IMPERVIOUS AREA DISPERSION
- LANDSCAPE WITH NATIVE OR DROUGHT TOLERANT SPECIES

A	PREVENTION OF ILLICIT DISCHARGES TO MS4
B	STORM DRAIN STENCILING OR SIGNAGE
C	ON-SITE STORM DRAIN INLETS
D	INTERIOR FLOOR DRAINS AND ELEVATOR SHAFT SUMP PUMPS
E	INTERIOR PARKING GARAGES
F	NEED FOR FUTURE INDOOR AND STRUCTURAL PEST CONTROL
G	LANDSCAPE/OUTDOOR PESTICIDE USE
H	FIRE SPRINKLER TEST WATER
I	PLAZAS, SIDEWALKS, AND PARKING LOTS

SAMPLE PROHIBITIVE SIGNAGE

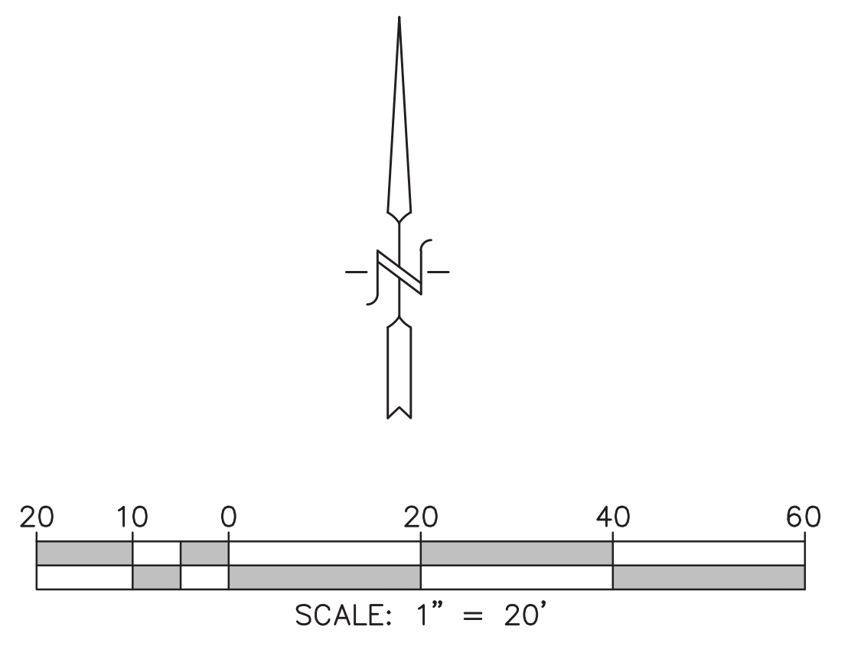
NTS

NOTES:

1. NO EXISTING NATURAL HYDROLOGIC FEATURES (WATERCOURSES, SEEPS, SPRINGS, WETLANDS). DEVELOPMENT PROPOSED ON EXISTING GRADED LOT.

2. NO CRITICAL COURSE SEDIMENT YIELD AREAS PRESENT WITHIN PROJECT LIMITS.

3. DEPTH OF GROUNDWATER > 6 FT
4. UNDERLYING SOIL GROUP "D"



DMA AREAS

PROPOSED CONDITIONS DMA AREAS

DMA	SUB-AREA	IMPERVIOUS (AC)	PERVIOUS (AC)	ARTIFICIAL TURF (AC)	PROPOSED DG SURFACE (AC)	TOTAL AREA (AC)	DRAINS TO	POC
1	1-1	0.28	0.00	0.35	0.00	0.63	BMP-1-1	POC-1
	1-2	0.53	0.00	0.00	0.00	0.53	BMP-1-2	
	1-3	0.05	0.02	0.00	0.02	0.09	BMP-1-1	
	1-4-A	0.05	0.06	0.00	0.00	0.12	BMP-1-4	
	1-4-B	0.01	0.00	0.00	0.00	0.01		
	1-5	0.03	0.01	0.00	0.00	0.03	BMP-1-5 (TREE WELL)	
	1-6	0.02	0.02	0.00	0.03	0.07	BMP-1-2	
TOTAL	0	0.96	0.11	0.35	0.05	1.48	-	

TREE WELL SIZING

TREE WELL SUMMARY

DMA	DCV (CU-FT)	TREE CREDITS (CU-FT)	FINAL DCV (CU-FT)	PROPOSED TREE WELL
1-5	108	180	-72	1, 20-FT CANOPY TREE

DMA	TREE CANOPY DIAMETER (FT)	TREE WELL AMMENDED SOIL SPECIFICATIONS			
		REQUIRED VOLUME (CU-FT)	PROPOSED SOIL DEPTH (FT)	AREA (SQ-FT)	PROPOSED SOIL DIAMETER (FT)
1-5	20	628.3	3	209.4	16.5

FILTERRA BASINS FLOW BASED SIZING

AVAILABLE FILTERRA BOX SIZES			DI = 0.2	C = 1.00	C = 0.85	C = 0.5
L (ft)	W (ft)	FILTERRA SURFACE AREA (sq-ft)	FILTERRA FLOW RATE, Q (cu-ft/s)	100% IMPERVIOUS DA (acres)	COMMERCIAL MAX DA (acres)	RESIDENTIAL MAS DA (acres)
4	4	16	0.037	0.122	0.144	0.245
6	4	24	0.0556	0.184	0.216	0.367
6.5	4	26	0.0602	0.199	0.234	0.398
8	4	32	0.0741	0.245	0.288	0.49
10	4	40	0.0923	0.306	0.26	0.612
12	4	48	0.1111	0.367	0.432	0.735
6	6	36	0.0833	0.275	0.324	0.551
8	6	48	0.1111	0.367	0.432	0.735
10	6	60	0.1389	0.459	0.54	0.918
12	6	72	0.1667	0.551	0.648	1.102
13	7	91	0.2106	0.696	0.819	1.393

MODULAR WETLANDS FLOW BASED SIZING

MODEL #	DIMENSIONS	WETLAND MEDIA SURFACE AREA (sq-ft)	TREATMENT FLOW RATE (CFS)
MWS-L-4-4	4' x 4'	23	0.052
MWS-L-4-6	4' x 6'	32	0.073
MWS-L-4-8	4' x 8'	50	0.115
MWS-L-4-13	4' x 13'	63	0.144
MWS-L-4-15	4' x 15'	76	0.175
MWS-L-4-17	4' x 17'	90	0.206
MWS-L-4-19	4' x 19'	103	0.237
MWS-L-4-22	4' x 21'	117	0.268
MWS-L-8-8	8' x 8'	100	0.23
MWS-L-8-12	8' x 12'	151	0.346
MWS-L-8-16	8' x 16'	201	0.462

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DATE: 08-23-2017
JOB NO: 15024
DRAWN BY: RJD
CHECKED BY: Checker

Revision Schedule

#	Date	Description

ORIGINAL PREPERATION DATE:
7/8/17

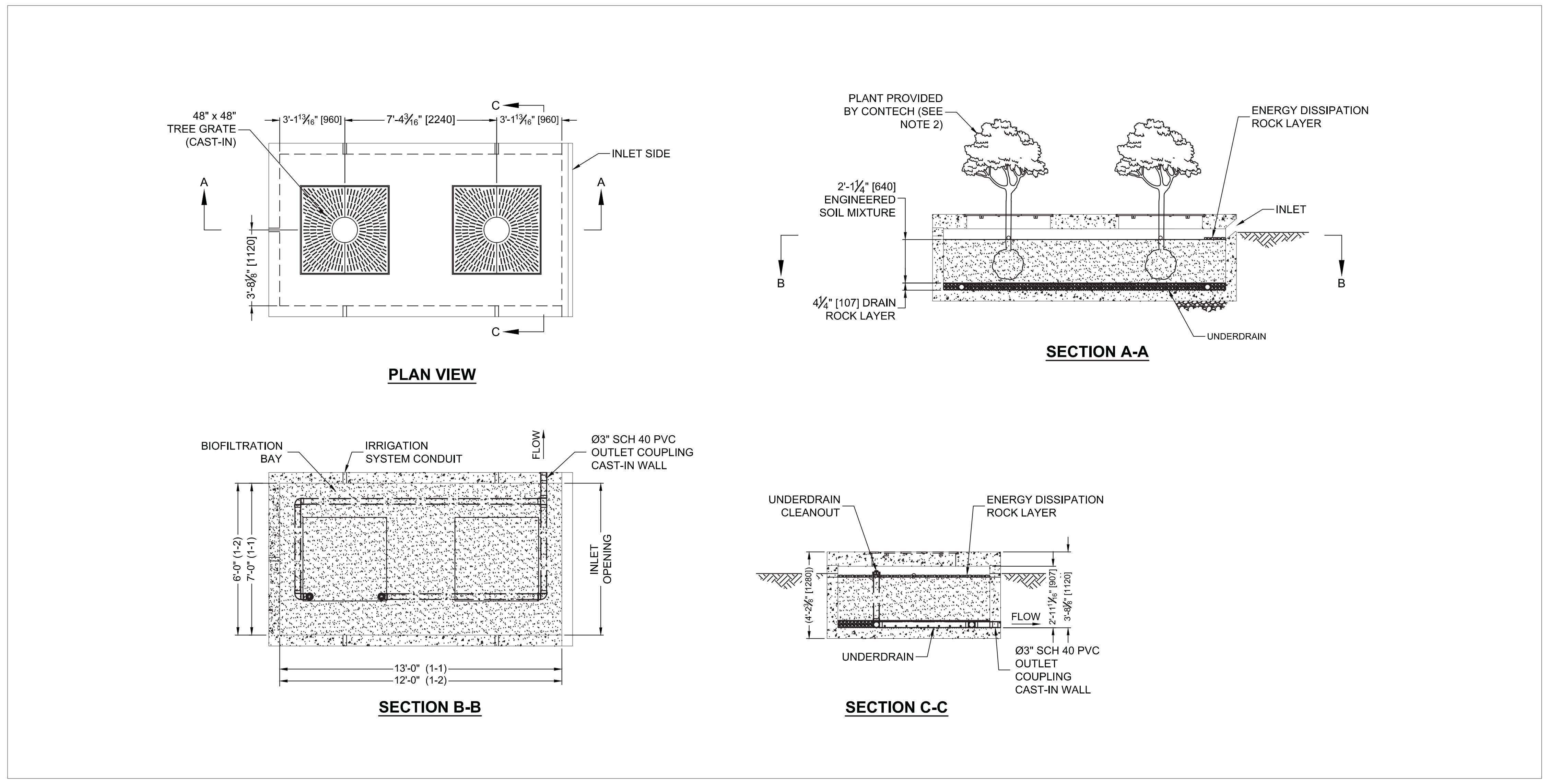
REVISION DATE(S):

project:
DMA EXHIBIT
Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

1

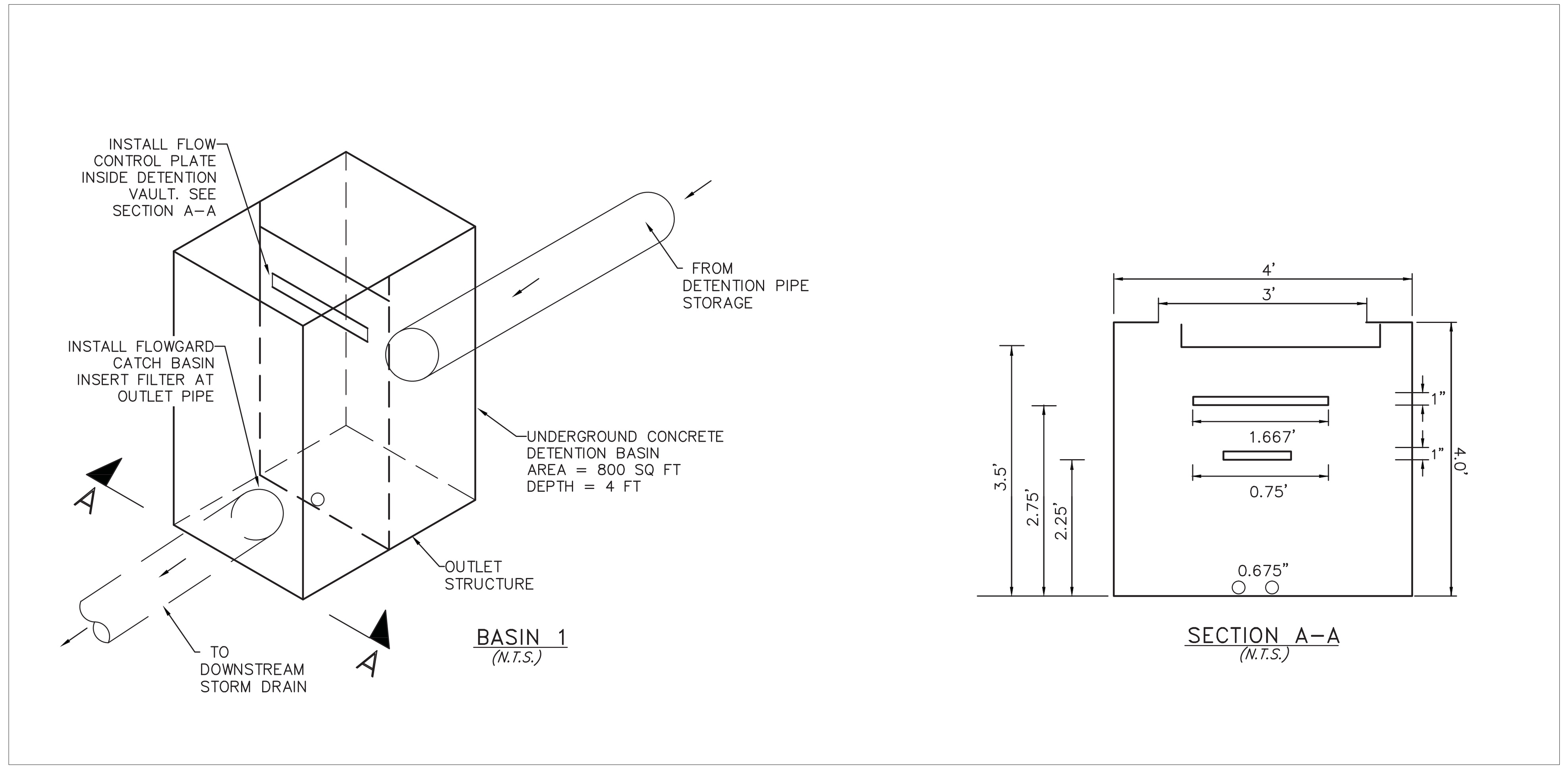
SHEET: 1 of 2

DRAINAGE MANAGEMENT AREAS DETAILS



FILTERRA FTIBP DETAIL

NTS



DETENTION VAULT DETAIL

NTS

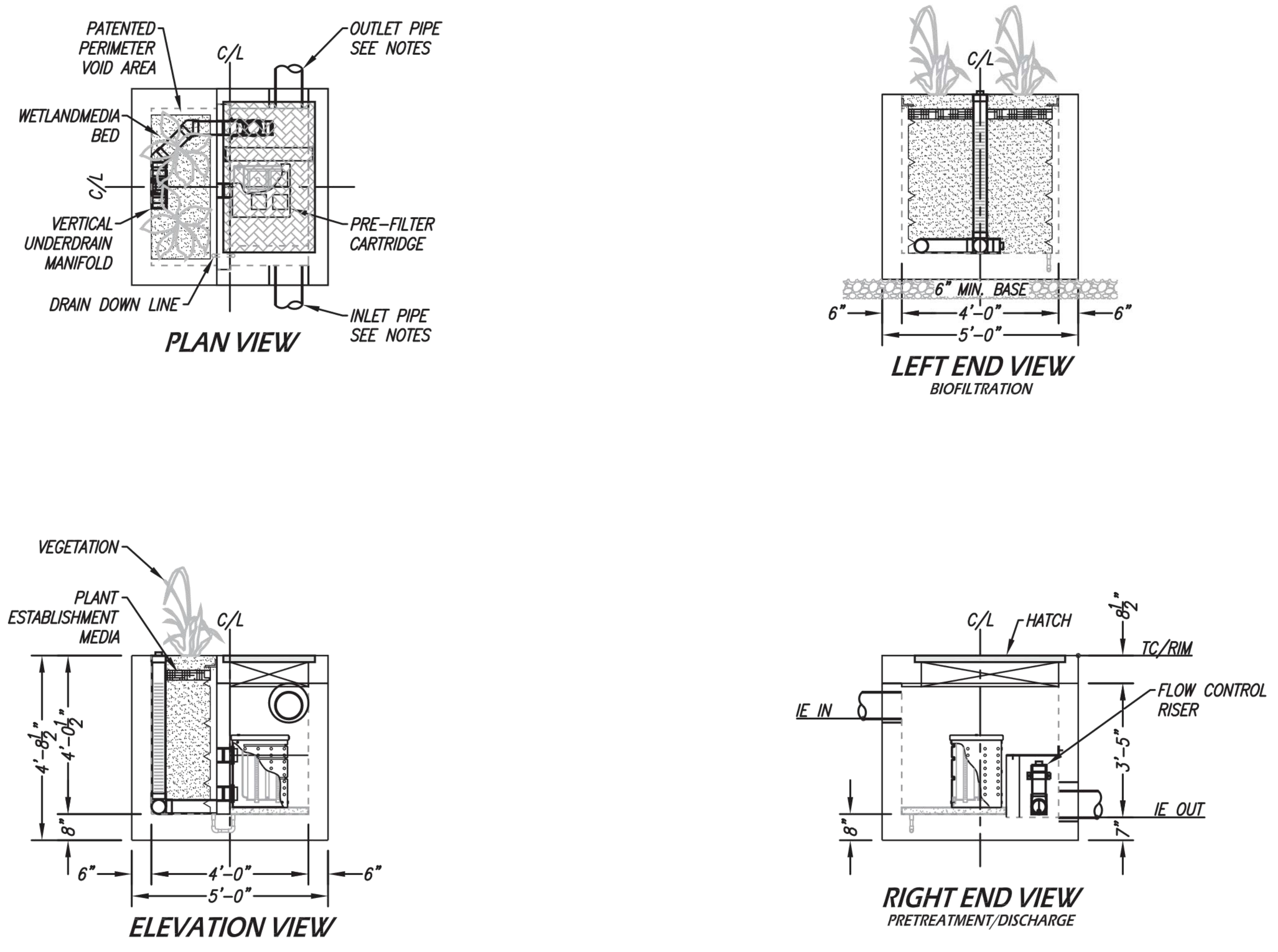
SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	24" x 42"	N/A	N/A
WETLANDMEDIA VOLUME (CY)			0.83
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø1.03"
MAXIMUM PICK WEIGHT (LBS)			9000
NOTES:			

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON–SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

GENERAL NOTES

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



TREATMENT FLOW (CFS)	0.052
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLAND DETAIL

NTS

THE PRODUCT DESCRIBED MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

MODULAR WETLANDS
www.ModularWetlands.com | (855) 5MOD-WET

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

REC
Consultants, Inc.
Civil Engineering • Environmental
Land Surveying
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SAVE DATE: 8/20/2018 ~ PLOT DATE: 8/20/2018 ~ FILE NAME: P:\Acad\1290 Kroc Center\Reports\SWQMP\CAD\DMA – HMP MAP.dwg

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DATE: 08-23-2017
JOB NO: 15024
DRAWN BY: RJD
CHECKED BY: Checker

Revision Schedule

#	Date	Description

ORIGINAL PREPERATION DATE:
7/8/17

REVISION DATE(S):

DMA DETAILS

project: Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

2

SHEET: 2 of 2

Harvest and Use Feasibility Checklist	Worksheet B.3-1 : Form I-7

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?
☑ Toilet and urinal flushing
☑ Landscape irrigation
☐ Other:___________

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.
[Provide a summary of calculations here]

Toilet and urinal flushing demand: (9.3 gal/person-day)(1 sq-ft/7.48gal)(1 building)(50 persons/building)(1.5day) =93.25 cu-ft

Irrigation Demand: (1470 gal/acre-1.5day)(1 cu-ft/7.48 gal)(1.5day)(0.1 acres) = 29.48 cu-ft

Total: 122.73 cu-ft

3. Calculate the DCV using worksheet B-2.1.
DCV = 2098 (cubic feet)
[Provide a summary of calculations here]

Per worksheets B-1 and B-2.1: The total area is 1.48 acres, with a weighted runoff coefficient of 0.71 and 85th percentile depth of 0.55 inches. Multiply the product of the three values by 3630.

3a. Is the 36-hour demand greater than or equal to the DCV? ☐ Yes / ☑ No ⇨ ⇩	3b. Is the 36-hour demand greater than 0.25DCV but less than the full DCV? ☐ Yes / ☑ No ⇨ ⇩	3c. Is the 36-hour demand less than 0.25DCV? ☑ Yes ⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	Harvest and use is considered to be infeasible.

Is harvest and use feasible based on further evaluation?
☐ Yes, refer to Appendix E to select and size harvest and use BMPs.
☑ No, select alternate BMPs.

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Project No. 06151-42-05
August 7, 2018

The Salvation Army
Ray and Joan Kroc Community Center
6845 University Avenue
San Diego, California 92115

Attention: Mr. Kevin Forrey

Subject: STORM WATER MANAGEMENT
KROC II – WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

Dear Mr. Forrey:

In accordance with the request of REC Consultants, we have prepared this report providing recommendations regarding storm water management for the subject project. Information specific to storm water management, as well as a summary of expected soil conditions are provided herein.

STORM WATER MANAGEMENT

If storm water management devices are not properly designed and constructed, there is a risk for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water being detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff into the subsurface occurs, downstream improvements may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, provides general information regarding soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table 1 presents the descriptions of the hydrologic soil groups.

TABLE 1
HYDROLOGIC SOIL GROUP DEFINITIONS

Soil Group	Soil Group Definition
A	Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
B	Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
C	Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
D	Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The site is underlain by compacted fill, undocumented fill, alluvium, and the Stadium Conglomerate formation. The property falls within Hydraulic Soil Group D, which has a very slow infiltration rating. Table 2 presents the information from the USDA website for the property.

TABLE 2
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group
Olivenhain-Urban land complex, 2 to 9 percent slopes	OkC	100	D

In-Situ Testing

On January 29, 2017, we performed five, constant-head, borehole infiltration tests at the approximate locations shown on Figure 1. All of the borings were drilled with a small-diameter drill rig using an 8-inch auger. Table 3 presents the results of the saturated hydraulic conductivity testing.

We used the guidelines presented in the Riverside County Low Impact Development BMP Design Handbook. Based on this widely accepted guideline, the saturated hydraulic conductivity (Ksat) approximately equal to the infiltration rate. Therefore, the Ksat value determined from the infiltration test is the unfactored infiltration rate. The Ksat (infiltration rate) equation provided in the Riverside County Handbook was used to compute the unfactored infiltration rate.

TABLE 3
UNFACTORED, FIELD-SATURATED, INFILTRATION TEST RESULTS USING THE SOILMOISTURE CORP AARDVARK PERMEAMETER

Test No.	Depth (inches)	Geologic Unit	Field Infiltration Rate, I (inches/hour)
A-1	40	Qudf	0.0003
A-2	55	Qudf	0.030
A-3	48	Qudf	0.0007
A-4	37	Qcf	0.10
A-5	57	Qudf	0.0004

Soil permeability values from in-situ tests can vary significantly from one location to another due to the non-homogeneous characteristics inherent to most soil. However, if a sufficient amount of field and laboratory test data is obtained, a general trend of soil permeability can usually be evaluated. For this project and for storm water purposes, the test results presented herein should be considered approximate values.

STORM WATER MANAGEMENT CONCLUSIONS

Soil Types

Undocumented Fill and Compacted Fill – Undocumented fill and compacted fill underlies the property. The fills are predominately comprised of silty to clayey sand. The infiltration rates indicate the soils are not suitable for full or partial infiltration.

Existing Improvements

The proposed area of infiltration is planned adjacent to existing hardscape and structures. Due to variable soil conditions and the low infiltration rates, there is a potential for lateral water movement, which could impact nearby structures.

Infiltration Rates

The results of the testing show infiltration rates ranging from approximately 0.003 to 0.1 inches per hour. The rates are not high enough to support full or partial infiltration.

Groundwater

Groundwater or seepage was previously observed during grading in the alluvium along the bedrock contact. We expect groundwater is present at depths of approximately 10 to 15 feet below existing grades. Groundwater/seepage may impact infiltration.

Existing Utilities

Existing utilities exist along the perimeter of the property. Infiltrating near utilities is not recommended. Mitigation measures to prevent water from infiltrating into the utilities consist of setbacks, installing cutoff walls around the utilities and installing subdrains and/or installing liners.

Soil or Groundwater Contamination

We are unaware of contaminated soil or groundwater on the property. Therefore, infiltration associated with this risk is considered feasible.

Storm Water Management Devices

Liners and subdrains are recommended in the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride**,** PVC). The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. The attached Worksheet C.4-1 presents the completed information for the submittal process.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table 4 describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE 4
SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS

Consideration	**High Concern – 3 Points**	**Medium Concern – 2 Points**	**Low Concern – 1 Point**
Assessment Methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., infiltrometer). Moderate spatial resolution	Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods.
Predominant Soil Texture	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site Soil Variability	Highly variable soils indicated from site assessment or unknown variability	Soil boring/test pits indicate moderately homogenous soils	Soil boring/test pits indicate relatively homogenous soils
Depth to Groundwater/ Impervious Layer	<5 feet below facility bottom	5-15 feet below facility bottom	>15 feet below facility bottom

Table 5 presents the estimated factor values for the evaluation of the factor of safety. The factor of safety is determined using the information contained in Table 4 and the results of our geotechnical investigation. Table 5 only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B of Worksheet D.5-1) and use the combined safety factor for the design infiltration rate.

TABLE 5
FACTOR OF SAFETY WORKSHEET D.5-1 DESIGN VALUES – PART A[1]

Suitability Assessment Factor Category	**Assigned Weight (w)**	**Factor Value (v)**	**Product (p = w x v)**
Assessment Methods	0.25	2	0.50
Predominant Soil Texture	0.25	2	0.50
Site Soil Variability	0.25	2	0.50
Depth to Groundwater/Impervious Layer	0.25	2	0.50
Suitability Assessment Safety Factor, $S_A = \Sigma p$			2.0

[1] The project civil engineer should complete Worksheet D.5-1 or Form I-9 to determine the overall factor of safety.

CONCLUSIONS AND RECOMMENDATIONS

Our results indicate the site has soils that inhibit infiltration. Because of these site conditions, and the presence of groundwater, it is our opinion that there is a high probability for lateral water migration. It is our opinion that full and partial infiltration is infeasible on this site. Liners and subdrains should be installed within BMP areas.

Should you have any questions regarding the letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

C. Mikesell

Rodney C. Mikesell
GE 2533

REGISTERED PROFESSIONAL ENGINEER
RODNEY C. MIKESELL
No.2533
GEOTECHNICAL
STATE OF CALIFORNIA

Garry W. Cannon
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RCE 56468

PROFESSIONAL GEOLOGIST
GARRY WELLS CANNON
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STATE OF CALIFORNIA

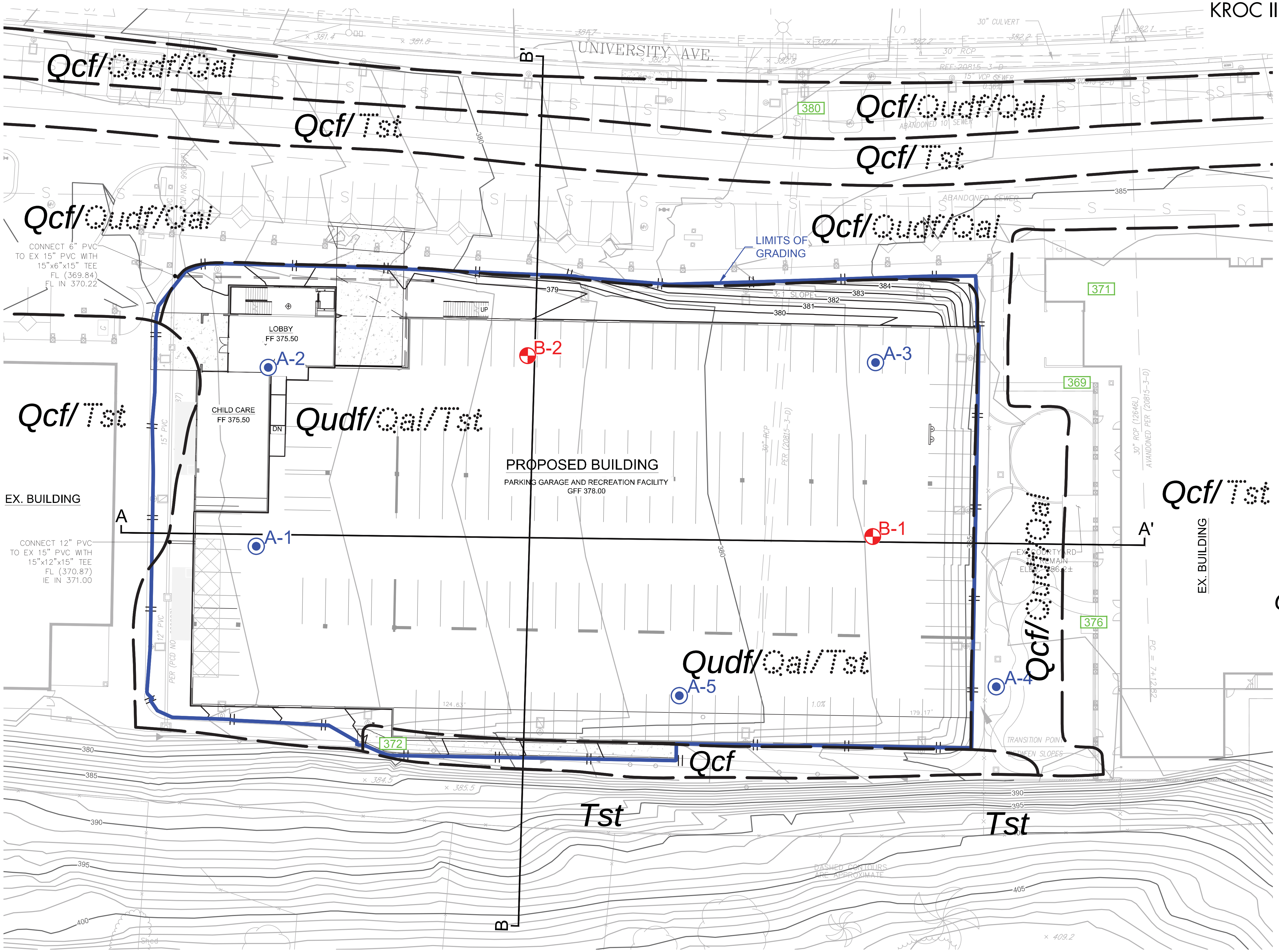
REGISTERED PROFESSIONAL ENGINEER
GARRY WELLS CANNON
No. C 056468
CIVIL
STATE OF CALIFORNIA

RCM:GWC:dmc

Attachments: Figure 1
Worksheet C.4-1/I-8

(1) Addressee
(e-mail) REC Consultants, Inc.
Attention: Ms. Marcela Diaz

KROC II WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA



0' 20' 40' 60' 80'
SCALE 1"=40'(on 11x17)

GEOCON LEGEND

Qcf ....COMPACTED FILL
Qudf ........UNDOCUMENTED FILL (Dotted Where Buried)
Qal ....ALLUVIUM (Dotted Where Buried)
Tst ....STADIUM CONGLOMERATE (Dotted Where Buried)
〜 ....APPROX. LOCATION OF GEOLOGIC CONTACT
B-2 ● ....APPROX. LOCATION OF EXPLORATORY BORING
A-5 ● ....APPROX. LOCATION OF INFILTRATION TEST
B B' ....APPROX. LOCATION GEOLOGIC CROSS SECTION
369 ....APPROX. ELEVATION AT BASE OF FILL

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GEOLOGIC MAP

PROJECT NO. G6151 - 42 - 05
FIGURE 1
DATE 08 - 07 - 2018

Plotted:08/07/2018 9:33AM | By:ALVIN LADRILLONO | File Location:Y:\1_GEOTECH\06000\06100\06151-42-05\2018-08-07\06151-42-05 Geo Map.dwg

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	**Worksheet C.4-1: Form I- 8A[10]**
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
Kroc II - Wellness Center/Gymnasium	
Criteria 1: Infiltration Rate Screening	
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☒ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☐ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☐ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☐ No; full infiltration is not required. Answer "No" to Criteria 1 Result.
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☐ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.

Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[11] Available data include site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☐ No; conduct appropriate number of tests.	
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☐ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.	
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☐ No; answer "No" to Criteria 1 Result.	
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☒ No; full infiltration is not required. Skip to Part 1 Result.	

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

We performed 5 field-saturated, hydraulic conductivity tests at the site using a Soil Moisture Corp Aardvark Permeameter at the locations presented Figure 2 of the project geotechnical investigation. Unfactored hydraulic conductivity ranged from 0.0003 to 0.10 inches/hour.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		**Worksheet C.4-1: Form I- 8A[10]**	
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A–1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	☐ Yes	☐ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B–1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☐ Yes	☐ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No

Summarize findings and basis; provide references to related reports or exhibits.

Part 1 Result – Full Infiltration Geotechnical Screening [12]	**Result**
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	☐ Full infiltration Condition ☒ Complete Part 2

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[12] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	**Worksheet C.4-1: Form I- 8A[10]**
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
Kroc II - Wellness Center/Gymnasium	
Criteria 3: Infiltration Rate Screening	
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☒ No; infiltration testing is conducted (refer to Table D.3–1), continue to Step 3B.
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ☐ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ☒ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ☐ Yes; Continue to Criteria 4. ☒ No: Skip to Part 2 Result.
Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate). We performed 5 field-saturated, hydraulic conductivity tests at the site using a Soil Moisture Corp Aardvark Permeameter at the locations presented Figure 2 of the project geotechnical investigation. The factored hydraulic conductivity ranged from 0.0001 to 0.05 inches/hour. The estimated factored reliable infiltration rate is 0.013 inches/hour.	

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I- 8A[10]		
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A–1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	☐ Yes	☐ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1 If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B–1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits.			

Part 2 – Partial Infiltration Geotechnical Screening Result[13]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐ Partial Infiltration Condition ☒ No Infiltration Condition

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[13] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Tabular Summary of DMAs

Worksheet B-1

DMA Unique Identifier	Area (acres)	Impervious Area (acres)	% Imp	HSG	Area Weighted Runoff Coefficient	DCV (cubic feet)	Treated By (BMP ID)	Pollutant Control Type	Drains to (POC ID)
DMA-1-1	0.63	0.28	43.83	D	0.56	705	BMP-1-1	Flow thru	POC-1
DMA-1-2	0.53	0.53	100.00	D	0.90	951	BMP-1-2	Flow thru	POC-1
DMA-1-3	0.09	0.05	55.01	D	0.63	109	BMP-1-1	Flow thru	POC-1
DMA-1-4	0.13	0.07	42.03	D	0.60	151	BMP-1-4	Flow thru	POC-1
DMA-1-5	0.03	0.03	83.45	D	0.81	52	BMP-1-5	Tree Well	POC-1
DMA-1-6	0.07	0.05	28.74	D	0.47	69	BMP-1-2	Flow thru	POC-1

Summary of DMA Information (Must match project description and SWQMP Narrative)

No. of DMAs	Total DMA Area (acres)	Total Impervious Area (acres)	% Imp		Area Weighted Runoff Coefficient	Total DCV (cubic feet)	Total Area Treated (acres)		No. of POCs
6	1.48	0.96	64.9		0.69	2037	1.48		1

Where: DMA = Drainage Management Area; Imp = Imperviousness; HSG = Hydrologic Soil Group; DCV= Design Capture Volume; BMP = Best Management Practice; POC = Point of Compliance; ID = identifier; No. = Number

Weighted Runoff Factor

DMA	Type of Surface	Area (acres)	Runoff Factor	C x A	Weighted C
1	Roof, Concrete, Asphalt	0.277	0.9	0.2493	0.56
	Pervious, Natural (Type D Soil) & Artificial Turf	0.354	0.3	0.1062	
2	Roof, Concrete, Asphalt	0.529	0.9	0.4761	0.90
	Pervious, Natural (Type D Soil)	0	0.3	0	
3	Roof, Concrete, Asphalt	0.048	0.9	0.0432	0.63
	Pervious, Natural (Type D Soil) & DG Surface	0.039	0.3	0.0117	
4	Roof, Concrete, Asphalt	0.062	0.9	0.0558	0.60
	Pervious, Natural (Type D Soil)	0.064	0.3	0.0192	
5	Roof, Concrete, Asphalt	0.027	0.9	0.0243	0.81
	Pervious, Natural (Type D Soil)	0.005	0.3	0.0015	
6	Roof, Concrete, Asphalt	0.021	0.9	0.0189	0.47
	Pervious, Natural (Type D Soil)	0.053	0.3	0.0159	

Weighted Runoff Factor

DMA	Type of Surface	Area (acres)	Runoff Factor	C x A	Weighted C
ALL	Roof, Concrete, Asphalt	0.964	0.9	0.8676	0.69
	Pervious, Natural (Type D Soil)	0.515	0.3	0.1545	

Weighted Runoff Factor

DMA	Type of Surface	Area (acres)	Runoff Factor	C x A	Weighted C
DETENTION VAULT	Roof, Concrete, Asphalt	0.875	0.9	0.7875	0.70
	Pervious, Natural (Type D Soil)	0.446	0.3	0.1338	

Weighted Runoff Factor

DMA	Type of Surface	Area (acres)	Runoff Factor	C x A	Weighted C
1-1 + 1-3 (BMP-1-1)	Roof, Concrete, Asphalt	0.325	0.9	0.2925	0.57
	Pervious, Natural (Type D Soil)	0.393	0.3	0.1179	

Weighted Runoff Factor

DMA	Type of Surface	Area (acres)	Runoff Factor	C x A	Weighted C
1-2 + 1-6 (BMP-1-2)	Roof, Concrete, Asphalt	0.550	0.9	0.495	0.85
	Pervious, Natural (Type D Soil)	0.053	0.3	0.0159	

Design Capture Volume for DMA-1-1		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.55	inches
2	Area tributary to BMP(S)	A=	0.631	acres
3	Area weighted runoff facotr (estimate using Appendix B.1.1 and B.2.1)	C=	0.56	unitless
4	Trees Credit Volume Note: In the SWQMP lis the number of trees, size of each tree, amount of soil volime installed for each tree,, contributing area to each treee and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and use the captured storm water runoff.	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x D x A) - TCV - RCV	DCV=	705	cubic-feet

	Design Capture Volume for DMA-1-2	Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.55	inches
2	Area tributary to BMP(S)	A=	0.529	acres
3	Area weighted runoff facotr (estimate using Appendix B.1.1 and B.2.1)	C=	0.9	unitless
4	Trees Credit Volume Note: In the SWQMP lis the number of trees, size of each tree, amount of soil volime installed for each tree,, contributing area to each treee and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and use the captured storm water runoff.	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x D x A) - TCV - RCV	DCV=	951	cubic-feet

Design Capture Volume for DMA-1-3		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.55	inches
2	Area tributary to BMP(S)	A=	0.09	acres
3	Area weighted runoff facotr (estimate using Appendix B.1.1 and B.2.1)	C=	0.63	unitless
4	Trees Credit Volume Note: In the SWQMP lis the number of trees, size of each tree, amount of soil volime installed for each tree,, contributing area to each treee and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and use the captured storm water runoff.	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x D x A) - TCV - RCV	DCV=	109	cubic-feet

Design Capture Volume for DMA-1-4		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.55	inches
2	Area tributary to BMP(S)	A=	0.126	acres
3	Area weighted runoff facotr (estimate using Appendix B.1.1 and B.2.1)	C=	0.6	unitless
4	Trees Credit Volume Note: In the SWQMP lis the number of trees, size of each tree, amount of soil volime installed for each tree,, contributing area to each treee and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and use the captured storm water runoff.	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x D x A) - TCV - RCV	DCV=	151	cubic-feet

Design Capture Volume for DMA-1-5		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.55	inches
2	Area tributary to BMP(S)	A=	0.032	acres
3	Area weighted runoff facotr (estimate using Appendix B.1.1 and B.2.1)	C=	0.81	unitless
4	Trees Credit Volume * Note: In the SWQMP lis the number of trees, size of each tree, amount of soil volime installed for each tree,, contributing area to each treee and the inlet opening dimension for each tree.	TCV=	180	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and use the captured storm water runoff.	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x D x A) - TCV - RCV	DCV=	-128	cubic-feet

* One (1) 20-ft canopy tree with TCV = 180 cu-ft

	Design Capture Volume for DMA-1-6	Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.55	inches
2	Area tributary to BMP(S)	A=	0.074	acres
3	Area weighted runoff facotr (estimate using Appendix B.1.1 and B.2.1)	C=	0.47	unitless
4	Trees Credit Volume Note: In the SWQMP lis the number of trees, size of each tree, amount of soil volime installed for each tree,, contributing area to each treee and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and use the captured storm water runoff.	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x D x A) - TCV - RCV	DCV=	69	cubic-feet

Design Capture Volume for Entire Project		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.55	inches
2	Area tributary to BMP(S)	A=	1.48	acres
3	Area weighted runoff facotr (estimate using Appendix B.1.1 and B.2.1)	C=	0.69	unitless
4	Trees Credit Volume Note: In the SWQMP lis the number of trees, size of each tree, amount of soil volime installed for each tree,, contributing area to each treee and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and use the captured storm water runoff.	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x D x A) - TCV - RCV	DCV=	2037	cubic-feet

Flow-thru Design Flows for DMA-1		Worksheet B.6-1		
1	DCV	DCV	705	cubic-feet
2	DCV retained	$DCV_{retained}$	0	cubic-feet
3	DCV Biofiltered	$DCV_{biofiltered}$	0	cubic-feet
4	DCV requiring flow thru (Line 1 - Line 2 - 0.67*Line3)	$DCV_{flow-thru}$	705	cubic-feet
5	Adjustment factor (Line 4/Line 1)	AF	1	unitless
6	Design rainfall intensity	i	0.2	in/hr
7	Area tributary to BMP(s)	A	0.631	acres
8	Area - weighted runoff factor (estimate using Appendix B.2)	C	0.56	unitless
9	Calculate Flow Rate = AF x (C x I x A)	Q	0.071	cfs

<table>
<tr><th colspan="2">Flow-thru Design Flows for DMA-2</th><th colspan="3">Worksheet B.6-1</th></tr>
<tr><td>1</td><td>DCV</td><td>DCV</td><td>951</td><td>cubic-feet</td></tr>
<tr><td>2</td><td>DCV retained</td><td>$DCV_{retained}$</td><td>0</td><td>cubic-feet</td></tr>
<tr><td>3</td><td>DCV Biofiltered</td><td>$DCV_{biofiltered}$</td><td>0</td><td>cubic-feet</td></tr>
<tr><td>4</td><td>DCV requiring flow thru
(Line 1 - Line 2 - 0.67*Line3)</td><td>$DCV_{flow-thru}$</td><td>951</td><td>cubic-feet</td></tr>
<tr><td>5</td><td>Adjustment factor (Line 4/Line 1)</td><td>AF</td><td>1</td><td>unitless</td></tr>
<tr><td>6</td><td>Design rainfall intensity</td><td>i</td><td>0.2</td><td>in/hr</td></tr>
<tr><td>7</td><td>Area tributary to BMP(s)</td><td>A</td><td>0.529</td><td>acres</td></tr>
<tr><td>8</td><td>Area - weighted runoff factor (estimate using Appendix B.2)</td><td>C</td><td>0.9</td><td>unitless</td></tr>
<tr><td>9</td><td>Calculate Flow Rate = AF x (C x I x A)</td><td>Q</td><td>0.095</td><td>cfs</td></tr>
</table>

Flow-thru Design Flows for DMA-3		Worksheet B.6-1		
1	DCV	DCV	109	cubic-feet
2	DCV retained	$DCV_{retained}$	0	cubic-feet
3	DCV Biofiltered	$DCV_{biofiltered}$	0	cubic-feet
4	DCV requiring flow thru (Line 1 - Line 2 - 0.67*Line3)	$DCV_{flow-thru}$	109	cubic-feet
5	Adjustment factor (Line 4/Line 1)	AF	1	unitless
6	Design rainfall intensity	i	0	in/hr
7	Area tributary to BMP(s)	A	0.09	acres
8	Area - weighted runoff factor (estimate using Appendix B.2)	C	0.63	unitless
9	Calculate Flow Rate = AF x (C x I x A)	Q	0.011	cfs

	Flow-thru Design Flows for DMA-4	Worksheet B.6-1		
1	DCV	DCV	151	cubic-feet
2	DCV retained	$DCV_{retained}$	0	cubic-feet
3	DCV Biofiltered	$DCV_{biofiltered}$	0	cubic-feet
4	DCV requiring flow thru (Line 1 - Line 2 - 0.67*Line3)	$DCV_{flow-thru}$	151	cubic-feet
5	Adjustment factor (Line 4/Line 1)	AF	1	unitless
6	Design rainfall intensity	i	0	in/hr
7	Area tributary to BMP(s)	A	0.126	acres
8	Area - weighted runoff factor (estimate using Appendix B.2)	C	0.6	unitless
9	Calculate Flow Rate = AF x (C x I x A)	Q	0.015	cfs

Flow-thru Design Flows for DMA-6		Worksheet B.6-1		
1	DCV	DCV	69	cubic-feet
2	DCV retained	$DCV_{retained}$	0	cubic-feet
3	DCV Biofiltered	$DCV_{biofiltered}$	0	cubic-feet
4	DCV requiring flow thru (Line 1 - Line 2 - 0.67*Line3)	$DCV_{flow\text{-}thru}$	69	cubic-feet
5	Adjustment factor (Line 4/Line 1)	AF	1	unitless
6	Design rainfall intensity	i	0	in/hr
7	Area tributary to BMP(s)	A	0.074	acres
8	Area - weighted runoff factor (estimate using Appendix B.2)	C	0.47	unitless
9	Calculate Flow Rate = AF x (C x I x A)	Q	0.007	cfs

Minimum Flow Rate Requirements

Proprietary Basin	Pre Calculated Flow Rate (cfs)	Scaling Factor	Final Flow Rate Requiring Treatment (cfs)
1-1 + 1-3	0.082	1.5	0.1230
1-2 + 1-6	0.102		0.1530
1-4	0.015		0.0225

Summary of Proposed Proprietary Basins

Basin ID	DMAs Treated	Flow Rate Requiring Treatment (cfs)	Proposed Proprietary Basin Model *	Dimensions of Proposed Proprietary Basin	Capacity of Proposed Proprietary Basin (cfs)
BMP-1-1	1-1 & 1-3	0.1230	Filterra FTIBP-1006	10' x 6'	0.1389
BMP-1-2	1-2 & 1-6	0.1530	Filterra FTIBP-1206	12' x 6'	0.1667
BMP-1-4	1-4	0.0225	Modular Wetland MWS-L-4-4	4' x 4'	0.052

Flow Based Sizing

The MWS Linear can be used in stand alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

Treatment Flow Sizing Table

Model #	Dimensions	WetlandMedia Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4' x 4'	23 ft^2	0.052
MWS-L-4-6	4' x 6'	32 ft^2	0.073
MWS-L-4-8	4' x 8'	50 ft^2	0.115
MWS-L-4-13	4' x 13'	63 ft^2	0.144
MWS-L-4-15	4' x 15'	76 ft^2	0.175
MWS-L-4-17	4' x 17'	90 ft^2	0.206
MWS-L-4-19	4' x 19'	103 ft^2	0.237
MWS-L-4-21	4' x 21'	117 ft^2	0.268
MWS-L-8-8	8' x 8'	100 ft^2	0.230
MWS-L-8-12	8' x 12'	151 ft^2	0.346
MWS-L-8-16	8' x 16'	201 ft^2	0.462

Volume Based Sizing

Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.

Treatment Volume Sizing Table

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145

AVAILABLE FILTERRA BOX SIZES			DI = 0.2	C = 1.00	C = 0.85	C = 0.5
L (ft)	W (ft)	FILTERRA SURFACE AREA (sq-ft)	FILTERRA FLOW RATE, Q (cu-ft/s)	100% IMPERVIOUS DA (acres)	COMMERCIAL MAX DA (acres)	RESIDENTIAL MAS DA (acres)
4	4	16	0.037	0.122	0.144	0.245
6	4	24	0.0556	0.184	0.216	0.367
6.5	4	26	0.0602	0.199	0.234	0.398
8	4	32	0.0741	0.245	0.288	0.49
10	4	40	0.0923	0.306	0.26	0.612
12	4	48	0.1111	0.367	0.432	0.735
6	6	36	0.0833	0.275	0.324	0.551
8	6	48	0.1111	0.367	0.432	0.735
10	6	60	0.1389	0.459	0.54	0.918
12	6	72	0.1667	0.551	0.648	1.102
13	7	91	0.2106	0.696	0.819	1.393

Tree Well Determination for DMA-1-5

Design Capture Volume for DMA-1-5		Worksheet B.2-1		
1	85th percentile 24-hr sotrm depth from Figure B.1-1	d=	0.55	inches
2	Area tributary to BMP(s)	A=	0.032	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.81	unitless
6	Calculate DCV=(3630xCxdxA) - TCV - RCV)	DCV=	52	cu-ft

DCV to be treated for Hydromodification Requirements			
DMA	DMA DCV (cu-ft)	Hydromodification Multiplier	DCV to be Treated (cu-ft)
1-5	52	2	103

Tree Well Calculations for DMA-1-5								
DMA	DMA DCV (cu-ft)	HMP Multiplier	DCV to be Treated (cu-ft)	Number of Trees	Tree Size	TCV per Tree	Final DCV	Tree Well Summary
1-5	52	2	103	1	20-ft	180	-77	1,20-ft Canopy Tree

Tree Well Amended Soil Requirements							
DMA	Tree Canopy Diameter (ft)	Required Volume (cu-ft)	Proposed Soil Depth (in)	Required Soil Area (sq-ft)	Proposed Diameter (ft)	Provided soil volume (cu-ft)	Proposed Soil Volume at least twice area of canopy?
1-5	20	628	3	209	16.4	634	YES

B.2.1.3 Permeable Pavement

When a permeable pavement is implemented in accordance with the SD-6B factsheet and it does not have an impermeable liner and has storage greater than the 85th percentile depth below the underdrain, if an underdrain is present, then the footprint of the permeable pavement shall be assigned a runoff factor of 0.10 for adjusted runoff factor calculations.

Permeable Pavement can also be designed as a structural BMP to treat run on from adjacent areas. Refer to INF-3 factsheet and Appendix B.4 for additional guidance.

B.2.2 Adjustment to DCV

When the following site design BMPs are implemented the anticipated volume reduction from these BMPs shall be deducted from the DCV to estimate the volume for which the downstream structural BMP should be sized for:

- SD-1: Street trees
- SD-8: Rain barrels

B.2.2.1 Street Trees

Street tree credit volume from tree trenches or boxes (tree BMPs) is a sum of three runoff reduction volumes provided by trees that decrease the required DCV for a tributary area. The following reduction in DCV is allowed per tree based on the mature diameter of the tree canopy, when trees are implemented in accordance with SD-1 factsheet:

Mature Tree Canopy Diameter (ft)	Tree Credit Volume (ft^3/tree)
5	10
10	40
15	100
20	180
25	290
30	420

The City of SAN DIEGO

Project Name	Joan and Ray Kroc Community Center	
BMP ID	BMP-1-1 Filterra Basin FTIBP-1006 (DMAs 1-1 + 1-3)	

	Sizing Method for Volume Retention Criteria	**Worksheet B.5-2**	
1	Area draining to the BMP	31222	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.57	
3	85th percentile 24-hour rainfall depth	0.55	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	816	cu. ft.
	Volume Retention Requirement		
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	19	cu. ft.

The City of SAN DIEGO

	Project Name	Joan and Ray Kroc Community Center	
	BMP ID	BMP-1-2 Filterra Basin FTIBP 1206 (DMAs 1-2 + 1-6)	
	Sizing Method for Volume Retention Criteria	**Worksheet B.5-2**	
1	Area draining to the BMP	26275	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.85	
3	85th percentile 24-hour rainfall depth	0.55	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	1024	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	24	cu. ft.

The City of SAN DIEGO

Project Name: Joan and Ray Kroc Community Center

BMP ID: BMP-1-4 Modular Wetland MWS-L-4-4

Sizing Method for Volume Retention Criteria — Worksheet B.5-2

1	Area draining to the BMP	5495	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.6	
3	85th percentile 24-hour rainfall depth	0.55	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	151	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	3	cu. ft.

The City of SAN DIEGO	**Project Name**	The Salvation Army Ray and Joan Kroc Community Center
	BMP ID	BMP-1-1 Filterra Basin FTIBP-1006

Volume Retention for No Infiltration Condition	**Worksheet B.5-6**

1	Area draining to the biofiltration BMP	31222	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.57	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	17797	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	534	sq. ft.
5	Biofiltration BMP Footprint	60	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		880	0			
7	Impervious area draining to the landscape area (sq. ft.)		2070	0			
8	Impervious to Pervious Area ratio [Line 7/Line 6]		2.35	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		880	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	880	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	940	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.76	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	4	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-3.04	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

The City of SAN DIEGO		
	Project Name	The Salvation Army Ray and Joan Kroc Community Center
	BMP ID	BMP-1-2 Filterra Basin FTIBP-1206

Volume Retention for No Infiltration Condition			**Worksheet B.5-6**
1	Area draining to the biofiltration BMP	26275	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.85	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	22334	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	670	sq. ft.
5	Biofiltration BMP Footprint	72	sq. ft.

Landscape Area (must be identified on DS-3247)

	Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)	898	0			
7	Impervious area draining to the landscape area (sq. ft.)	926	0			
8	Impervious to Pervious Area ratio [Line 7/Line 6]	1.03	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	617	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	617	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	689	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.03	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	4	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-0.12	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

The City of SAN DIEGO

Project Name	The Salvation Army Ray and Joan Kroc Community Center
BMP ID	BMP-1-4 Modular Wetland MWS-4-4

Volume Retention for No Infiltration Condition — **Worksheet B.5-6**

1	Area draining to the biofiltration BMP	5495	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.6	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	3297	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	99	sq. ft.
5	Biofiltration BMP Footprint	16	sq. ft.

Landscape Area (must be identified on DS-3247)

	Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)	963	0			
7	Impervious area draining to the landscape area (sq. ft.)	385	0			
8	Impervious to Pervious Area ratio [Line 7/Line 6]	0.40	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	257	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	257	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	273	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	2.76	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	4	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-7.04	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

Compliance of Volume Detention Criteria by Proposed BMPs

Project runoff is directed towards different proposed BMPs.

- Runoff from DMAs 1-1, 1-2 1-3 and 1-6 are directed onto a combination of BMPs: two proposed Filterra Basins followed by a proposed underground detention storage system/vault.
- Runoff from DMAs 1-4-A & B are directed toward a proposed Modular Wetland System.
- Runoff from DMA 1-5 will be directed toward a proposed 20—foot canopy tree well.

Water Quality Compliance

The proposed Filterra basins and Modular Wetland System will serve to meet Water Quality requirements only for most of the project site (DMAs 1-1 through 1-4 and 1-6). DMA-1-5 will meet water quality requirements with the proposed tree well.

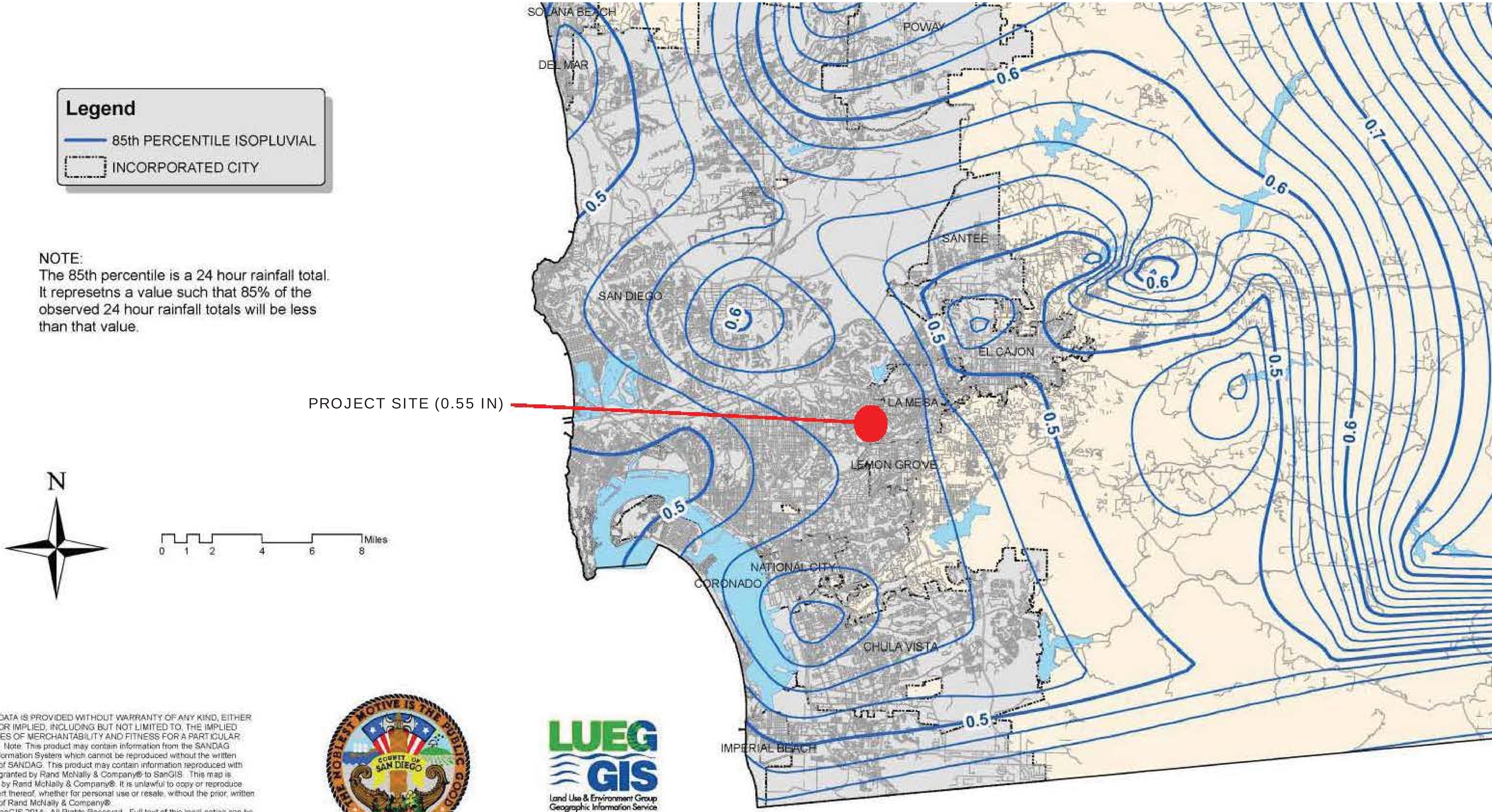
Drainage (Q100) Compliance

The project site meets Q100 requirements when peak flows at the discharge location are lower in developed conditions than in pre-developed conditions. The proposed project site proposes a significant increase in impervious areas when compared to existing conditions, therefore it is logical to assume that peak flows will increase in proposed conditions. In order to mitigate the proposed conditions peak flows, runoff from most of the project site will be detained by a proposed underground detention basin. This basin will be located downstream from the proposed filterra basins. The proposed underground vault will receive runoff from those DMAs treated by the Filterra basins only. Although not all runoff will be detained by the underground storage system, the vault will have enough capacity to reduce the peak flows from the entire site at the discharge location. Please refer to the project's 100-Year Routing Analysis by REC Consultants for further details.

Hydromodification Compliance

The project meets hydromodification compliance with the use of the aforementioned detention vault and the proposed 20-foot tree well. The proposed tree well will meet hydromodification compliance for DMA-1-5 by introducing a hydromodification multiplier onto the DMA's design capture volume.

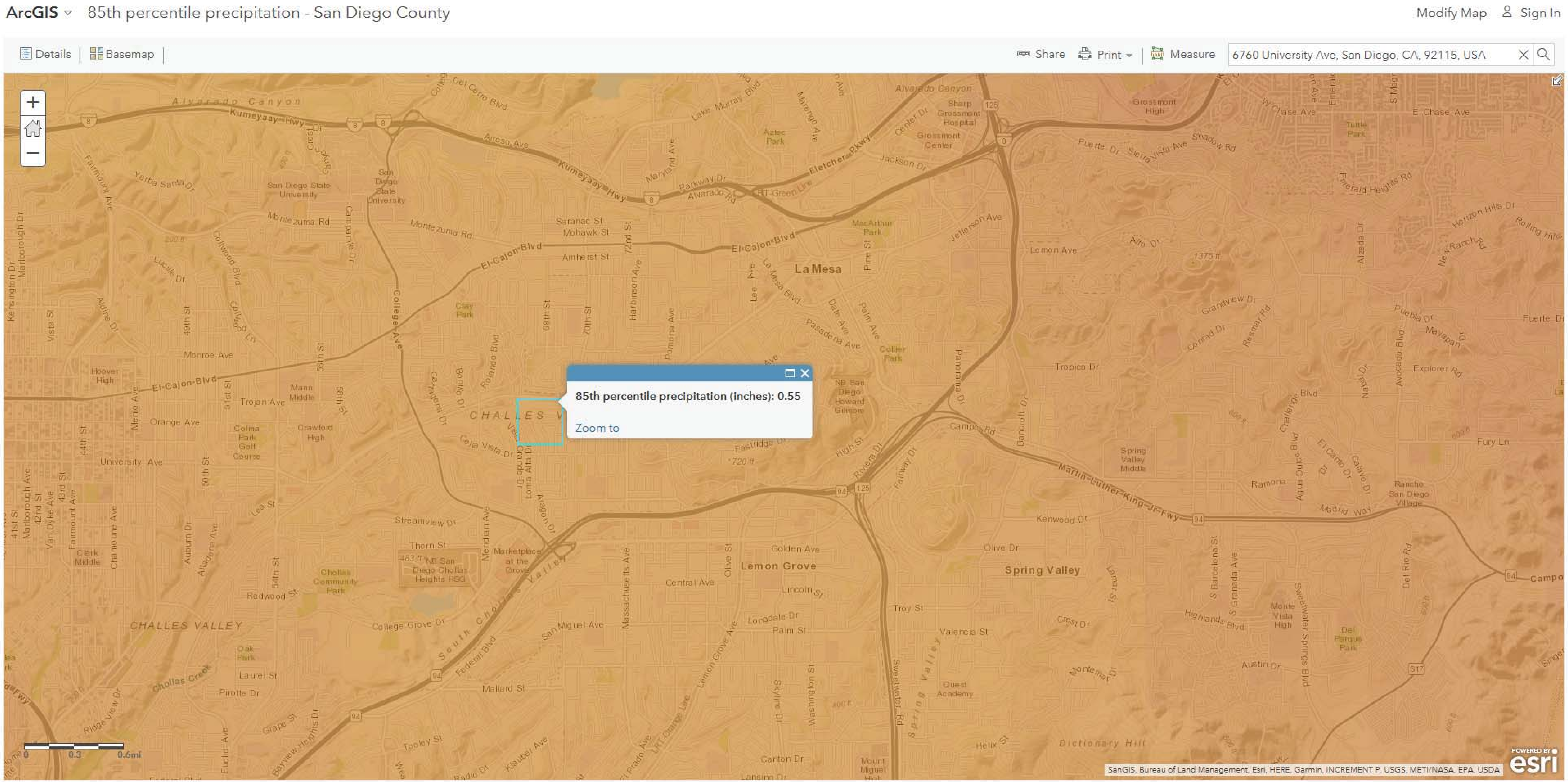
Although, only a portion of the project site will be directed towards the proposed detention vault; the underground detention system has enough capacity to reduce the peak flows enough as to meet HMP requirements for the entire site at the discharge location. In other words, the design of the vault is such that it compensates for the fact that not all runoff will be detained. DMA-1-4 will bypass proposed HMP compliant BMPs and will discharge directly from the Modular Wetland onto the discharge location. Please refer to the project's SWMM Modeling for Hydromodification Compliance by REC Consultants for further details.



NOTE:
The 85th percentile is a 24 hour rainfall total. It represetns a value such that 85% of the observed 24 hour rainfall totals will be less than that value.

14/2015
Flood Control\NOAA_ATLAS_14\PCT85_REVISITED_2015\
CT85_DISPLAY.mxd

ArcGIS – 85TH PERCENTILE PRECIPITATION



85th percentile precipitation - San Diego County

6760 University Ave, San Diego, CA, 92115, USA

85th percentile precipitation (inches): 0.55

SECTION (_____)
Filterra®– Vault Configuration
Bioretention System Standard Specification

1.0 GENERAL

1.1 This item shall govern the furnishing and installation of the Filterra® Bioretention System by Contech Engineered Solutions LLC, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.

1.2 Contractor shall furnish all labor, materials, equipment and incidentals necessary to install the bioretention system, appurtenances and incidentals in accordance with the Drawings and as specified herein.

1.3 Bioretention system shall utilize the physical, chemical and biological mechanisms of an engineered biofiltration media, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system shall be a fully equipped, pre-constructed, drop-in-place unit designed for applications in the urban landscape to treat contaminated runoff from impervious surfaces.

1.4 Bioretention system shall be capable of stand-alone stormwater treatment. No pretreatment to biofiltration media shall be required.

1.5 The bioretention system shall be of a type that has been installed and in use for a minimum of five (5) consecutive years preceding the date of installation of the system. The Manufacturer shall have been, during the same consecutive five (5) year period, engaged in the engineering design and production of systems deployed for the treatment of storm water runoff and which have a history of successful production, acceptable to the Engineer of Record and/or the approving Jurisdiction. The Manufacturer of the Filterra Bioretention System shall be, without exception:

Contech Engineered Solutions LLC
9025 Centre Pointe Drive
West Chester, OH, 45069
Tel: 1 800 338 1122

1.6 Applicable provisions of any Division shall govern work in this section.

1.7 American Society for Testing and Materials (ASTM) Reference Specifications

1.7.1 ASTM C857: Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

1.7.2 ASTM C858: Standard Specification of Underground Precast Concrete Utility Structures

1.7.3 ASTM C990: Standard Specification for Joints for Precast Box Sections Using Preformed Flexible Joint Sealants

1.7.4 ASTM C109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars

1.8 Manufacturer or authorized supplier to submit shop drawings for bioretention System with the vault, engineered biofiltration media and accessory equipment. Drawings shall include principal dimensions, engineered biofiltration media placement, location of piping and unit foundation.

1.8.1 Manufacturer or authorized supplier shall submit installation instructions to the contractor.

1.8.2 Manufacturer or authorized supplier shall submit Operations and Maintenance Manual to the contractor.

1.8.3 Before installation of the bioretention system, Contractor shall obtain the written approval of the Engineer of Record for the system drawings.

1.9 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer of Record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

2.0 MATERIALS

2.1 All internal components including engineered biofiltration media, underdrain stone, PVC underdrain piping, mulch, dissipation stone, and vegetation must be included as part of the bioretention system and shall be provided by Contech Engineered Solutions LLC.

2.1.1 Engineered biofiltration media shall consist of both organic and inorganic components. Stormwater shall be directed to flow vertically through the media profile, saturating the full media profile without downstream flow control.

2.1.2 Underdrain stone shall be of size and shape to provide adequate bridging between the media and stone for the prevention of migration of fine particles. Underdrain stone must also be able to convey the design flow rate of the system without restriction and be approved for use in the Filterra Bioretention System by Contech Engineered Solutions LLC.

2.1.3 PVC Underdrain Piping shall be SDR35 with perforation pattern designed to convey system design flow rate without restriction.

2.1.4 Mulch shall be double shredded wood or bark mulch approved for use with the Filterra Bioretention System by Contech Engineered Solutions LLC.

2.1.5 Vegetation shall comply with the type and size required by the approved drawings and shall be alive and free of obvious signs of disease.

2.1.6 Dissipation stone shall be 3”-6” diameter washed stones or cobbles.

2.2 Precast concrete vault shall be provided by Manufacturer or authorized supplier according to ASTM C857 and C858.

2.2.1 Vault joint sealant shall be Conseal CS-101 or approved equal. Joints shall be sealed with preformed joint sealing compound conforming to ASTM C 990.

2.2.2 If interior concrete baffle walls are provided, baffle walls shall be cast-in or sealed to the interior vault walls and floor with a polyurethane construction sealant rated for use below the waterline, SikaFlex 1a or equal. Contractor to provide sealant material and installation unless completed prior to shipment.

2.3 Tree grates and access covers shall be cast iron. Tree grate frames shall be galvanized steel.

2.4 Curb Nosing (where applicable) shall be galvanized steel and where specified shall be cast into a top slab designed to support AASHTO HS-20 loading at the curb.

2.5 All contractor-provided components shall meet the requirements of this section, the plans specifications and contract documents. In the case of conflict, the more stringent specification shall apply.

2.5.1 Crushed rock base material shall be six-inch minimum layer of ¾-inch minus rock. Compact undisturbed sub-grade materials to 95% of maximum density at +/-2% of optimum moisture content. Unsuitable material below sub-grade shall be replaced to engineer’s approval.

2.5.2 Concrete shall have an unconfined compressive strength at 28 days of at least 3000 psi, with ¾-inch round rock, a 4-inch slump maximum, and shall be placed within 90 minutes of initial mixing.

2.5.3 Silicone Sealant shall be pure RTV silicone conforming to Federal Specification Number TT S001543A or TT S00230C or Engineer approved.

2.5.4 Grout shall be non-shrink grout meeting the requirements of Corps of Engineers CRD-C588. Specimens molded, cured and tested in accordance with ASTM C-109 shall have minimum compressive strength of 6,200 psi. Grout shall not exhibit visible bleeding.

2.5.5 Backfill material shall be ¾-inch minus crushed rock, or approved equal.

3.0 PERFORMANCE

3.1 Treatment Capabilities shall be verified via third-party reports following TAPE or TARP protocols.

3.1.1 Engineered biofiltration Media flow rate shall be verified via third-party report following TAPE or TARP protocols. The minimum treatment flow rate based on target pollutant shall be as follows:

TSS: 100”/hr
Phosphorus: 100”/hr
Oil/Grease: 50”/hr
Metals: 35”/hr

The system shall be designed to ensure that high flow events shall bypass the Engineered biofiltration media preventing erosion and resuspension of pollutants.

3.1.2 The system shall remove a minimum of 86% Total Suspended Solids (TSS) based on aggregated data from at least four third party field studies following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 3.3 mg/L.

3.1.3 The system shall remove a minimum of 70% Total Phosphorus (TP) based on aggregated data from at least two third party field studies following TAPE protocols. Aggregated median effluent concentration shall be less than 0.05 mg/L.

3.1.4 The system shall remove a minimum of 70% Total Phosphorus (TP) based on aggregated data from at least two third party field studies following TAPE protocols. Aggregated median effluent concentration shall be less than 0.05 mg/L.

3.1.5 The system shall remove a minimum of 55% Total Copper based on aggregated data from at least two third party field studies following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.004 mg/L.

3.1.6 The system shall remove a minimum of 43% Dissolved Copper based on aggregated data from at least one third party field study following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.003 mg/L.

3.1.7 The system shall remove a minimum of 56% Total Zinc based on aggregated data from at least three third party field studies following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.04 mg/L.

3.1.8 The system shall remove a minimum of 54% Dissolved Zinc based on aggregated data from at least one third party field study following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.003 mg/L.

3.1.9 The system shall remove a minimum of 87% Total Petroleum Hydrocarbons based on aggregated data from at least one third party field study following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.71 mg/L.

3.2 The system shall have General Use Level Designation from Washington Department of Ecology for Basic (TSS), Phosphorus, Enhanced (Metals), and Oil/Grease and have Certification by New Jersey Department of Environment.

3.3 Quality Assurance and Quality Control procedures shall be followed for all batches of engineered biofiltration media produced. Engineered biofiltration media shall be certified by the Manufacturer for performance and composition.

3.3.1 Media particle size distribution and composition shall be verified as per relevant ASTM Standards.

3.3.2 Media pollutant removal performance shall be verified as per relevant ASTM Standards as well as a minimum of one scientific method approved by the USEPA.

3.3.3 Media hydraulic performance shall be verified as per relevant ASTM Standards.

3.3.4 Media fertility shall be verified as per a minimum of one published scientific method.

3.4 The Manufacturer shall ensure through third party full scale field testing of installed units that the design flow rate of the system is not reduced over time. Studies shall be performed on a minimum of 10 systems of various ages, maintenance frequencies, and land uses. At least 80% of the tested systems shall have been installed 2.5 or more years. At least 50% of the systems shall have previous maintenance intervals greater than 2 times the manufacturer's recommendation.

4.0 EXECUTION

4.1 Set precast vault on crushed rock base material that has been placed in maximum 6-inch lifts, loose thickness, and compacted to at least 95-percent of the maximum dry density as determined by the standard Proctor compaction test, ASTM D698, at moisture content of +/-2% of optimum water content.

4.2 Inlet and outlet pipes shall be attached to provided couplers or grouted in and connected to precast concrete vault according to Engineer's requirements and specifications. All connections to be water tight.

4.3 All throat and grate protection covers shall remain in place until the system is activated.

4.4 Contractor to cast-in-place throat inlet to convey stormwater into bioretention System according to Engineer's requirements and specifications.

4.5 Engineered biofiltration media shall be delivered installed in the vault, unless otherwise agreed upon with the Manufacturer. Contractor shall take appropriate action to protect the media from sediment and other debris during construction. The method ultimately selected shall be at Contractor's discretion and Contractor's risk.

4.5.1 If media is shipped separately from vault, Manufacturer or a Manufacturer's certified representative shall install media into the vault or be present to supervise installation in order to ensure proper installation.

4.6 The bioretention system shall not be placed in operation (activated) until the project site is clean and stabilized (construction erosion control measures no longer required). The project site includes any surface that contributes storm drainage to the system. All impermeable surfaces shall be clean and free of dirt and debris. All catch basins, manholes and pipes shall be free of dirt and sediment. Activation shall be provided by Manufacturer or authorized supplier.

4.7 Each correctly installed system shall be maintained by Manufacturer or authorized supplier for a minimum period of one year. The cost of this service shall be included in the price of the system.

  4.7.1 Annual maintenance consists of a maximum of two [2] scheduled visits.

  4.7.2 Each routine maintenance visit shall consist of only the following items: system inspection; removal of foreign debris, silt, loose plant material and trash; mulch removal; engineered biofiltration media evaluation; plant health evaluation and pruning; replacement of mulch; disposal of all maintenance refuse items; and updating of maintenance records

4.8 To ensure long term performance of the bioretention system, continuing annual maintenance programs should be performed or purchased by the owner per the latest Filterra Bioretention System Operation and Maintenance manual.

Section [________]
Modular Subsurface Flow Wetland System

PART 1 – GENERAL

01.01.00 Purpose
The purpose of this specification is to establish generally acceptable criteria for Modular Subsurface Flow Wetland Systems used for biofiltration of stormwater runoff including dry weather flows and other contaminated water sources. It is intended to serve as a guide to producers, distributors, architects, engineers, contractors, plumbers, installers, inspectors, agencies and users; to promote understanding regarding materials, manufacture and installation; and to provide for identification of devices complying with this specification.

01.02.00 Description
Modular Subsurface Flow Wetland Systems (MSFWS) are used for filtration of stormwater runoff including dry weather flows. The MSFWS is a pre-engineered biofiltration system composed of a pretreatment chamber containing filtration cartridges, a horizontal flow biofiltration chamber with a peripheral void area and a centralized and vertically extending underdrain, the biofiltration chamber containing a sorptive media mix which does not contain any organic material and a layer of plant establishment media, and a discharge chamber containing an orifice control structure . Treated water flows horizontally in series through the pretreatment chamber cartridges, biofiltration chamber and orifice control structure.

01.03.00 Manufacturer
The manufacturer of the MSFWS shall be one that is regularly engaged in the engineering design and production of systems developed for the treatment of stormwater runoff for at least (10) years, and which have a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the MSFWS(s) shall be a filter device Manufactured by Bio Clean Environmental Services, Inc., or Modular Wetland Systems, Inc., or assigned distributors or licensees. Bio Clean Environmental Services Inc., and Modular Wetland Systems, Inc., can be reached at:

Corporate Headquarters:
Bio Clean Environmental Service, Inc.
2972 San Luis Rey Road
Oceanside, CA 92058
Phone: (760) 433-7640
Fax: (760) 433-3176
www.biocleanenvironmental.net

Corporate Headquarters:
Modular Wetland Systems, Inc.
P.O. Box 869
Oceanside, CA 92049
Phone: (760) 433-7650
www.modularwetlands.net

01.04.00 Submittals

01.04.01 Shop drawings are to be submitted with each order to the contractor and consulting engineer.

01.04.02 Shop drawings are to detail the MSFWS and all components required and the sequence for installation, including:

- System configuration with primary dimensions
- Interior components
- Any accessory equipment called out on shop drawings

01.04.03 Inspection and maintenance documentation submitted upon request.

01.05.00 Work Included

01.05.01 Specification requirements for installation of MSFWS.

01.05.02 Manufacturer to supply components of the MSFWS(s):

- Pretreatment chamber components (pre-assembled)
- Concrete Structure(s)
- Biofiltration chamber components (pre-assembled)
- Flow control discharge structure (pre-assembled)

01.06.00 Reference Standards

ASTM C 29	Standard Test Method for Unit Weight and Voids in Aggregate
ASTM C 88	C 88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C131	C 131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregates by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 330	C 330 Standard Specification for Lightweight Aggregate for Structural Concrete
ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft.-lbf/ft3 (600 kN-m/m3)
ASTM D 1621	10 Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
ASTM D 1777	ASTM D1777 - 96(2007) Standard Test Method for Thickness of Textile Materials
ASTM D 4716	Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
AASHTO T 99-01	Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in) Drop
AASHTO T 104	Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
AASHTO T 260	Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials.
AASHTO T 288	Standard Method of Test for Determining Minimum Laboratory Soil Resistivity
AASHTO T 289	Standard Method of Test for Determining ph of Soil for Use in Corrosion Testing
AASHTO T 291	Standard Method of Test for Determining Water Soluble Chloride Ion Content in Soil
AASHTO T 290	T 290 Standard Method of Test for Determining Water Soluble Sulfate Ion Content in Soil

PART 2 – COMPONENTS

The Modular Subsurface Flow Wetland Systems (MSFWS) and all of its components shall be self-contained within a concrete structure constructed of concrete with a minimum 28 day compressive strength of 5,000 psi, with reinforcing per ASTM A 615, Grade 60, and supports and H20 loading as indicated by AASHTO. Each Chamber shall have appropriate access hatches for easy maintenance and sized to allow removal of all internal components without disassembly. All water transfer system components shall conform with the following;

- Filter netting shall be 100% Polyester with a number 16 sieve size, and strength tested per ASTM D 3787.
- Drainage cells shall be manufactured of lightweight injection-molded plastic and have a minimum compressive strength test of 6,000 psi and a void area along the surface making contact with the filter media of 75% or greater. The cells shall be at least 2" in thickness and allow water to freely flow in all four directions.

02.01.00 Pretreatment Chamber Components

02.01.01 Filter Cartridges shall operate at a loading rate not to exceed 3 gallons per minute per square foot surface area.

02.01.02 Drain Down System shall include a pervious floor that allows water to drain into the underdrain pipe that is connected to the discharge chamber.

02.02.00 Biofiltration Chamber Components

02.02.01 Media shall consist of ceramic material produced by expanding and vitrifying select material in a rotary kiln. Media must be produced to meet the requirements of ASTM C330, ASTM C331, and AASHTO M195. Aggregates must have a minimum 24-hour water absorption of 10.5% mass. Media shall not contain any organic material. Flow through media shall be horizontal from the outer perimeter of the chamber toward the centralized and vertically extending underdrain. The retention time in the media shall be at least 3 minutes. Downward flow filters are not acceptable alternatives. The thickness of the media shall be at least 19" from influent end to effluent end. The loading rate on the media shall not exceed 1.1 gallons per minute per square foot surface area. Media must be contained within structure that spaces the surface of the media at least 2" from all vertically extending walls of the concrete structure.

02.02.02 Planting shall be native, drought tolerant species recommend by manufacturer and/or landscape architect.

02.02.03 Plant Support Media shall be made of a 3" thick moisture retention cell that is inert and contains no chemicals or fertilizers, is not made of organic material and has an internal void percentage of 80%.

02.03.00 Discharge Chamber

The discharge device shall house a flow control orifice plate that restricts flows greater than designed treatment flow rate. All piping components shall be made of a high-density polyethylene. The discharge chamber shall also contain a drain down filter if specified on the drawing.

PART 3 – PERFORMANCE

03.01.00 General

03.01.01 Function - The MSFWS has no moving internal components and functions based on gravity flow, unless otherwise specified. The MSFWS is composed of a pretreatment chamber, a biofiltration chamber and a discharge chamber. The pretreatment device houses cartridge media filters, which consist of filter media housed in a perforated enclosure. The untreated runoff flows into the system via subsurface piping and or surface inlet. Water entering the system is forced through the filter cartridge enclosures by gravity flow. Then the flow contacts the filter media. The flow through the media is horizontal toward the center of each individual media filter. In the center of the media shall be a round slotted PVC pipe of no greater than 1.5" in diameter. The slotted PVC pipe shall extend downward into the water transfer cavity of the cartridge. The slotted PVC pipe shall be threaded on the bottom to connect to the water transfer cavity. After pollutants have been removed by the filter media the water discharges the pretreatment chamber and flows into the water transfer system and is conveyed to the biofiltration chamber. Once runoff has been filtered by the biofiltration chamber it is collected by the vertical underdrain and conveyed to a discharge chamber equipped with a flow control orifice plate. Finally the treated flow exits the system.

03.01.02 Pollutants - The MSFWS will remove and retain debris, sediments, TSS, dissolved and particulate metals and nutrients including nitrogen and phosphorus species, bacteria, BOD, oxygen demanding substances, organic compounds and hydrocarbons entering the filter during frequent storm events and continuous dry weather flows.

03.01.03 Treatment Flow Rate and Bypass - The MSFWS operates in-line. The MSFWS will treat 100% of the required water quality treatment flow based on a minimum filtration capacities listed in section 03.02.00. The size of the system must match those provided on the drawing to ensure proper performance and hydraulic residence time.

Minimum Treatment Capabilities

- System must be capable of treating flows to the specified treatment flow rate on the drawings. The flow rate shall be controlled by an orifice plate.

PART 4 - EXECUTION

04.01.00 General

The installation of the MSFWS shall conform to all applicable national, state, state highway, municipal and local specifications.

04.02.00 Installation

The Contractor shall furnish all labor, equipment, materials and incidentals required to install the (MSFWS) device(s) and appurtenances in accordance with the drawings and these specifications.

04.02.01 Grading and Excavation site shall be properly surveyed by a registered professional surveyor, and clearly marked with excavation limits and elevations. After site is marked it is the responsibility of the contractor to contact local utility companies and/or DigAlert to check for underground utilities. All grading permits shall be approved by governing agencies before commencement of grading and excavation. Soil conditions shall be tested in accordance with the governing agencies requirements. All earth removed shall be transported, disposed, stored, and handled per governing agencies standards. It is the responsibility of the contractor to install and maintain proper erosion control measures during grading and excavation operations.

04.02.02 Compaction – All soil shall be compacted per registered professional soils engineer’s recommendations prior to installation of MSFWS components.

04.02.03 Backfill shall be placed according to a registered professional soils engineer’s recommendations, and with a minimum of 6” of gravel under all concrete structures.

04.02.04 Concrete Structures – After backfill has been inspected by the governing agency and approved the concrete structures shall be lifted and placed in proper position per plans.

04.02.05 Subsurface Flow Wetland Media shall be carefully loaded into area so not to damage the Wetland Liner or Water Transfer Systems. The entire wetland area shall be filled to a level 9 inches below finished surface.

04.02.06 Planting layer shall be installed per manufacturer’s drawings and consist of a minimum 3” grow enhancement media that ensures greater than 95% plant survival rate, and 6” of wetland media. Planting shall consist of native plants recommended by manufacturer and/or landscape architect. Planting shall be drip irrigated for at least the first 3 months to insure long term plant growth. No chemical herbicides, pesticides, or fertilizers shall be used in the planting or care and maintenance of the planted area.

04.03.00 Shipping, Storage and Handling

04.03.01 Shipping – MSFWS shall be shipped to the contractor’s address or job site, and is the responsibility of the contractor to offload the unit(s) and place in the exact site of installation.

04.03.02 Storage and Handling– The contractor shall exercise care in the storage and handling of the MSFWS and all components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be born by the contractor. The MSFWS(s) and all components shall always be stored indoors and transported inside the original shipping container until the unit(s) are ready to be installed. The MSFWS shall always be handled with care and lifted according to OSHA and NIOSA lifting recommendations and/or contractor’s workplace safety professional recommendations.

04.04.00 Maintenance and Inspection

04.04.01 Inspection – After installation, the contractor shall demonstrate that the MSFWS has been properly installed at the correct location(s), elevations, and with appropriate components. All components associated with the MSFWS and its installation shall be subject to inspection by the engineer at the place of installation. In addition, the contractor shall demonstrate that the MSFWS has been installed per the manufacturer’s specifications and recommendations. All components shall be inspected by a qualified person once a year and results of inspection shall be kept in an inspection log.

04.04.02 Maintenance – The manufacturer recommends cleaning and debris removal maintenance of once a year and replacement of the Cartridge Filters as needed. The maintenance shall be performed by someone qualified. A Maintenance Manual is available upon request from the manufacturer. The manual has detailed information regarding the maintenance of the MSFWS. A Maintenance/Inspection record shall be kept by the maintenance operator. The record shall include any maintenance activities preformed, amount and description of debris collected, and the condition of the filter.

04.04.03 Material Disposal - All debris, trash, organics, and sediments captured by the MSFWS shall be transported and disposed of at an approved facility for disposal in accordance with local and state requirements. Please refer to state and local regulations for the proper disposal of toxic and non-toxic material.

PART 5 – QUALITY ASSURNACE

05.01.00 Warranty

The Manufacturer shall guarantee the MSFWS against all manufacturing defects in materials and workmanship for a period of (5) years from the date of delivery to the ______. The manufacturer shall be notified of repair or replacement issues in writing within the warranty period. The MSFWS is limited to recommended application for which it was designed.

05.02.00 Performance Certification

The MSFWS manufacturer shall submit to the Engineer of Record a “Manufacturer’s Performance Certificate” certifying the MSFWS is capable of achieving the specified removal efficiency for suspended solids, phosphorous and dissolved metals.

2 Detention Tank Systems

2.1 Introduction to Stormwater Detention Tank Systems

Detention tanks collect and store stormwater runoff during a storm event, then release it at controlled rates to the downstream drainage system, thereby attenuating peak discharge rates from the site. With such systems in place, the drainage system as a whole can cater for higher intensity storms brought about by increasing uncertainties due to climate change. Detention tanks may be located above ground on buildings, on ground levels and even underground. Figure 2.1.1 below shows an example of an on-site detention tank system.

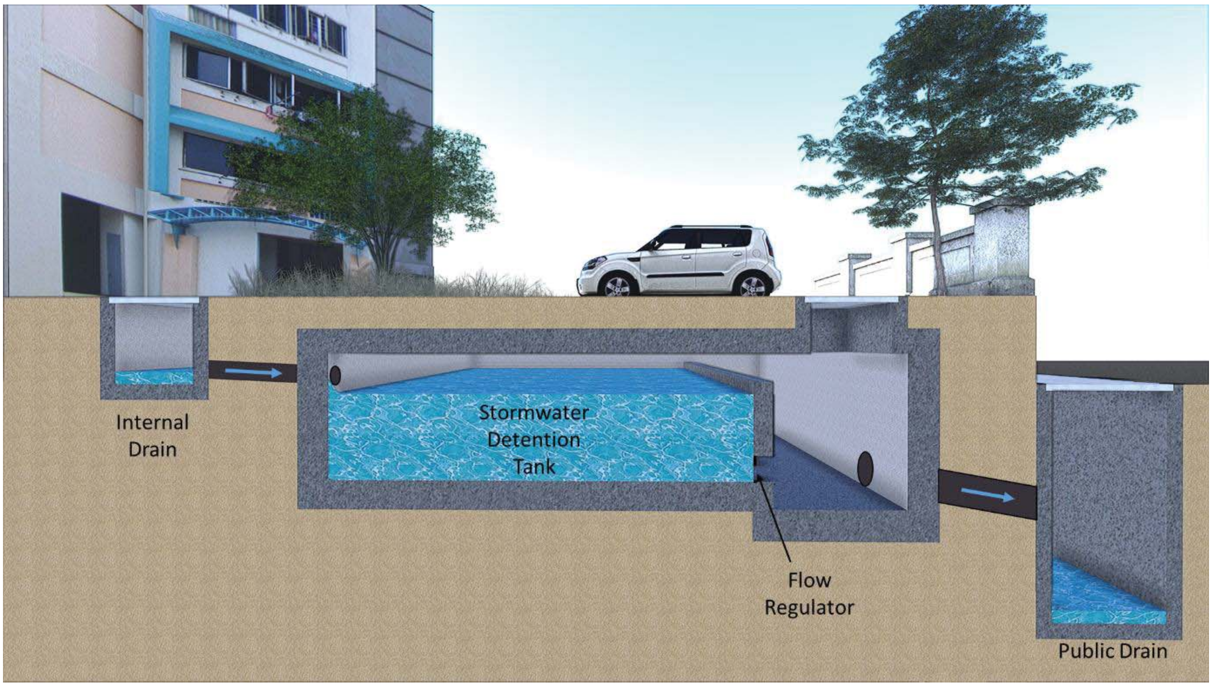


Figure 2.1.1 Schematic diagram of an underground detention tank

2.2 Tank Configurations

Stormwater detention tank systems can be configured as online or offline systems (Figure 2.2.1 and Figure 2.2.2).

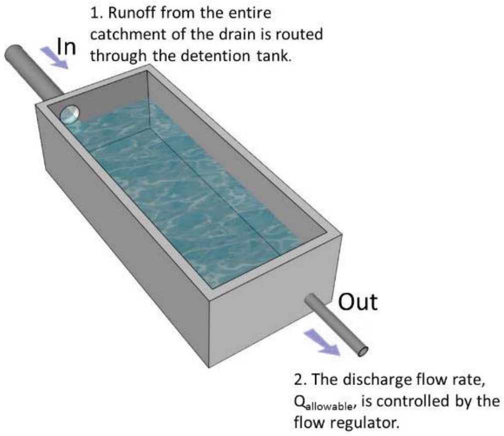


Figure 2.2.1 Online detention system

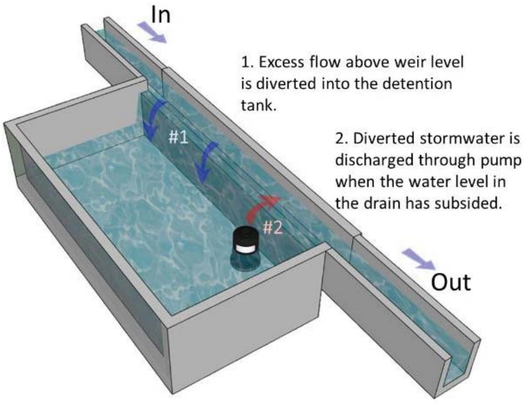


Figure 2.2.2 Offline detention system

For online detention systems, runoff from the entire catchment of the drain is routed through the detention tank via an inlet.

Offline detention systems are located separately from, or in parallel to the drain through which runoff from the catchment flows. Hence, only a portion of the flow in the drain is conveyed into the detention tank. When the water level in the drain exceeds a certain level, determined by the flow diversion structure such as a side flow weir, the excess flow above the weir level will be diverted into the detention tank. Although the detention volumes required by offline detention systems are smaller as compared with online detention systems, offline detention systems are generally more complex to design due to the sensitivity of the weir levels in relation to the water levels in the diversion structure.

2.3 Discharge Methods

Stormwater in the detention tank may be discharged either by gravity or through pumping. In order to ensure that detention volume is available for the next storm event, discharge systems shall be designed to empty the tank within 4 hours after a storm event.

A gravity discharge system utilises the head difference between the water in the detention tank and the receiving drain to discharge the water collected in the detention tank. Hence, the elevation of the site with respect to the receiving drain will determine the maximum effective depth of the detention tank. As no pumping is required, gravity discharge systems generally incur lower operations and maintenance costs as compared with pumped discharge systems. Where gravity discharge of the stormwater is not feasible due to site constraints, pumped discharge systems may be used.

Discharge of stormwater in the detention tank can take place during or after the storm event, as long as the total peak runoff discharged from the development site is in compliance with the maximum allowable peak discharge requirement. Systems that are designed to release the water after the storm event are recommended to have a control system to activate the discharge so as to ensure reliable operations. Instrumentation and control systems, such as an automated valve linked to a rain-sensor or water level sensor in the drain to which the tank discharges to, may be used to automate the activation of the discharge when the storm has ceased or when the water level in the drain has subsided.

4 Design Considerations

4.1 Siting of Detention Tank System

The site characteristics shall be assessed in terms of space availability, topography and elevations of internal and external drain levels. The detention tank system may be located above ground on buildings, on ground level or underground. The location of the detention tank will determine its operation and effectiveness. For example, above ground detention systems can typically be discharged by gravity and therefore generally incur lower operating costs. However, they may only capture runoff from a smaller catchment area. Such trade-offs should be assessed in the siting of the detention tank system.

4.2 Location of Discharge Outlets

The location of the discharge outlet should be designed taking into account the downstream water level in the drain to enable free discharge as much as possible, and to prevent backflow of water from the drain into the detention tank system.

4.3 Design of Pumps

For detention tank systems using pumped discharge mechanisms, it is good practice to consider a 2+1 pump system (with 2 duty pumps and 1 standby pump having a capacity of 0.5Q each), which allows for both redundancy and rotation. This may not apply under spatial constraints, whereby at least one standby pump is required.

The sizing of the generator set for the development should also cater for the additional pumping associated with the detention tank system. A standby generator set is recommended for additional reliability.

4.4 Overflow Structure

It is good engineering practice to design an overflow structure for an online detention tank system to allow drainage of the site in the event that the detention tank system malfunctions (e.g. the orifice clogs or a power outage disables the pumps) or is completely full.

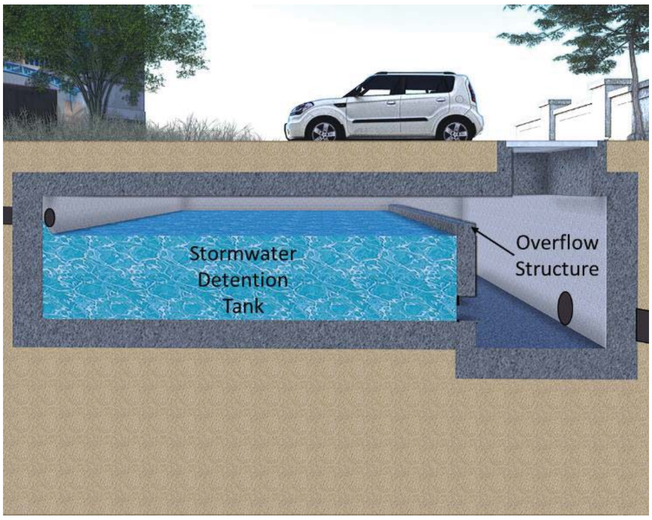


Figure 4.4.1: Overflow structure for an underground detention tank

4.5 Grading of Detention Tank

The detention tanks shall be graded towards the outlet or the discharge sump to prevent stagnation of water. If a pumped discharge system is proposed, the pumps shall be located within a small sump pit which should be deeper than the pump sump so that there will be no stagnant water in the pump /discharge sump at all times. The gradient used shall direct flow towards the outlet while allowing easy accessibility during maintenance.

4.6 Access Requirements

The detention tank system shall be designed to allow personnel and equipment access to various parts of the tank which would require maintenance. These areas include the base of the tank as well as the inlet and outlet structures. Where necessary, ladders shall be provided below openings to the tank.

4.7 Trash Screen/Rack Requirements

To protect the inlet and outlet structures of the tank from debris clogging, trash screens may be provided upstream of stormwater detention systems and flow diversion structures.

4.8 Mosquito Control Considerations

In the construction and maintenance of the detention tank system, measures must be put in place to comply with the National Environment Agency's (NEA) requirements for the prevention of mosquito breeding. The tank shall be designed to allow the tank to be completely drained after storm events. Regular inspection and proper maintenance of the detention tank system to prevent water stagnation would also ensure that they do not become potential mosquito breeding grounds.

The NEA's Guidebook on Prevention of Mosquito Breeding is available on the following website, www.dengue.gov.sg, which provides information for property maintenance officers, managing agents and operational managers on measures to prevent or treat mosquito breeding.

4.9 Instrumentation and Control Considerations

Detention tank systems that discharge through pumping or valve installations should be designed with the necessary instrumentation and control features such as pump controls, rain sensors and water level sensors to automate the discharge of the tank systems. Flow meters or water level sensors such as electrode sensors may also be installed to monitor tank operations and verify the performance of the pumping system.

Street Trees/Tree Wells

Street Trees (Source: County of San Diego LID Manual – EOA, Inc.)

MS4 Permit Category
Site Design

Manual Category
Site Design

Applicable Performance Standard
Site Design

Primary Benefits
Volume Reduction

Description

Trees planted in the right-of-way can be used as storm water management tools in addition to other typical benefits associated with trees, including energy conservation, air quality improvement, and aesthetic enhancement. Typical storm water management benefits associated with trees include:

- **Interception of rainfall** – tree surfaces (roots, foliage, bark, and branches) intercept, evaporate, store, or convey precipitation to the soil before it reaches surrounding impervious surfaces
- **Reduced erosion** – trees protect denuded area by intercepting or reducing the velocity of rain drops as they fall through the tree canopy
- **Increased infiltration** – soil conditions created by roots and fallen leaves promote infiltration
- **Treatment of storm water** – trees provide treatment through uptake of nutrients and other storm water pollutants (phytoremediation) and support of other biological processes that break down pollutants

Typical street tree system components include:

- Trees of the appropriate species for site conditions and constraints
- Available growing space based on tree species, soil type, water availability, surrounding land uses, and project goals

- Optional suspended pavement design to provide structural support for adjacent pavement without requiring compaction of underlying layers
- Optional root barrier devices as needed; a root barrier is a device installed in the ground, between a tree and the sidewalk, intended to guide roots down and away from the sidewalk in order to prevent sidewalk lifting from tree roots.
- Optional tree grates; to be considered to maximize available space for pedestrian circulation and to protect tree roots from compaction related to pedestrian circulation; tree grates are typically made up of porous material that will allow the runoff to soak through.
- Optional shallow surface depression for ponding of excess runoff
- Optional planter box drain

Design Adaptations for Project Goals

Site design BMP to provide incidental treatment. Street trees primarily functions as site design BMPs for incidental treatment. Benefits from street trees are accounted for by adjustment factors presented in Appendix B.2. This credit can apply to non-street trees as well (that meet the same criteria).

Design Criteria and Considerations

Street Trees must meet the following design criteria and considerations. Deviations from the below criteria may be approved at the discretion of the City Engineer if it is determined to be appropriate:

	Siting and Design	*Intent/Rationale*
☐	**Tree species** is appropriately chosen for the development (private or public). For public rights-of-ways, local planning guidelines and zoning provisions for the permissible species and placement of trees are consulted. A list of trees appropriate for site design that can be used by all county municipalities are provided in Appendix E.20	Proper tree placement and species selection minimizes problems such as pavement damage by surface roots and poor growth.

<table>
<tr><th></th><th>Siting and Design</th><th>Intent/Rationale</th></tr>
<tr><td>☐</td><td><p>Location of trees planted along public streets follows local requirements and guidelines. Vehicle and pedestrian line of sight are considered in tree selection and placement.</p><p>Unless exemption is granted by the City Engineer the following minimum tree separation distance is followed</p>
<table>
<tr><th>Improvement</th><th>Minimum distance to Street Tree</th></tr>
<tr><td>Traffic Signal, Stop sign</td><td>20 feet</td></tr>
<tr><td>Underground Utility lines (except sewer)</td><td>5 feet</td></tr>
<tr><td>Sewer Lines</td><td>10 feet</td></tr>
<tr><td>Above ground utility structures (Transformers, Hydrants, Utility poles, etc.)</td><td>10 feet</td></tr>
<tr><td>Driveways</td><td>10 feet</td></tr>
<tr><td>Intersections (intersecting curb lines of two streets)</td><td>25 feet</td></tr>
</table></td><td>Roadway safety for both vehicular and pedestrian traffic is a key consideration for placement along public streets.</td></tr>
<tr><td>☐</td><td>Underground utilities and overhead wires are considered in the design and avoided or circumvented. Underground utilities are routed around or through the planter in suspended pavement applications. All underground utilities are protected from water and root penetration.</td><td>Tree growth can damage utilities and overhead wires resulting in service interruptions. Protecting utilities routed through the planter prevents damage and service interruptions.</td></tr>
<tr><td>☐</td><td><p>Suspended pavement design was developed where appropriate to minimize soil compaction and improve infiltration and filtration capabilities.</p><p>Suspended pavement was constructed with an approved structural cell.</p></td><td><p>Suspended pavement designs provide structural support without compaction of the underlying layers, thereby promoting tree growth.</p><p>Recommended structural cells include poured in place concrete columns, Silva Cells manufactured by Deeproot Green Infrastructures and Stratacell and Stratavault systems manufactured by Citygreen Systems.</p></td></tr>
</table>

	Siting and Design	*Intent/Rationale*
☐	A minimum soil volume of 2 cubic feet per square foot of canopy projection volume is provided for each tree. Canopy projection area is the ground area beneath the tree, measured at the drip line.	The minimum soil volume ensures that there is adequate storage volume to allow for unrestricted evapotranspiration.

Conceptual Design and Sizing Approach for Site Design

1. Determine the areas where street trees can be used in the site design to achieve incidental treatment. Street trees reduce runoff volumes from the site. Refer to Appendix B.2.

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Attachment 2
Backup for PDP Hydromodification Control Measures

This is the cover sheet for Attachment 2.

☐ Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

Project Name: The Salvation Army, Ray and Joan Kroc Center

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☑ Included See Hydromodification Management Exhibit Checklist.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☑ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☑ Not Performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	☑ Included ☐ Submitted as separate stand-alone document

Project Name: The Salvation Army, Ray and Joan Kroc Center

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

☑ Underlying hydrologic soil group
☑ Approximate depth to groundwater
☑ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☑ Critical coarse sediment yield areas to be protected OR provide a separate map showing that the project site is outside of any critical coarse sediment yield areas
☑ Existing topography
☑ Existing and proposed site drainage network and connections to drainage offsite
☑ Proposed grading
☑ Proposed impervious features
☑ Proposed design features and surface treatments used to minimize imperviousness
☑ Point(s) of Compliance (POC) for Hydromodification Management
Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
☑ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail).

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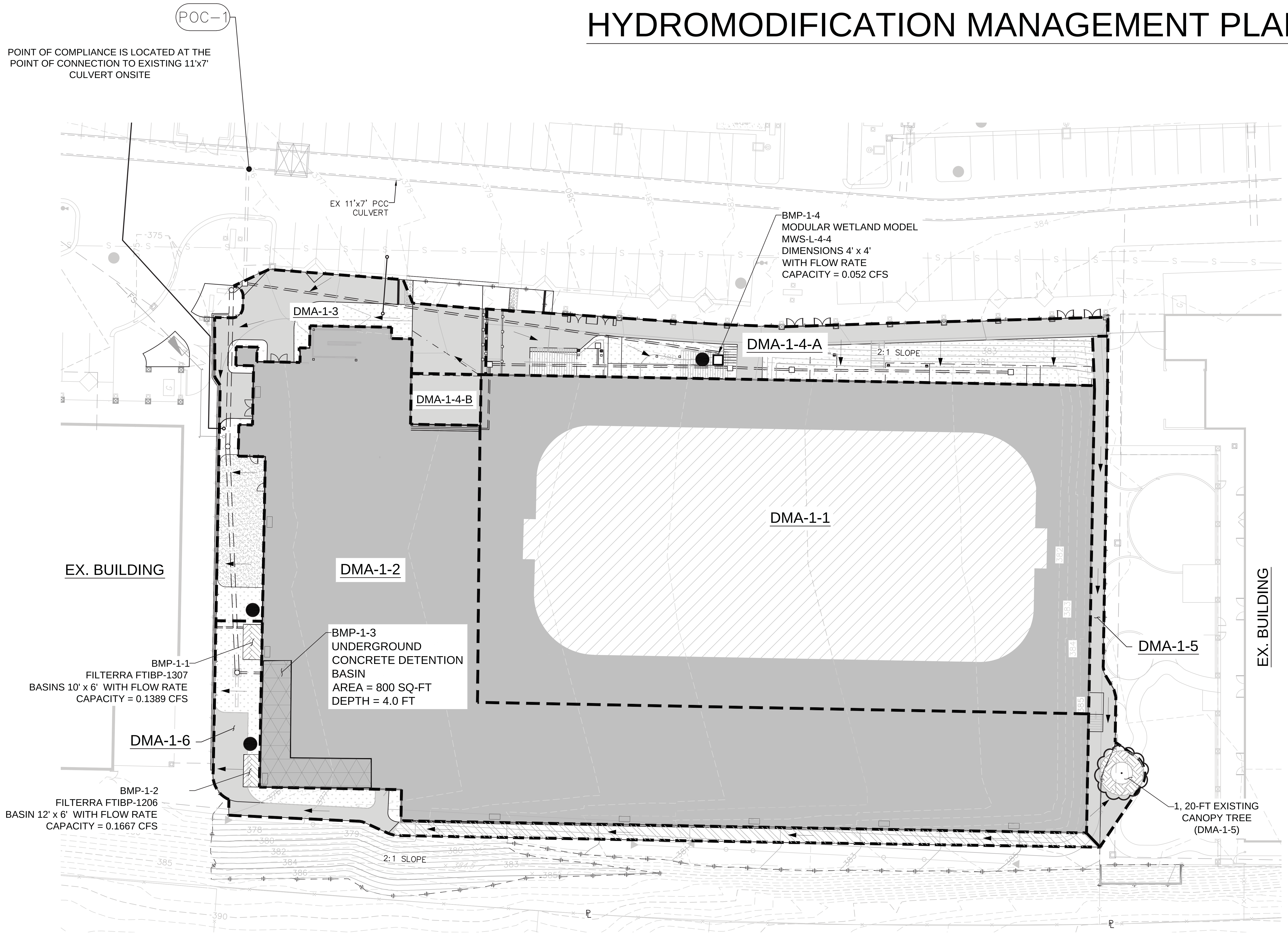
HYDROMODIFICATION MANAGEMENT PLAN EXHIBIT



NOTES:

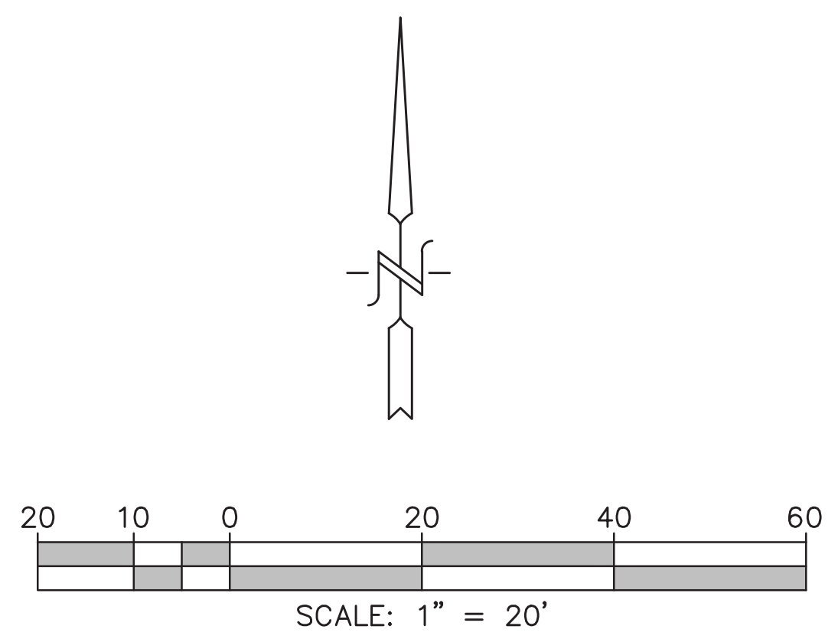
1. NO EXISTING NATURAL HYDROLOGIC FEATURES (WATERCOURSES, SEEPS, SPRINGS, WETLANDS). DEVELOPMENT PROPOSED ON EXISTING GRADED LOT.

2. NO CRITICAL COURSE SEDIMENT YIELD AREAS PRESENT WITHIN PROJECT LIMITS.

3. DEPTH OF GROUNDWATER > 6 FT
4. UNDERLYING SOIL GROUP "D"

SAMPLE PROHIBITIVE SIGNAGE

NTS



LEGEND

DESCRIPTION	SYMBOL
PROPERTY LINE	℄
DMA BOUNDARY	
PROPOSED CONTOUR	630
EXISTING CONTOUR	630
DAYLIGHT	
RAISED PLANTAR BOX (FILTERRA UNIT)	▨
DRAINAGE VAULT	▨
MODULAR WETLAND	☐
15' CANOPY TREE WELL	○
TREE WELL AMENDED SOIL	◎
IMPERVIOUS AREA	▭
PROPOSED BUILDING (IMPERVIOUS)	▭
ARTIFICIAL TURF (PERVIOUS)	▨
PERVIOUS LANDSCAPE AREA	▭
DECOMPOSED GRANITE AREA (PERMEABLE)	▭
PROPOSED PERVIOUS CONCRETE	▨

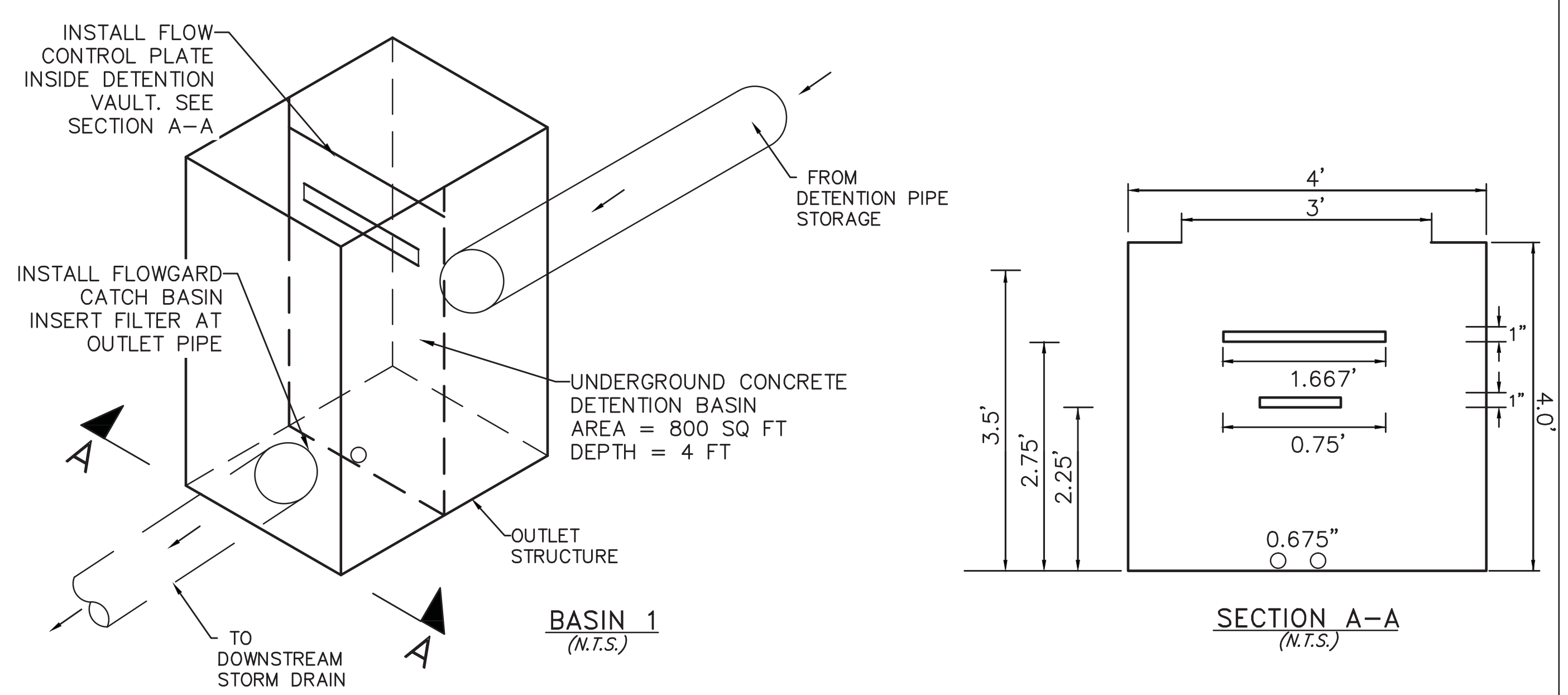
TREE WELL SIZING

TREE WELL SUMMARY				
DMA	DCV (CU-FT)	TREE CREDITS (CU-FT)	FINAL DCV (CU-FT)	PROPOSED TREE WELL
1-5	108	180	-72	1, 20-FT CANOPY TREE

DMA	TREE CANOPY DIAMETER (FT)	TREE WELL AMMENDED SOIL SPECIFICATIONS			
		REQUIRED VOLUME (CU-FT)	PROPOSED SOIL DEPTH (FT)	AREA (SQ-FT)	PROPOSED SOIL DIAMETER (FT)
1-5	20	628.3	3	209.4	16.5

DMA AREAS

PROPOSED CONDITIONS DMA AREAS								
DMA	SUB-AREA	IMPERVIOUS (AC)	PERVIOUS (AC)	ARTIFICIAL TURF (AC)	PROPOSED DG SURFACE (AC)	TOTAL AREA (AC)	DRAINS TO	POC
1	1-1	0.28	0.00	0.35	0.00	0.63	BMP-1-1	POC-1
	1-2	0.53	0.00	0.00	0.00	0.53	BMP-1-2	
	1-3	0.05	0.02	0.00	0.02	0.09	BMP-1-1	
	1-4-A	0.05	0.06	0.00	0.00	0.12	BMP-1-4	
	1-4-B	0.01	0.00	0.00	0.00	0.01		
	1-5	0.03	0.01	0.00	0.00	0.03	BMP-1-5 (TREE WELL)	
	1-6	0.02	0.02	0.00	0.03	0.07	BMP-1-2	
TOTAL	0	0.96	0.11	0.35	0.05	1.48	-	



DETENTION VAULT DETAIL

NTS

KENNETH D. SMITH
ARCHITECT
& ASSOCIATES, INC.

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Fax / 619 442 2699

DATE: 08-23-2017
JOB NO: 15024
DRAWN BY: RJD
CHECKED BY: Checker

Revision Schedule

#	Date	Description

ORIGINAL PREPERATION DATE:
7/8/17

REVISION DATE(S):

project:
HMP EXHIBIT
Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

1

SHEET: 1 of 1

R·E·C
Consultants, Inc.
Civil Engineering · Environmental
Land Surveying
2442 Second Avenue
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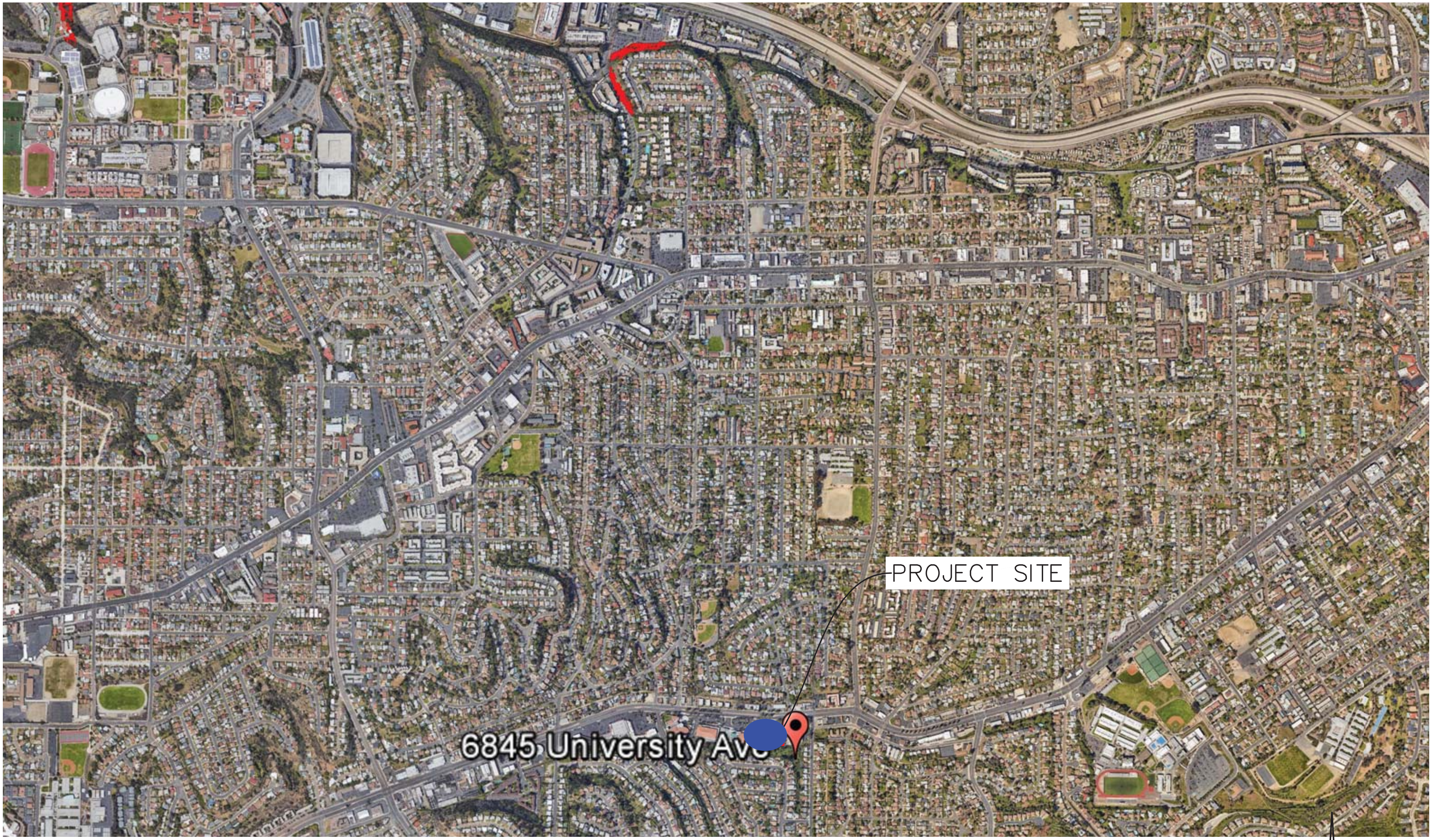

🟥 CRITICAL COURSE SEDIMENT YIELD AREAS

THE SALVATION ARMY RAY AND JOAN KROC COMMUNITY CENTER
SAN DIEGO, CA 92115

NOT TO SCALE

TECHNICAL MEMORANDUM:

SWMM Modeling for Hydromodification Compliance of:

Ray & Joan Kroc Community Center

Prepared For:

The Salvation Army

Prepared by:

Luis Parra, PhD, CPSWQ, ToR, D.WRE.
R.C.E. 66377

REGISTERED PROFESSIONAL ENGINEER
LUIS A PARRA-ROSALES
RCE ~ 66377
EXP 6/30/18
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STATE OF CALIFORNIA

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Telephone: (619) 232-9200

R·E·C

TECHNICAL MEMORANDUM

TO: The Salvation Army

FROM: Luis Parra, PhD, PE, CPSWQ, ToR, D.WRE.
David Edwards, PE.

DATE: April 14, 2017, Revised February 14, 2018, August 9, 2018

RE: Summary of SWMM Modeling for Hydromodification Compliance for KROC Community Center, San Diego, CA.

INTRODUCTION

This memorandum summarizes the approach used to model the proposed community use site in the City of San Diego using the Environmental Protection Agency (EPA) Storm Water Management Model 5.0 (SWMM). SWMM models were prepared for the pre and post-developed conditions at the site in order to determine if the proposed HMP detention facility has sufficient volume to meet Order R9-2013-001 requirements of the California Regional Water Quality Control Board San Diego Region (SDRWQCB), as explained in the Final Hydromodification Management Plan (HMP), dated March 2011, prepared for the County of San Diego by Brown and Caldwell.

SWMM MODEL DEVELOPMENT

The Kroc Community Center project site consists of a proposed community use development within the existing community use site. Two (2) SWMM models were prepared for this study: the first for the pre-developed and the second for the post-developed conditions. The project site drains to one (1) Point of Compliance (POC) located to the north west of the project site at the existing storm drain.

The SWMM model was used since we have found it to be more comparable to San Diego area watersheds than the alternative San Diego Hydrology Model (SDHM) and also because it is a non-proprietary model approved by the HMP document. For both SWMM models, flow duration curves were prepared to determine if the proposed HMP facility is sufficient to meet the current HMP requirements.

The inputs required to develop SWMM models include rainfall, watershed characteristics, and BMP configurations. The Kearny Mesa Gage from the Project Clean Water website was used for this study, since it is the most representative of the project site precipitation due to elevation and proximity to the project site.

Per the California Irrigation Management Information System “Reference Evaporation Zones” (CIMIS ETo Zone Map), the project site is located within the Zone 6 Evapotranspiration Area. Thus evapotranspiration vales for the site were modeled using Zone 6 average monthly values from Table G.1-1 from the 2016 BMP Design Manual. Per the NRCS web soil survey, the project site is situated upon Class D soils. Soils have been assumed to be compacted in the existing condition to represent the current condition of the site, while fully compacted in the post developed conditions. Other SWMM inputs for the subareas are discussed in the appendices to this document, where the selection of parameters is explained in detail.

HMP MODELING

PRE DEVELOPED CONDITIONS

In current existing conditions, runoff from the development site (currently compacted landscaping area) discharges via overland flow to one (1) point of compliance located at the existing storm drain inlet located at the north-west boundary of the project site. Table 1 below illustrates the pre-developed area and impervious percentage accordingly.

TABLE 1 – SUMMARY OF PRE-DEVELOPED CONDITIONS

POC	DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip(1)
POC-1	DMA-1-1	1.446	0%
	DMA-1-5	0.033	100%
TOTAL	**--**	**1.479**	--

Notes: (1) – Per the 2013 RWQCB permit, existing condition impervious surfaces are not to be accounted for in existing conditions analysis.

Runoff from DMA-1-5 will flow to an HMP compliant tree well in proposed conditions and thus will not be considered in the proposed conditions SWMM analysis. . As such, this area has also been removed from the existing conditions SWMM analysis in order to provide a fair and accurate comparison.

DEVELOPED CONDITIONS

The Kroc Community site proposes the construction of a community use facility with a soccer field located on the roof of the proposed structure. Runoff from the majority of the project site is drained to one (1) onsite receiving HMP detention facility. Once flows are routed via the proposed HMP detention facility, flows are then discharged to the adjacent storm drain at POC-1.

TABLE 2 – SUMMARY OF POST-DEVELOPED CONDITIONS

POC	DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
POC-1	DMA-1-1	0.631	43.83%
	DMA-1-2	0.529	100%
	DMA-1-3	0.086	55.01%
	DMA-1-4	0.126	49.98%
	DMA-1-5	0.033*	100%
	DMA-1-6	0.074	100%
TOTAL	**--**	**1.479**	N/A

*Please note that HMP compliance for this area is achieved via one (1) tree well and is not considered in the SWMM analysis.

One (1) HMP detention facility is located within the project site and is responsible for handling hydromodification requirements for the project site. In developed conditions, the vault will have a depth of 4-feet and will contain a riser spillway structure to control outflow (see dimensions in Table 3). The riser structure will act as a spillway such that peak flows can be safely discharged to the receiving storm drain.

It should be noted that detailed outlet structure location and elevations will be shown on the construction plans based on the recommendations of this study.

One tree well will be responsible for meeting water quality and hydromodification requirements for DMA-1-5. Please refer to Attachment 1 of Storm Water Quality Management Plan for compliance and sizing details.

Water Quality BMP Sizing

It is assumed all storm water quality requirements for the project will be met by the proposed water quality BMP detailed in the SWQMP and other BMPs included within the site design. However, detailed water quality requirements are not discussed within this technical memo.

For further information in regards to storm water quality requirements for the project (including sizing and drawdown) please refer to the site specific Storm Water Quality Management Plan (SWQMP).

BMP MODELING FOR HMP PURPOSES

One (1) HMP detention vault is proposed for hydromodification conformance for the project site. Tables 3 & 4 illustrate the dimensions required for HMP compliance according to the SWMM model that was undertaken for the project.

TABLE 3 – SUMMARY OF DEVELOPED HMP BMP

BMP	Tributary Area (1) (Ac)	DIMENSIONS					
		HMP Area (2) (Ac)	Vault Depth (ft)	Vault Volume (ft^3)	Depth Riser Invert (ft)(3)	Weir Length(4) (ft)	Total Depth(5) (ft)
BASIN 1	1.32	800	4	3,200	3.5-ft	3-ft	4

NOTES:
(1) Tributary Area to detention vault excludes DMAs 1-4 and 1-6.
(2) Area of vault base footprint.
(3) Depth of ponding beneath the riser structure's surface spillway.
(4) Overflow length of the internal emergency spillway weir.
(5) Total surface depth of BMP from top crest elevation to surface invert.

TABLE 4 – SUMMARY OF RISER DETAILS:

BMP	Lower Orifice			Lower Slot			Upper Slot		
	Diam. (in)	Number	Elev.[1] (ft)	Width (ft)	Height (ft)	Elev.[1] (ft)	Width (ft)	Height (ft)	Elev.[1] (ft)
BR-1	0.675	2	0.00	0.75	0.083	2.25	1.667	0.083	2.75

Notes: (1): Basin ground surface elevation assumed to be 0.00 ft elevation.

FLOW DURATION CURVE COMPARISON

The Flow Duration Curve (FDC) for the site was compared at the POC by exporting the hourly runoff time series results from SWMM to a spreadsheet.

Q_2 and Q_{10} were determined with a partial duration statistical analysis of the runoff time series in an Excel spreadsheet using the Cunnane plotting position method (which is the preferred plotting methodology in the HMP Permit). As the SWMM Model includes a statistical analysis based on the Weibull Plotting Position Method, the Weibull Method was also used within the spreadsheet to ensure that the results were similar to those obtained by the SWMM Model.

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals; the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period “i” were obtained (Q_i with i=3 to 9). For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate. FDC comparison at the POC is illustrated in Figure 1 in both normal and logarithmic scale. Attachment 5 provides a detailed drainage exhibit for the post-developed condition.

As can be seen in Figure 1, the FDC for the proposed condition with the HMP BMP is within 110% of the curve for the existing condition in both peak flows and durations. The additional runoff volume generated from developing the site will be released to the existing point of discharge at a flow rate below the 10% Q_2 lower threshold for POC-1. Additionally, the project will also not increase peak flow rates between the Q_2 and the Q_{10}, as shown in the peak flow tables in Attachment 1.

Discussion of the Manning’s coefficient (Pervious Areas) for Pre and Post-Development Conditions

Typically the Manning’s coefficient is selected as n = 0.10 for pervious areas and n = 0.012 for impervious areas. However, due to the impact that n has in the continuous simulation a more accurate value of the Manning’s coefficient has been chosen for pervious areas. Taken into consideration the study prepared by TRWE (Reference [6]) a value of n = 0.05 has been selected (see Table 1 of Reference [6] included in Attachment 7). An average n value between average grass plus pasture (0.04) and dense grass (0.06) has been selected per the reference cited, for light rain (<0.8 in/hr) as more than 99% of the rainfall has been measured with this intensity.

SUMMARY

This study has demonstrated that the proposed HMP BMP provided for the Kroc Community Center site is sufficient to meet the current HMP criteria for the Point of Compliance (POC), if the cross-section area and volume recommended within this technical memorandum, and the respective orifice and outlet structure are incorporated as specified within the proposed project site.

KEY ASSUMPTIONS

1. Type D Soils is representative of the existing condition site.

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. FDC Plots (log and natural “x” scale) and Flow Duration Table.
3. List of the “n” largest Peaks: Pre-Development and Post-Development Conditions
4. Elevations vs. Discharge Curves to be used in SWMM
5. Pre & Post Development Maps, Project plan and section sketches
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. SWMM Screens and Explanation of Significant Variables
8. Geotechnical Documentation
9. Summary files from the SWMM Model

REFERENCES

[1] – *"Review and Analysis of San Diego County Hydromodification Management Plan (HMP): Assumptions, Criteria, Methods, & Modeling Tools – Prepared for the Cities of San Marcos, Oceanside & Vista",* May 2012, TRW Engineering.

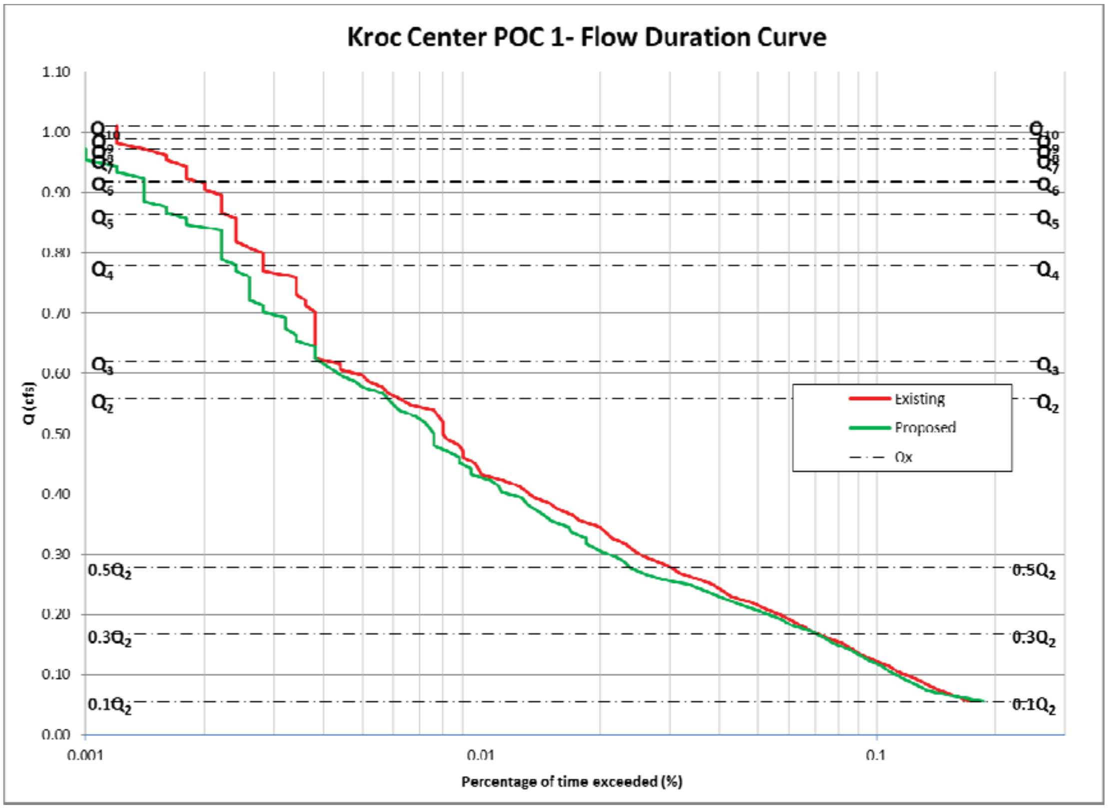
[2] – *"Final Hydromodification Management Plan (HMP) prepared for the County of San Diego"*, March 2011, Brown and Caldwell.

[3] - Order R9-20013-001, California Regional Water Quality Control Board San Diego Region (SDRWQCB).

[4] – "*Handbook of Hydrology*", David R. Maidment, Editor in Chief. 1992, McGraw Hill.

[5] – "*City of San Diego BMP Design Manual*", February 2016.

[6] – "*Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region*", 2016, TRW Engineering.



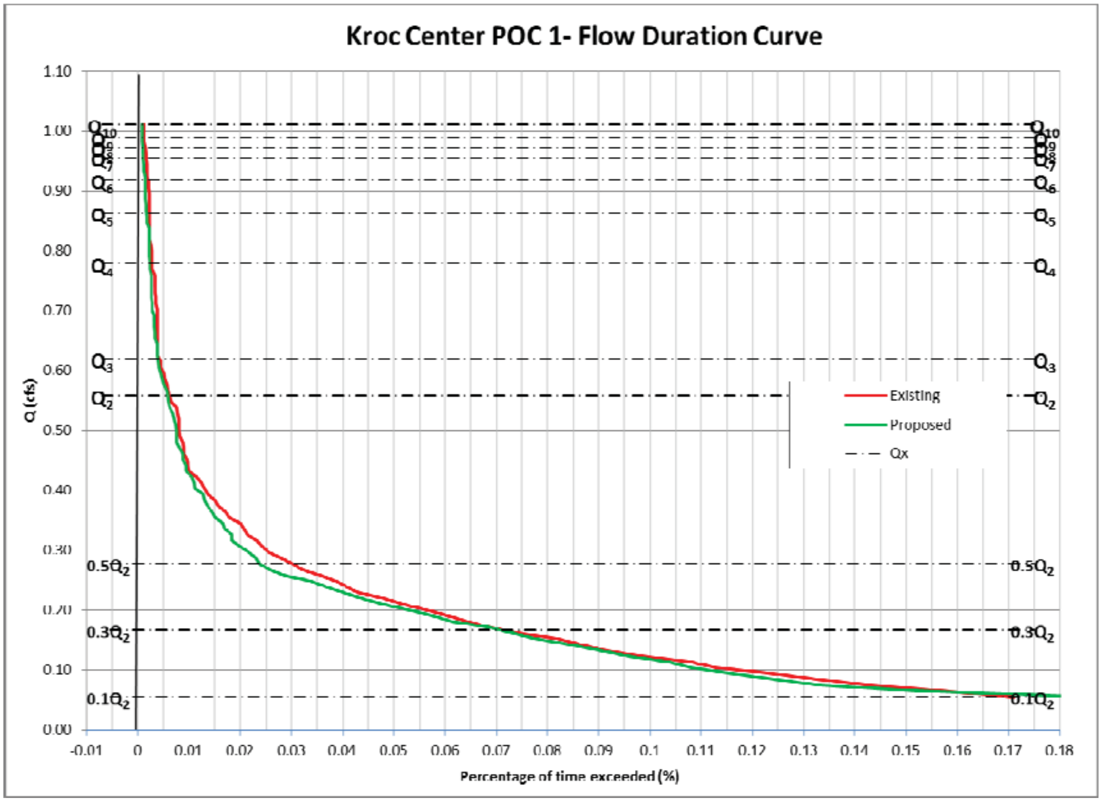


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal "x" scale)

ATTACHMENT 1.

Q_2 to Q_{10} Comparison Table – POC 1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
2-year	0.558	0.532	0.026
3-year	0.620	0.616	0.004
4-year	0.779	0.701	0.078
5-year	0.864	0.794	0.070
6-year	0.919	0.841	0.078
7-year	0.956	0.872	0.084
8-year	0.973	0.904	0.069
9-year	0.989	0.935	0.054
10-year	1.011	0.947	0.064

ATTACHMENT 2

FLOW DURATION CURVE ANALYSIS

1) Flow duration curve shall not exceed the existing conditions by more than 10%, neither in peak flow nor duration.

The figures on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval $0.10Q_2 – Q_{10}$ is divided in 100 sub-intervals, then a) the post development divided by pre-development durations are never larger than 110% (the permit allows up to 110%); and b) there are no more than 10 intervals in the range 101%-110% which would imply an excess over 10% of the length of the curve (the permit allows less than 10% of excesses measured as 101-110%).

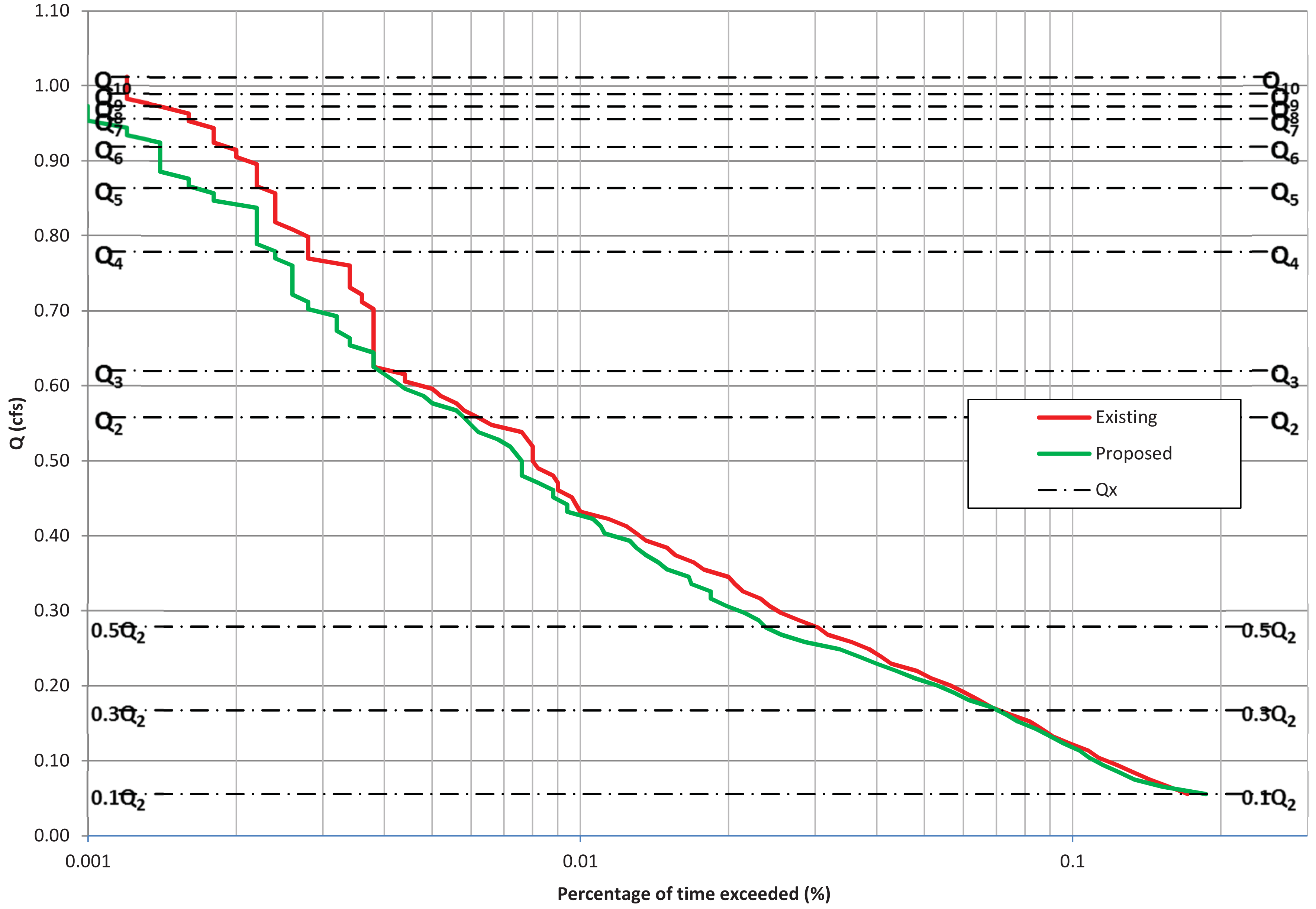
Consequently, the design passes the hydromodification test.

It is important to note that the flow duration curve can be expressed in the “x” axis as percentage of time, hours per year, total number of hours, or any other similar time variable. As those variables only differ by a multiplying constant, their plot in logarithmic scale is going to look exactly the same, and compliance can be observed regardless of the variable selected. However, in order to satisfy the City of San Diego HMP example, % of time exceeded is the variable of choice in the flow duration curve. The selection of a logarithmic scale in lieu of the normal scale is preferred, as differences between the pre-development and post-development curves can be seen more clearly in the entire range of analysis. Both graphics are presented just to prove the difference.

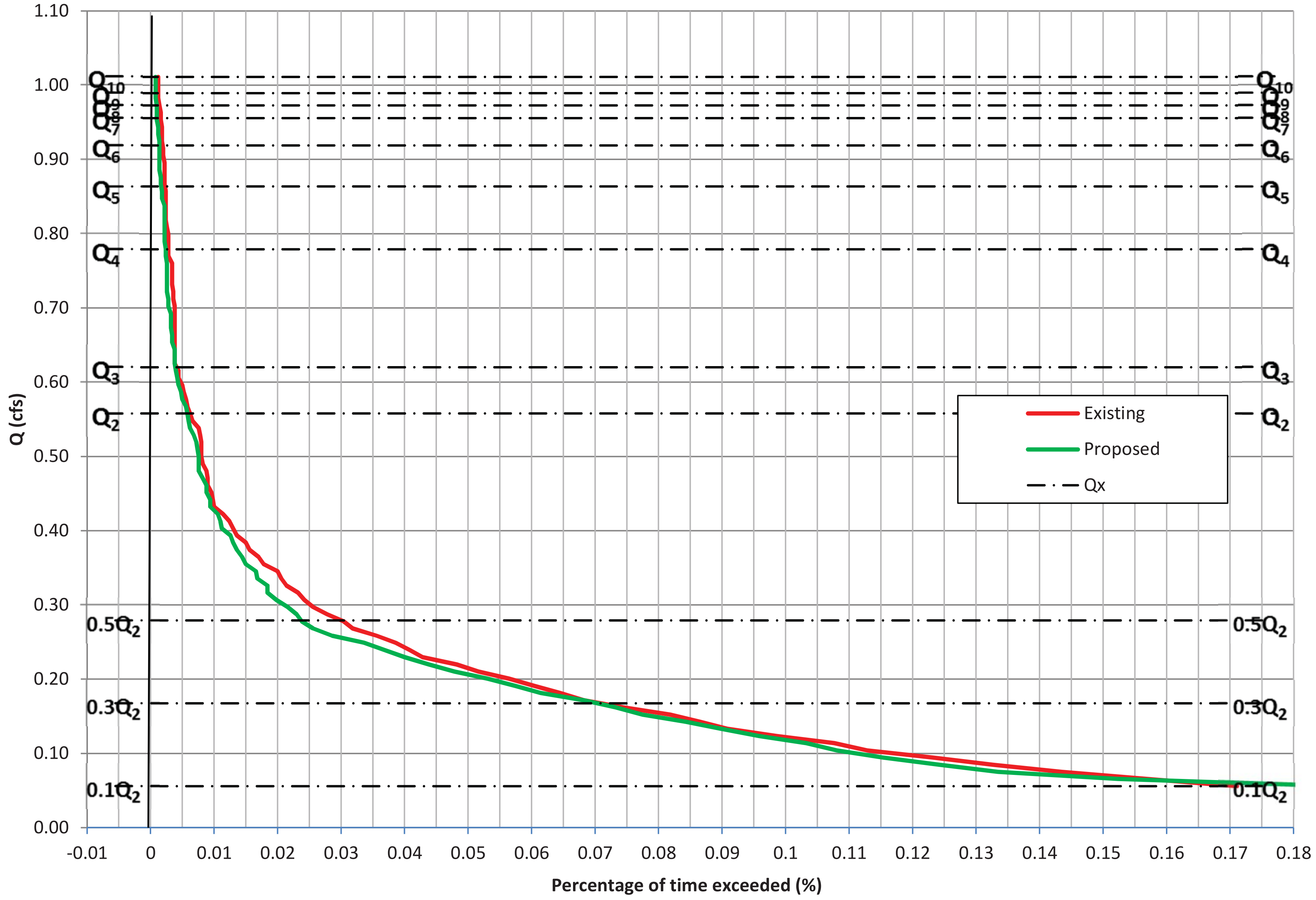
In terms of the “y” axis, the peak flow value is the variable of choice. As an additional analysis performed by REC, not only the range of analysis is clearly depicted (10% of Q_2 to Q_{10}) but also all intermediate flows are shown (Q_2, Q_3, Q_4, Q_5, Q_6, Q_7, Q_8 and Q_9) in order to demonstrate compliance at any range $Q_x – Q_{x+1}$. It must be pointed out that one of the limitations of both the SWMM and SDHM models is that the intermediate analysis is not performed (to obtain Q_i from i = 2 to 10). REC performed the analysis using the Cunnane Plotting position Method (the preferred method in the HMP permit) from the “n” largest independent peak flows obtained from the continuous time series.

The largest “n” peak flows are attached in this appendix, as well as the values of Q_i with a return period “i”, from i=2 to 10. The Q_i values are also added into the flow-duration plot.

Kroc Center POC 1- Flow Duration Curve



Kroc Center POC 1- Flow Duration Curve



Flow Duration Curve Data for Kroc Center POC-1 , City of San Diego, CA

Q2 = 0.56 cfs
Q10 = 1.01 cfs
Step = 0.0097 cfs
Count = 499679 hours
57.00 years

Fraction 10 %

	Existing Condition			Detention Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
1	0.056	855	1.71E-01	933	1.87E-01	109%	Pass
2	0.065	784	1.57E-01	761	1.52E-01	97%	Pass
3	0.075	717	1.43E-01	667	1.33E-01	93%	Pass
4	0.085	663	1.33E-01	621	1.24E-01	94%	Pass
5	0.094	615	1.23E-01	576	1.15E-01	94%	Pass
6	0.104	564	1.13E-01	540	1.08E-01	96%	Pass
7	0.114	538	1.08E-01	516	1.03E-01	96%	Pass
8	0.123	493	9.87E-02	479	9.59E-02	97%	Pass
9	0.133	454	9.09E-02	449	8.99E-02	99%	Pass
10	0.143	432	8.65E-02	421	8.43E-02	97%	Pass
11	0.152	409	8.19E-02	387	7.74E-02	95%	Pass
12	0.162	372	7.44E-02	366	7.32E-02	98%	Pass
13	0.172	341	6.82E-02	341	6.82E-02	100%	Pass
14	0.181	322	6.44E-02	307	6.14E-02	95%	Pass
15	0.191	302	6.04E-02	287	5.74E-02	95%	Pass
16	0.201	282	5.64E-02	265	5.30E-02	94%	Pass
17	0.210	258	5.16E-02	239	4.78E-02	93%	Pass
18	0.220	241	4.82E-02	219	4.38E-02	91%	Pass
19	0.230	214	4.28E-02	200	4.00E-02	93%	Pass
20	0.239	204	4.08E-02	184	3.68E-02	90%	Pass
21	0.249	193	3.86E-02	168	3.36E-02	87%	Pass
22	0.258	178	3.56E-02	143	2.86E-02	80%	Pass
23	0.268	159	3.18E-02	128	2.56E-02	81%	Pass
24	0.278	152	3.04E-02	119	2.38E-02	78%	Pass
25	0.287	139	2.78E-02	115	2.30E-02	83%	Pass
26	0.297	128	2.56E-02	108	2.16E-02	84%	Pass
27	0.307	121	2.42E-02	99	1.98E-02	82%	Pass
28	0.316	116	2.32E-02	92	1.84E-02	79%	Pass
29	0.326	107	2.14E-02	92	1.84E-02	86%	Pass
30	0.336	103	2.06E-02	84	1.68E-02	82%	Pass
31	0.345	100	2.00E-02	83	1.66E-02	83%	Pass
32	0.355	89	1.78E-02	75	1.50E-02	84%	Pass
33	0.365	85	1.70E-02	72	1.44E-02	85%	Pass
34	0.374	78	1.56E-02	68	1.36E-02	87%	Pass
35	0.384	75	1.50E-02	65	1.30E-02	87%	Pass
36	0.394	68	1.36E-02	63	1.26E-02	93%	Pass
37	0.403	65	1.30E-02	56	1.12E-02	86%	Pass
38	0.413	62	1.24E-02	55	1.10E-02	89%	Pass

	Existing Condition			Detention Optimized			Pass or Fail?
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
39	0.423	57	1.14E-02	53	1.06E-02	93%	Pass
40	0.432	50	1.00E-02	47	9.41E-03	94%	Pass
41	0.442	49	9.81E-03	47	9.41E-03	96%	Pass
42	0.452	48	9.61E-03	44	8.81E-03	92%	Pass
43	0.461	45	9.01E-03	44	8.81E-03	98%	Pass
44	0.471	45	9.01E-03	41	8.21E-03	91%	Pass
45	0.480	44	8.81E-03	38	7.60E-03	86%	Pass
46	0.490	41	8.21E-03	38	7.60E-03	93%	Pass
47	0.500	40	8.01E-03	38	7.60E-03	95%	Pass
48	0.509	40	8.01E-03	37	7.40E-03	93%	Pass
49	0.519	40	8.01E-03	36	7.20E-03	90%	Pass
50	0.529	39	7.81E-03	34	6.80E-03	87%	Pass
51	0.538	38	7.60E-03	31	6.20E-03	82%	Pass
52	0.548	33	6.60E-03	30	6.00E-03	91%	Pass
53	0.558	31	6.20E-03	29	5.80E-03	94%	Pass
54	0.567	29	5.80E-03	28	5.60E-03	97%	Pass
55	0.577	28	5.60E-03	25	5.00E-03	89%	Pass
56	0.587	26	5.20E-03	24	4.80E-03	92%	Pass
57	0.596	25	5.00E-03	22	4.40E-03	88%	Pass
58	0.606	22	4.40E-03	21	4.20E-03	95%	Pass
59	0.616	22	4.40E-03	20	4.00E-03	91%	Pass
60	0.625	19	3.80E-03	19	3.80E-03	100%	Pass
61	0.635	19	3.80E-03	19	3.80E-03	100%	Pass
62	0.645	19	3.80E-03	19	3.80E-03	100%	Pass
63	0.654	19	3.80E-03	17	3.40E-03	89%	Pass
64	0.664	19	3.80E-03	17	3.40E-03	89%	Pass
65	0.673	19	3.80E-03	16	3.20E-03	84%	Pass
66	0.683	19	3.80E-03	16	3.20E-03	84%	Pass
67	0.693	19	3.80E-03	16	3.20E-03	84%	Pass
68	0.702	19	3.80E-03	14	2.80E-03	74%	Pass
69	0.712	18	3.60E-03	14	2.80E-03	78%	Pass
70	0.722	18	3.60E-03	13	2.60E-03	72%	Pass
71	0.731	17	3.40E-03	13	2.60E-03	76%	Pass
72	0.741	17	3.40E-03	13	2.60E-03	76%	Pass
73	0.751	17	3.40E-03	13	2.60E-03	76%	Pass
74	0.760	17	3.40E-03	13	2.60E-03	76%	Pass
75	0.770	14	2.80E-03	12	2.40E-03	86%	Pass
76	0.780	14	2.80E-03	12	2.40E-03	86%	Pass
77	0.789	14	2.80E-03	11	2.20E-03	79%	Pass
78	0.799	14	2.80E-03	11	2.20E-03	79%	Pass
79	0.809	13	2.60E-03	11	2.20E-03	85%	Pass
80	0.818	12	2.40E-03	11	2.20E-03	92%	Pass
81	0.828	12	2.40E-03	11	2.20E-03	92%	Pass
82	0.838	12	2.40E-03	11	2.20E-03	92%	Pass
83	0.847	12	2.40E-03	9	1.80E-03	75%	Pass
84	0.857	12	2.40E-03	9	1.80E-03	75%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
85	0.867	11	2.20E-03	8	1.60E-03	73%	Pass
86	0.876	11	2.20E-03	8	1.60E-03	73%	Pass
87	0.886	11	2.20E-03	7	1.40E-03	64%	Pass
88	0.895	11	2.20E-03	7	1.40E-03	64%	Pass
89	0.905	10	2.00E-03	7	1.40E-03	70%	Pass
90	0.915	10	2.00E-03	7	1.40E-03	70%	Pass
91	0.924	9	1.80E-03	7	1.40E-03	78%	Pass
92	0.934	9	1.80E-03	6	1.20E-03	67%	Pass
93	0.944	9	1.80E-03	6	1.20E-03	67%	Pass
94	0.953	8	1.60E-03	5	1.00E-03	63%	Pass
95	0.963	8	1.60E-03	5	1.00E-03	63%	Pass
96	0.973	7	1.40E-03	5	1.00E-03	71%	Pass
97	0.982	6	1.20E-03	4	8.01E-04	67%	Pass
98	0.992	6	1.20E-03	4	8.01E-04	67%	Pass
99	1.002	6	1.20E-03	4	8.01E-04	67%	Pass
100	1.011	6	1.20E-03	4	8.01E-04	67%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period (years)	Pre-dev. Q (cfs)	Post-Dev. Q (cfs)	Reduction (cfs)
10	1.011	0.947	0.064
9	0.989	0.935	0.054
8	0.973	0.904	0.069
7	0.956	0.872	0.084
6	0.919	0.841	0.078
5	0.864	0.794	0.070
4	0.779	0.701	0.078
3	0.620	0.616	0.004
2	0.558	0.532	0.026

ATTACHMENT 3

List of the "n" Largest Peaks: Pre & Post-Developed Conditions

Basic Probabilistic Equation:

R = 1/P R: Return period (years).

P: Probability of a flow to be equaled or exceeded any given year (dimensionless).

Cunnane Equation:

$$P = \frac{i-0.4}{n+0.2}$$

Weibull Equation:

$$P = \frac{i}{n+1}$$

i: Position of the peak whose probability is desired (sorted from large to small)

n: number of years analyzed.

Explanation of Variables for the Tables in this Attachment

Peak: Refers to the peak flow at the date given, taken from the continuous simulation hourly results of the n year analyzed.

Posit: If all peaks are sorted from large to small, the position of the peak in a sorting analysis is included under the variable Posit.

Date: Date of the occurrence of the peak at the outlet from the continuous simulation

Note: all peaks are not annual maxima; instead they are defined as event maxima, with a threshold to separate peaks of at least 12 hours. In other words, any peak P in a time series is defined as a value where dP/dt = 0, and the peak is the largest value in 25 hours (12 hours before, the hour of occurrence and 12 hours after the occurrence, so it is in essence a daily peak).

List of Peak events and Determination of Q2 and Q10 (Pre-Development)
Kroc Center, San Diego, CA - POC-1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**1.01**	**1.02**
9	**0.99**	**1.00**
8	**0.97**	**0.98**
7	**0.96**	**0.96**
6	**0.92**	**0.93**
5	**0.86**	**0.87**
4	**0.78**	**0.78**
3	**0.62**	**0.62**
2	**0.56**	**0.56**

Note:
Cunnane is the preferred
method by the HMP permit.

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
0.404	1/15/1993	57	1.02	1.01
0.408	2/8/1998	56	1.04	1.03
0.413	2/6/1950	55	1.05	1.05
0.417	5/8/1977	54	1.07	1.07
0.417	2/8/1993	53	1.09	1.09
0.419	2/23/2000	52	1.12	1.11
0.42	2/23/2005	51	1.14	1.13
0.424	4/6/1986	50	1.16	1.15
0.426	2/12/2003	49	1.18	1.18
0.429	2/8/1976	48	1.21	1.20
0.429	12/31/1976	47	1.23	1.23
0.43	10/10/1986	46	1.26	1.25
0.434	1/18/1993	45	1.29	1.28
0.445	1/4/1995	44	1.32	1.31
0.453	12/21/2002	43	1.35	1.34
0.456	11/13/1950	42	1.38	1.38
0.457	2/6/1969	41	1.41	1.41
0.476	11/10/1949	40	1.45	1.44
0.481	1/14/1969	39	1.49	1.48
0.493	2/17/1998	38	1.53	1.52
0.526	11/17/1986	37	1.57	1.56
0.537	12/28/2004	36	1.61	1.61
0.54	1/18/1952	35	1.66	1.65
0.541	1/31/1993	34	1.71	1.70
0.545	3/17/1982	33	1.76	1.75
0.545	12/4/1987	32	1.81	1.81
0.552	2/25/1981	31	1.87	1.87
0.557	2/3/1958	30	1.93	1.93
0.558	3/11/1995	29	2.00	2.00
0.563	2/21/2005	28	2.07	2.07
0.574	3/24/1983	27	2.15	2.15
0.579	12/18/1967	26	2.23	2.23
0.582	3/6/1975	25	2.32	2.33
0.592	4/21/1988	24	2.42	2.42
0.597	1/6/1979	23	2.52	2.53
0.6	3/1/1981	22	2.64	2.65
0.616	3/1/1983	21	2.76	2.78
0.62	2/14/1995	20	2.90	2.92
0.62	12/23/1995	19	3.05	3.08
0.703	1/12/1960	18	3.22	3.25
0.766	12/4/1974	17	3.41	3.45
0.77	3/16/1986	16	3.63	3.67
0.77	11/5/1987	15	3.87	3.92
0.801	3/8/1968	14	4.14	4.21
0.809	1/10/1978	13	4.46	4.54
0.857	1/10/1955	12	4.83	4.93
0.903	2/24/1998	11	5.27	5.40
0.917	1/25/1995	10	5.80	5.96
0.949	10/27/2004	9	6.44	6.65
0.966	11/21/1967	8	7.25	7.53
0.982	2/28/1970	7	8.29	8.67
1.016	1/31/1979	6	9.67	10.21
1.017	11/16/1972	5	11.60	12.43
1.097	12/29/2004	4	14.50	15.89
1.183	2/20/1980	3	19.33	22.00
1.275	3/7/1952	2	29.00	35.75
1.782	12/10/1965	1	58.00	95.33

List of Peak events and Determination of Q2 and Q10 (Post-Development)
Kroc Center, San Diego, CA - POC-1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**0.95**	**0.95**
9	**0.94**	**0.94**
8	**0.90**	**0.92**
7	**0.87**	**0.88**
6	**0.84**	**0.85**
5	**0.79**	**0.81**
4	**0.70**	**0.70**
3	**0.62**	**0.62**
2	**0.53**	**0.53**

Note:
Cunnane is the preferred
method by the HMP permit.

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
0.352	3/2/1983	57	1.02	1.01
0.353	3/16/1958	56	1.04	1.03
0.357	3/22/1954	55	1.05	1.05
0.371	12/5/1966	54	1.07	1.07
0.374	11/5/1987	53	1.09	1.09
0.376	12/28/1989	52	1.12	1.11
0.382	2/25/1981	51	1.14	1.13
0.384	11/16/1965	50	1.16	1.15
0.388	2/15/1986	49	1.18	1.18
0.395	4/6/1986	48	1.21	1.20
0.399	8/17/1977	47	1.23	1.23
0.399	2/19/1993	46	1.26	1.25
0.4	3/2/1992	45	1.29	1.28
0.402	3/1/1983	44	1.32	1.31
0.405	2/14/2003	43	1.35	1.34
0.414	3/5/2005	42	1.38	1.38
0.415	12/30/1951	41	1.41	1.41
0.426	1/14/1978	40	1.45	1.44
0.432	1/15/1993	39	1.49	1.48
0.45	1/22/1967	38	1.53	1.52
0.451	2/8/1998	37	1.57	1.56
0.465	11/17/1986	36	1.61	1.61
0.468	2/24/1998	35	1.66	1.65
0.469	2/8/1993	34	1.71	1.70
0.472	3/11/1995	33	1.76	1.75
0.503	1/4/1995	32	1.81	1.81
0.515	10/10/1986	31	1.87	1.87
0.528	2/17/1998	30	1.93	1.93
0.532	2/3/1958	29	2.00	2.00
0.546	3/6/1975	28	2.07	2.07
0.554	5/8/1977	27	2.15	2.15
0.568	1/18/1952	26	2.23	2.23
0.573	3/17/1982	25	2.32	2.33
0.582	1/14/1969	24	2.42	2.42
0.592	2/21/2005	23	2.52	2.53
0.596	4/21/1988	22	2.64	2.65
0.599	11/13/1950	21	2.76	2.78
0.615	3/16/1986	20	2.90	2.92
0.617	3/1/1981	19	3.05	3.08
0.652	1/12/1960	18	3.22	3.25
0.653	12/28/2004	17	3.41	3.45
0.67	1/6/1979	16	3.63	3.67
0.7	1/10/1978	15	3.87	3.92
0.702	2/14/1995	14	4.14	4.21
0.764	11/21/1967	13	4.46	4.54
0.786	11/16/1972	12	4.83	4.93
0.838	1/10/1955	11	5.27	5.40
0.84	12/4/1974	10	5.80	5.96
0.863	1/25/1995	9	6.44	6.65
0.885	3/8/1968	8	7.25	7.53
0.931	1/31/1979	7	8.29	8.67
0.95	10/27/2004	6	9.67	10.21
0.978	2/20/1980	5	11.60	12.43
1.059	2/28/1970	4	14.50	15.89
1.088	3/7/1952	3	19.33	22.00
1.107	12/29/2004	2	29.00	35.75
1.825	12/10/1965	1	58.00	95.33

ATTACHMENT 4

AREA VS ELEVATION

A stage-storage relationship is provided within this Module, It should be noted that basin comprises of vertical walls, as such the area vs elevation is a constant with only depth increasing.

DISCHARGE VS ELEVATION

The orifices have been selected to maximize their size while still restricting flows to conform with the required 10% of the Q2 event flow as mandated in the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011. While REC acknowledges that these orifices are small, to increase the size of these outlets would impact the basin's ability to restrict flows beneath the HMP thresholds, thus preventing the BMP from conformance with HMP requirements.

In order to further reduce the risk of blockage of the orifices, regular maintenance of the riser and orifices must be performed to ensure potential blockages are minimized. A detail of the orifice and riser structure is provided in Attachment 5 of this memorandum.

A stage-discharge relationship is provided on the following pages for the surface outlet structure. The LID low flow orifice discharge relationship is addressed within the LID Module within SWMM – please refer to Attachment 7 for further information.

DRAWDOWN CALCULATIONS

Drawdown calculations are provided in the project specific SWQMP. Please refer to this aforementioned document for further information.

DISCHARGE EQUATIONS

1) Weir:

$$Q_W = C_W \cdot L \cdot H^{3/2} \qquad (1)$$

2) Slot:

As an orifice: $$Q_s = B_s \cdot h_s \cdot c_g \cdot \sqrt{2g\left(H - \frac{h_s}{2}\right)} \qquad (2.a)$$

As a weir: $$Q_s = C_W \cdot B_s \cdot H^{3/2} \qquad (2.b)$$

For H > h_s slot works as weir until orifice equation provides a smaller discharge. The elevation such that equation (2.a) = equation (2.b) is the elevation at which the behavior changes from weir to orifice.

3) Vertical Orifices

As an orifice: $$Q_o = 0.25 \cdot \pi D^2 \cdot c_g \cdot \sqrt{2g\left(H - \frac{D}{2}\right)} \qquad (3.a)$$

As a weir: Critical depth and geometric family of circular sector must be solved to determined Q as a function of H:

$$\frac{Q_O^2}{g} = \frac{A_{cr}^3}{T_{cr}}; \quad H = y_{cr} + \frac{A_{cr}}{2 \cdot T_{cr}}; \; T_{cr} = 2\sqrt{y_{cr}(D - y_{cr})}\,; \quad A_{cr} = \frac{D^2}{8}[\alpha_{cr} - sin(\alpha_{cr})]\,;$$

$$y_{cr} = \frac{D}{2}[1 - sin(0.5 \cdot \alpha_{cr})] \qquad \text{(3.b.1, 3.b.2, 3.b.3, 3.b.4 and 3.b.5)}$$

There is a value of H (approximately H = 110% D) from which orifices no longer work as weirs as critical depth is not possible at the entrance of the orifice. This value of H is obtained equaling the discharge using critical equations and equations (3.b).

A mathematical model is prepared with the previous equations depending on the type o discharge.

The following are the variables used above:

Q_W, Q_s, Q_O = Discharge of weir, slot or orifice (cfs)

C_W, c_g : Coefficients of discharge of weir (typically 3.1) and orifice (0.61 to 0.62)

L, B_s, D, h_s : Length of weir, width of slot, diameter of orifice and height of slot, respectively; (ft)

H: Level of water in the pond over the invert of slot, weir or orifice (ft)

A_{cr}, T_{cr}, y_{cr}, α_{cr}: Critical variables for circular sector: area (sq-ft), top width (ft), critical depth (ft), and angle to the center, respectively.

Outlet structure for Underground Detention System

Discharge vs Elevation Table

Low orifice: 0.675 "
Number: 2
Cg-low: 0.61
Middle orifice: 1 "
number of orif: 0
Cg-middle: 0.61
invert elev: 0.25 ft

Lower slot
Invert: 2.250 ft
B 0.75 ft
h 0.083 ft
Upper slot
Invert: 2.750 ft
B: 1.667 ft
h 0.083 ft

Emergency Weir
Invert: 3.500 ft
B: 3 ft

h (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qemer (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.100	1.778	0.000	0.007	0.008	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.200	3.556	0.000	0.010	0.012	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.010
0.300	5.333	0.600	0.013	0.113	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.400	7.111	1.800	0.015	0.148	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.015
0.500	8.889	3.000	0.017	0.167	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.017
0.600	10.667	4.200	0.018	0.184	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.018
0.700	12.444	5.400	0.020	0.199	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.020
0.800	14.222	6.600	0.021	0.214	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.900	16.000	7.800	0.023	0.227	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.023
1.000	17.778	9.000	0.024	0.240	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.024
1.100	19.556	10.200	0.025	0.252	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.025
1.200	21.333	11.400	0.026	0.263	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.026
1.300	23.111	12.600	0.027	0.274	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.027
1.400	24.889	13.800	0.028	0.285	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.028
1.500	26.667	15.000	0.030	0.295	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.030
1.600	28.444	16.200	0.031	0.305	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.031
1.700	30.222	17.400	0.031	0.315	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.031
1.800	32.000	18.600	0.032	0.324	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.032
1.900	33.778	19.800	0.033	0.333	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.033
2.000	35.556	21.000	0.034	0.342	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.034
2.100	37.333	22.200	0.035	0.350	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.035
2.200	39.111	23.400	0.036	0.359	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.036
2.300	40.889	24.600	0.037	0.367	0.037	0.000	0.000	0.000	0.026	0.000	0.000	0.063
2.400	42.667	25.800	0.037	0.375	0.037	0.000	0.000	0.000	0.101	0.000	0.000	0.138
2.500	44.444	27.000	0.038	0.383	0.038	0.000	0.000	0.000	0.140	0.000	0.000	0.178
2.600	46.222	28.200	0.039	0.390	0.039	0.000	0.000	0.000	0.170	0.000	0.000	0.209
2.700	48.000	29.400	0.040	0.398	0.040	0.000	0.000	0.000	0.196	0.000	0.000	0.235
2.800	49.778	30.600	0.041	0.405	0.041	0.000	0.000	0.000	0.218	0.058	0.000	0.316
2.900	51.556	31.800	0.041	0.412	0.041	0.000	0.000	0.000	0.239	0.224	0.000	0.504
3.000	53.333	33.000	0.042	0.419	0.042	0.000	0.000	0.000	0.257	0.310	0.000	0.610
3.100	55.111	34.200	0.043	0.426	0.043	0.000	0.000	0.000	0.275	0.378	0.000	0.695
3.200	56.889	35.400	0.043	0.433	0.043	0.000	0.000	0.000	0.292	0.434	0.000	0.769
3.300	58.667	36.600	0.044	0.440	0.044	0.000	0.000	0.000	0.307	0.485	0.000	0.836
3.400	60.444	37.800	0.045	0.447	0.045	0.000	0.000	0.000	0.322	0.530	0.000	0.897
3.500	62.222	39.000	0.045	0.453	0.045	0.000	0.000	0.000	0.336	0.572	0.000	0.954
3.600	64.000	40.200	0.046	0.460	0.046	0.000	0.000	0.000	0.350	0.611	0.294	1.301
3.700	65.778	41.400	0.047	0.466	0.047	0.000	0.000	0.000	0.363	0.648	0.832	1.890
3.800	67.556	42.600	0.047	0.473	0.047	0.000	0.000	0.000	0.376	0.683	1.528	2.634
3.900	69.333	43.800	0.048	0.479	0.048	0.000	0.000	0.000	0.388	0.716	2.353	3.504
4.000	71.111	45.000	0.048	0.485	0.048	0.000	0.000	0.000	0.400	0.747	3.288	4.484

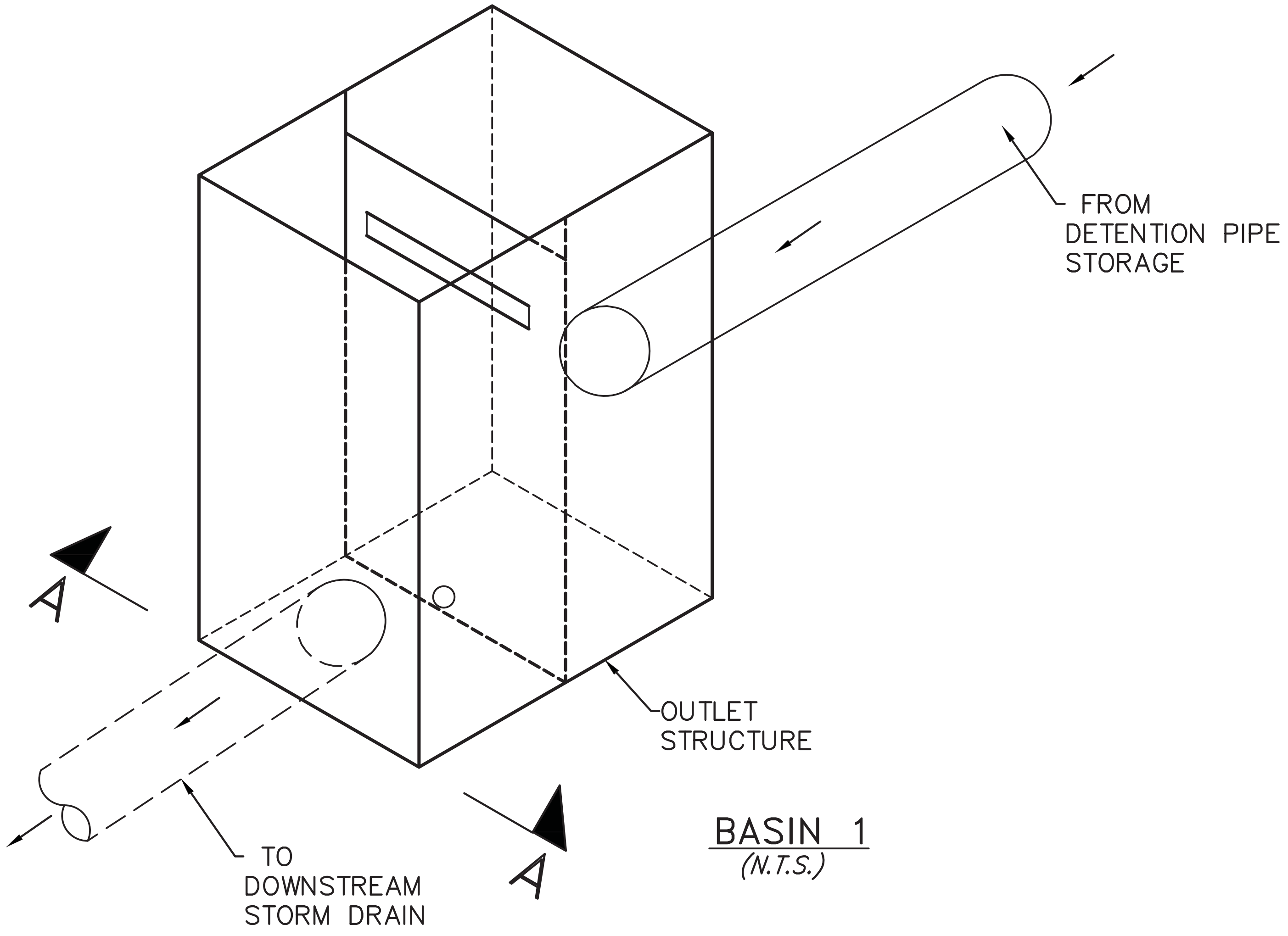
BASIN 1 STAGE-STORAGE

Actual Elev (ft)	Elev (ft)	Area (ft^2)	Volume (ft^3)	
372	0	1353.0	0.00	
372.5	0.5	1674.0	756.75	**LID AREA**
372.75	0.75	1829.0	1194.63	**SURFACE OUTLET**
373	1.0	1994.0	1672.50	
373.5	1.5	2335.0	2754.75	
374	2	2669.0	4005.75	

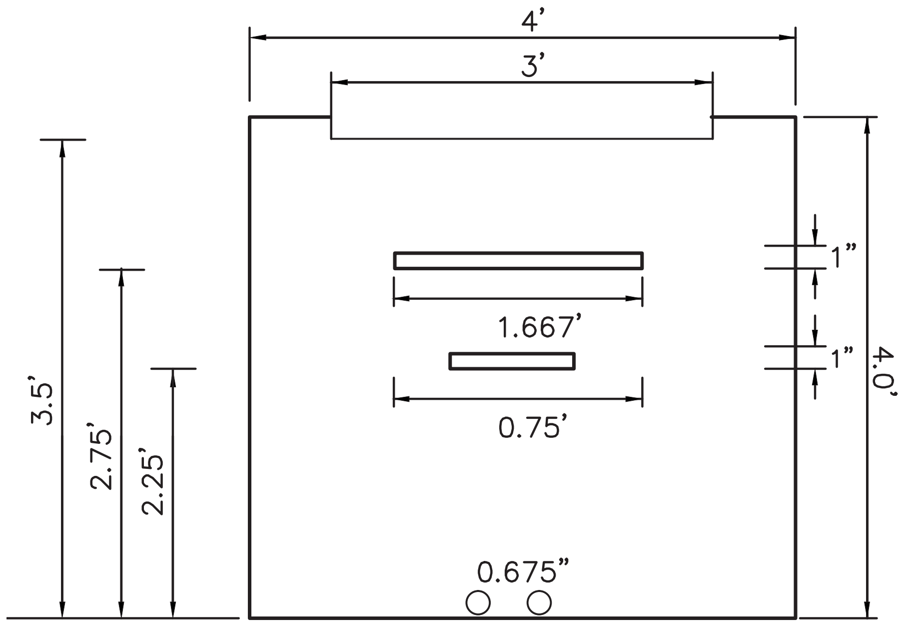
Effective Depth **8.564 inches**

ATTACHMENT 5

Pre & Post-Developed Maps, Project Plan and Detention Section Sketches



BASIN 1
(N.T.S.)



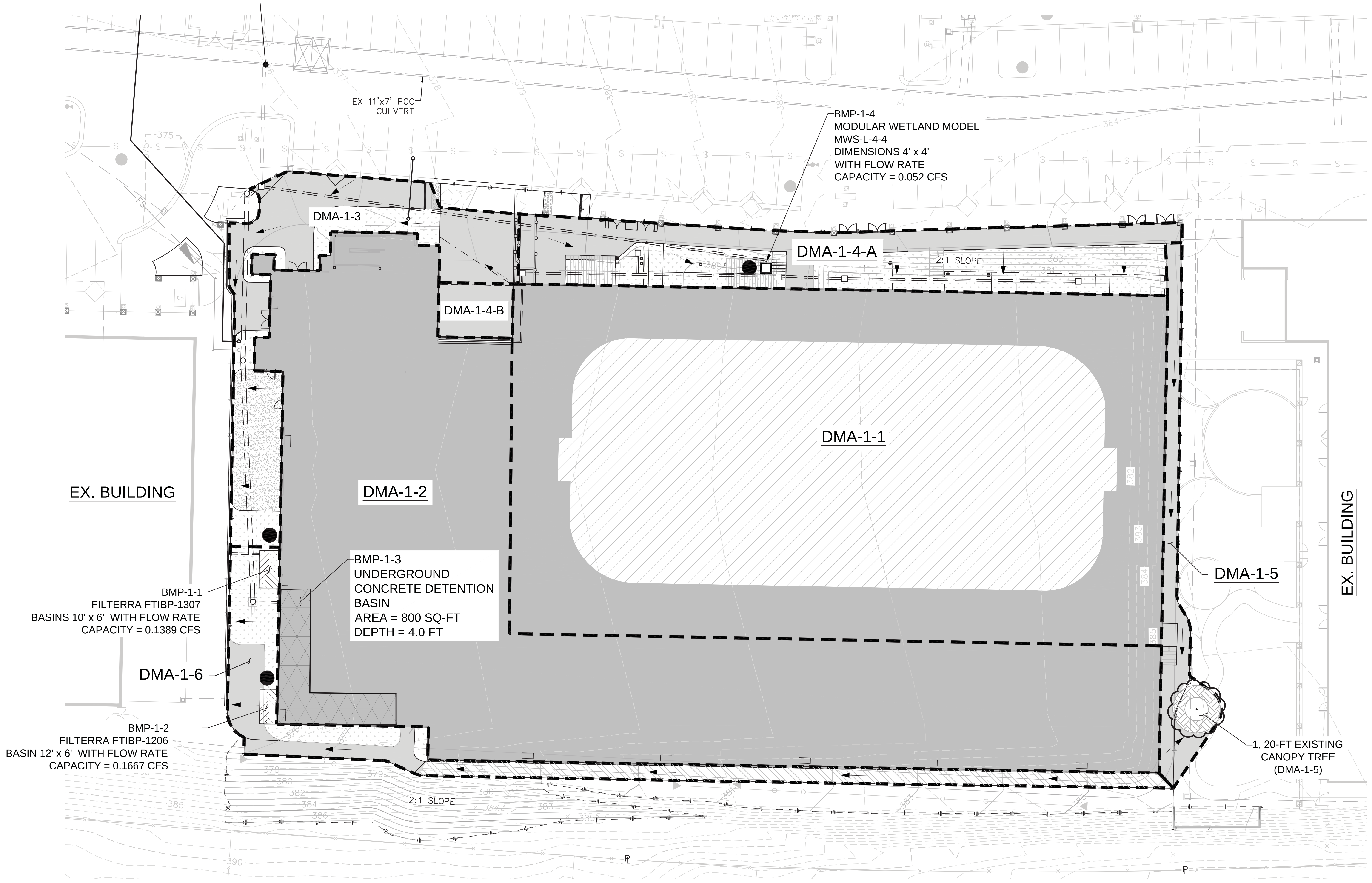
SECTION A–A
(N.T.S.)

R·E·C
Consultants, Inc.
Civil Engineering Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

BASIN 1 DETAIL

NTS

HYDROMODIFICATION MANAGEMENT PLAN EXHIBIT



NOTES:

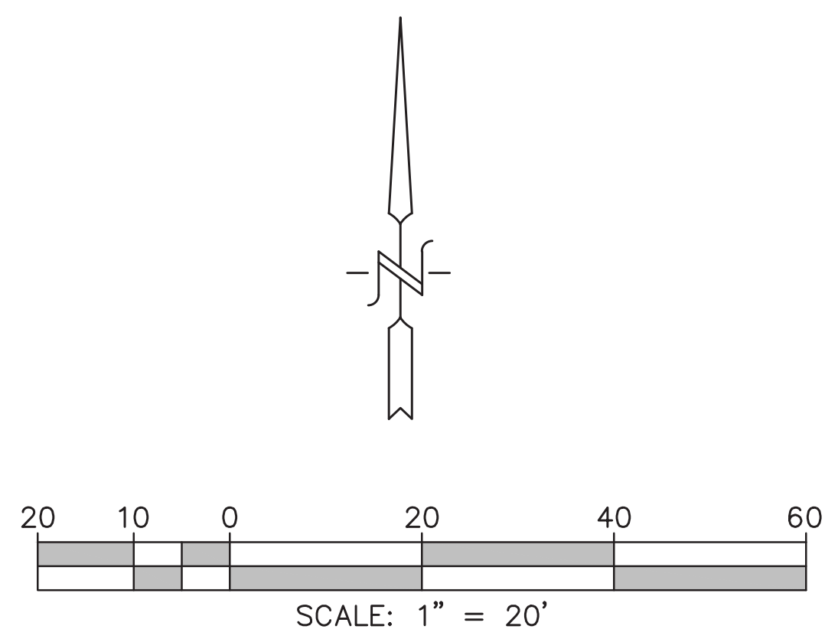
1. NO EXISTING NATURAL HYDROLOGIC FEATURES (WATERCOURSES, SEEPS, SPRINGS, WETLANDS). DEVELOPMENT PROPOSED ON EXISTING GRADED LOT.

2. NO CRITICAL COURSE SEDIMENT YIELD AREAS PRESENT WITHIN PROJECT LIMITS.

3. DEPTH OF GROUNDWATER > 6 FT
4. UNDERLYING SOIL GROUP "D"

SAMPLE PROHIBITIVE SIGNAGE

NTS



LEGEND

DESCRIPTION	SYMBOL
PROPERTY LINE	℄
DMA BOUNDARY	
PROPOSED CONTOUR	630
EXISTING CONTOUR	630
DAYLIGHT	
RAISED PLANTAR BOX (FILTERRA UNIT)	▨
DRAINAGE VAULT	▨
MODULAR WETLAND	□
15' CANOPY TREE WELL	○
TREE WELL AMENDED SOIL	◎
IMPERVIOUS AREA	▭
PROPOSED BUILDING (IMPERVIOUS)	▭
ARTIFICIAL TURF (PERVIOUS)	▨
PERVIOUS LANDSCAPE AREA	▭
DECOMPOSED GRANITE AREA (PERMEABLE)	▭
PROPOSED PERVIOUS CONCRETE	▨

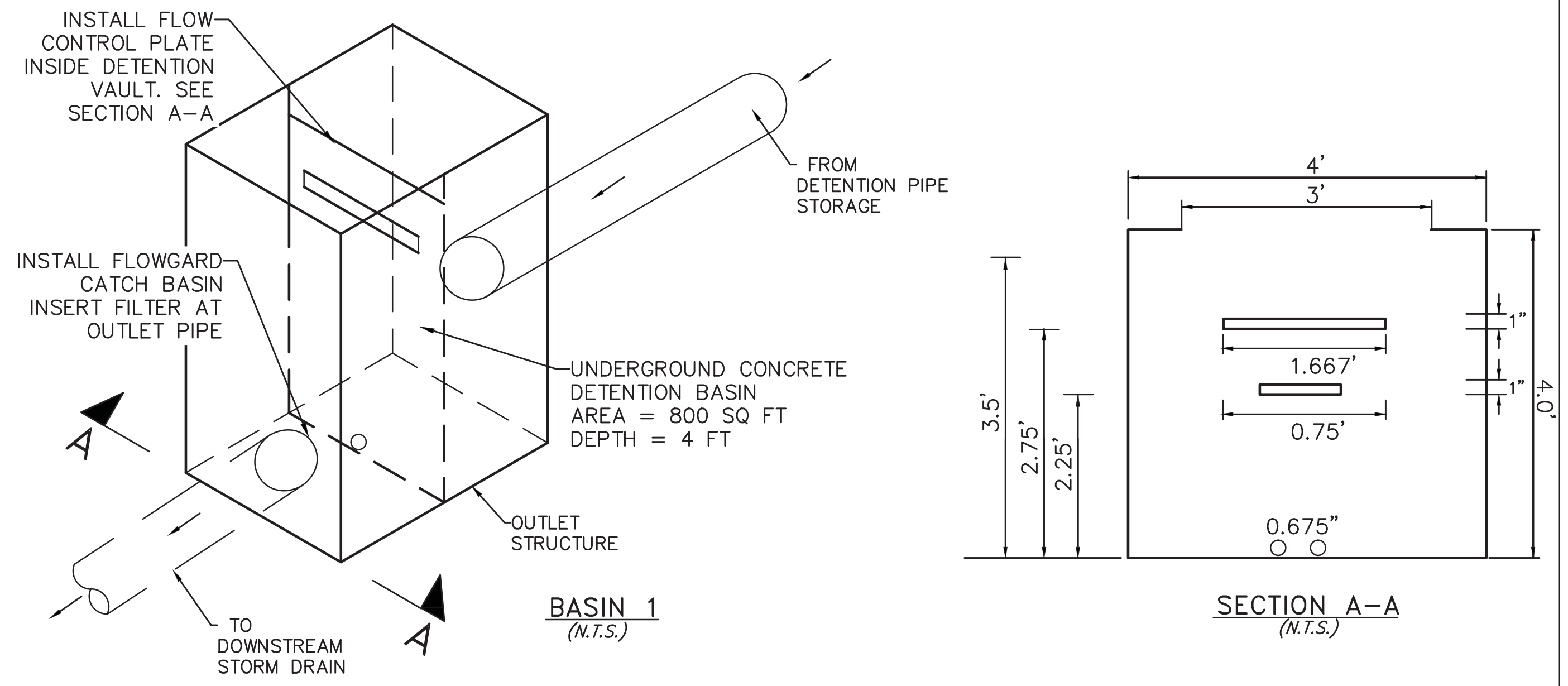
TREE WELL SIZING

TREE WELL SUMMARY				
DMA	DCV (CU-FT)	TREE CREDITS (CU-FT)	FINAL DCV (CU-FT)	PROPOSED TREE WELL
1-5	108	180	-72	1, 20-FT CANOPY TREE

DMA	TREE CANOPY DIAMETER (FT)	TREE WELL AMMENDED SOIL SPECIFICATIONS			
		REQUIRED VOLUME (CU-FT)	PROPOSED SOIL DEPTH (FT)	AREA (SQ-FT)	PROPOSED SOIL DIAMETER (FT)
1-5	20	628.3	3	209.4	16.5

DMA AREAS

PROPOSED CONDITIONS DMA AREAS								
DMA	SUB-AREA	IMPERVIOUS (AC)	PERVIOUS (AC)	ARTIFICIAL TURF (AC)	PROPOSED DG SURFACE (AC)	TOTAL AREA (AC)	DRAINS TO	POC
1	1-1	0.28	0.00	0.35	0.00	0.63	BMP-1-1	POC-1
	1-2	0.53	0.00	0.00	0.00	0.53	BMP-1-2	
	1-3	0.05	0.02	0.00	0.02	0.09	BMP-1-1	
	1-4-A	0.05	0.06	0.00	0.00	0.12	BMP-1-4	
	1-4-B	0.01	0.00	0.00	0.00	0.01		
	1-5	0.03	0.01	0.00	0.00	0.03	BMP-1-5 (TREE WELL)	
	1-6	0.02	0.02	0.00	0.03	0.07	BMP-1-2	
TOTAL	0	0.96	0.11	0.35	0.05	1.48	-	



DETENTION VAULT DETAIL

NTS

KENNETH D. SMITH
ARCHITECT
& ASSOCIATES, INC.
500 FESLER ST. SUITE 102
EL CAJON - CA - 92020
PH / 619 444 2182
Fax / 619 442 2699

DATE: 08-23-2017
JOB NO: 15024
DRAWN BY: RJD
CHECKED BY: Checker

Revision Schedule

#	Date	Description

ORIGINAL PREPERATION DATE:
7/8/17

REVISION DATE(S):

project:
HMP EXHIBIT
Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

1

SHEET: 1 of 1

R·E·C
Consultants, Inc.
Civil Engineering · Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

SAVE DATE: 8/20/2018 ~ PLOT DATE: 8/20/2018 ~ FILE NAME: P:\Acad\1290 Kroc Center\Reports\SWQMP\CAD\DMA - HMP MAP.dwg

ATTACHMENT 6

SWMM Input Data in Input Format (Existing & Proposed Models)

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           10/17/1948
START_TIME           00:00:00
REPORT_START_DATE    10/17/1948
REPORT_START_TIME    00:00:00
END_DATE             10/17/2005
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.06   0.08   0.11   0.16   0.18   0.21   0.21   0.2    0.16   0.12   0.08   0.06
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
LINDBERGH        INTENSITY 1:00   1.0    TIMESERIES LINDBERGH

[SUBCATCHMENTS]
;;                                               Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
1D-PRE           LINDBERGH        POC-1-PRE        1.3652   0        186      1        0
2D-POST          LINDBERGH        BASIN-1          0.5045   100      120      1        0
1D-POST          LINDBERGH        BASIN-1          0.6257   43.4     130      1        0
4D               LINDBERGH        3N               0.0855   0        17       1        0
5D               LINDBERGH        3N               0.0128   92.3     19       1        0
3N               LINDBERGH        3W               0.0299   39.5     16       1        0
3W               LINDBERGH        POC-1-POST       0.0793   13       173      1        0
3S               LINDBERGH        3W               0.0275   52.1     7        1        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
1D-PRE           0.012      0.05       0.05       0.1        25         OUTLET
2D-POST          0.012      0.05       0.05       0.1        25         OUTLET
1D-POST          0.012      0.05       0.05       0.1        25         OUTLET
4D               0.012      0.05       0.05       0.1        25         OUTLET
5D               0.012      0.05       0.05       0.1        25         OUTLET
3N               0.012      0.05       0.05       0.1        25         PERVIOUS   100
3W               0.012      0.05       0.05       0.1        25         PERVIOUS   100
3S               0.012      0.05       0.05       0.1        25         PERVIOUS   100

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
1D-PRE           9          0.01875    0.33
```

```
2D-POST          9          0.01875    0.33
1D-POST          9          0.001      0.33
4D               9          0.01875    0.33
5D               9          0.01875    0.33
3N               9          0.01875    0.33
3W               9          0.01875    0.33
3S               9          0.01875    0.33

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
POC-1-PRE        0          FREE                        NO
POC-1-POST       0          FREE                        NO

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                      Ponded   Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                     Area     Frac.    Infiltration
Parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- -------- -----------------
------
BASIN-1          0        4        0        TABULAR    BASIN-1                    1000     0

[OUTLETS]
;;               Inlet            Outlet           Outflow    Outlet          Qcoeff/                     Flap
;;Name           Node             Node             Height     Type            QTable           Qexpon     Gate
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- ----
OUT-1            BASIN-1          POC-1-POST       0          TABULAR/HEAD    OUT-1                       NO

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
OUT-1            Rating     0.000      0.000
OUT-1                       0.100      0.005
OUT-1                       0.200      0.008
OUT-1                       0.300      0.011
OUT-1                       0.400      0.013
OUT-1                       0.500      0.014
OUT-1                       0.600      0.016
OUT-1                       0.700      0.017
OUT-1                       0.800      0.018
OUT-1                       0.900      0.019
OUT-1                       1.000      0.020
OUT-1                       1.100      0.021
OUT-1                       1.200      0.022
OUT-1                       1.300      0.023
OUT-1                       1.400      0.024
OUT-1                       1.500      0.025
OUT-1                       1.600      0.026
OUT-1                       1.700      0.027
OUT-1                       1.800      0.028
OUT-1                       1.900      0.028
OUT-1                       2.000      0.029
OUT-1                       2.100      0.030
OUT-1                       2.200      0.031
OUT-1                       2.300      0.057
OUT-1                       2.400      0.133
OUT-1                       2.500      0.172
OUT-1                       2.600      0.203
OUT-1                       2.700      0.229
OUT-1                       2.800      0.296
OUT-1                       2.900      0.442
OUT-1                       3.000      0.526
OUT-1                       3.100      0.595
OUT-1                       3.200      0.654
OUT-1                       3.300      0.708
OUT-1                       3.400      0.758
OUT-1                       3.500      0.804
OUT-1                       3.600      1.191
OUT-1                       3.700      1.859
OUT-1                       3.800      2.711
```

```
OUT-1                      3.900      3.711
OUT-1                      4.000      4.838

BASIN-1          Storage    0          800
BASIN-1                     4          800

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
LINDBERGH        FILE "LbergRain.prn"

[REPORT]
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1-PRE        750.000            2900.000
POC-1-POST       3750.000           2900.000
BASIN-1          3750.000           4500.000

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
1D-PRE           750.000            6000.000
1D-PRE           750.000            6000.000
2D-POST          4500.000           6000.000
1D-POST          3000.000           6000.000
4D               6000.000           6000.000
5D               7500.000           6000.000
3N               6000.000           4500.000
3W               6000.000           2900.000
3S               7500.000           2900.000

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
LINDBERGH        1525.424           6864.407
```

ATTACHMENT 7

EPA SWMM FIGURES AND EXPLANATIONS

Per the attached, the reader can see the screens associated with the EPA-SWMM Model in both pre-development and post-development conditions. Each portion, i.e., sub-catchments, outfalls, storage units, weir as a discharge, and outfalls (point of compliance), are also shown.

Variables for modeling are associated with typical recommended values by the EPA-SWMM model, typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been attained from the interim Orange County criteria established for their SWMM calibration. Currently, no recommended values have been established by the San Diego County HMP Permit for the SWMM Model.

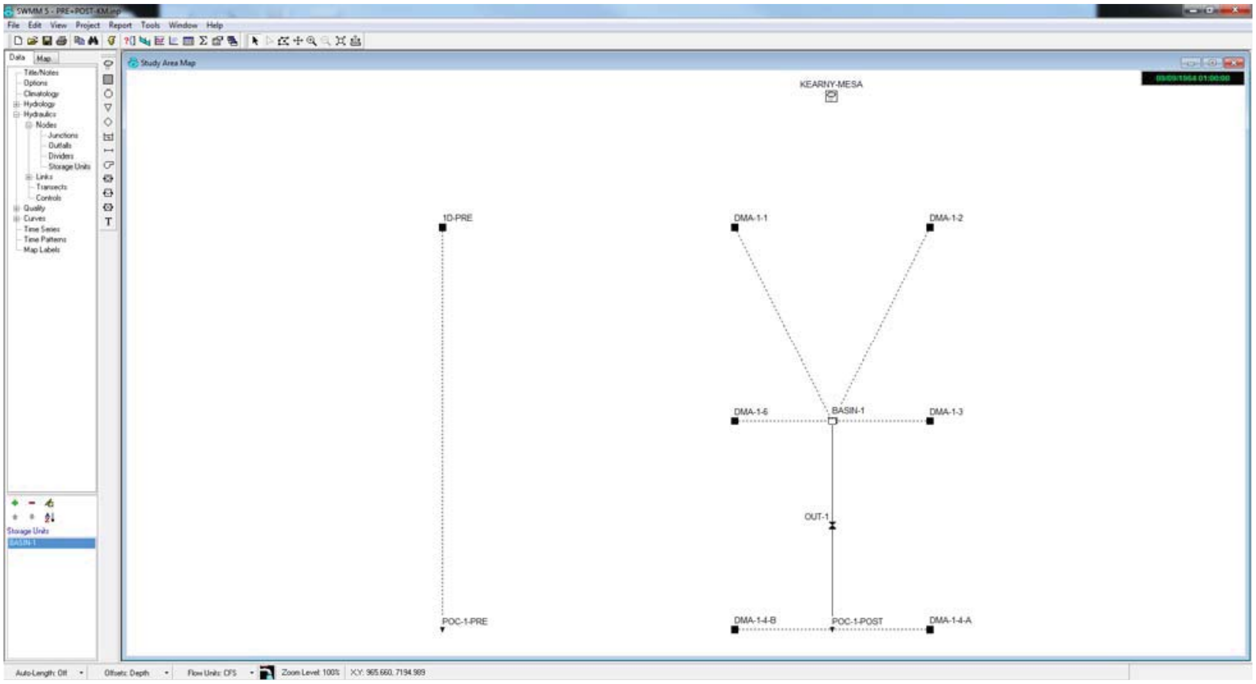
Soil characteristics of the existing soils were determined from the NRCS Web Soil Survey (located in Attachment 8 of this report).

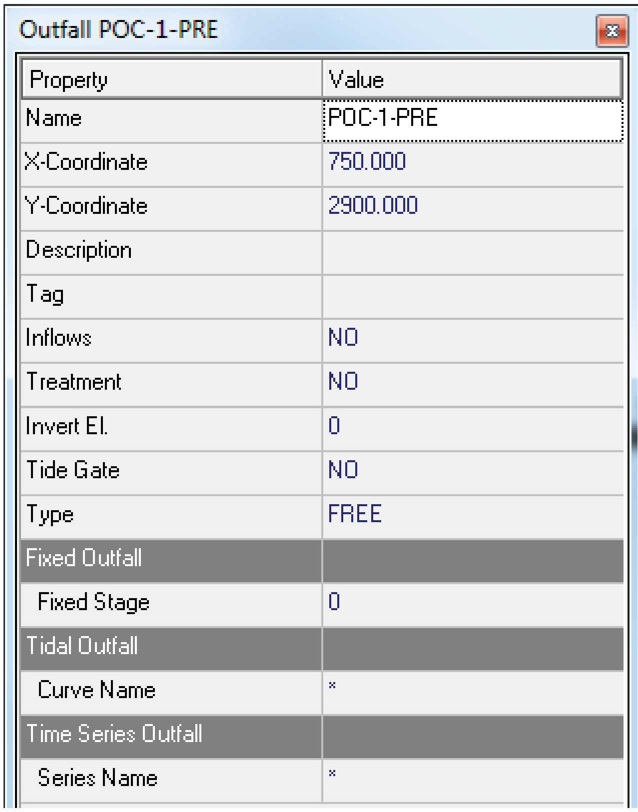
Some values incorporated within the SWMM model have been determined from the professional experience of REC using conservative assumptions that have a tendency to increase the size of the needed BMP and also generate a long-term runoff as a percentage of rainfall similar to those measured in gage stations in Southern California by the USGS.

A Technical document prepared by Tory R Walker Engineering for the Cities of San Marcos, Oceanside and Vista (Reference [1]) can also be consulted for additional information regarding typical values for SWMM parameters.

Manning's roughness coefficients have been based upon the findings of the "*Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region*" date 2016 by TRW Engineering (Reference [6]).

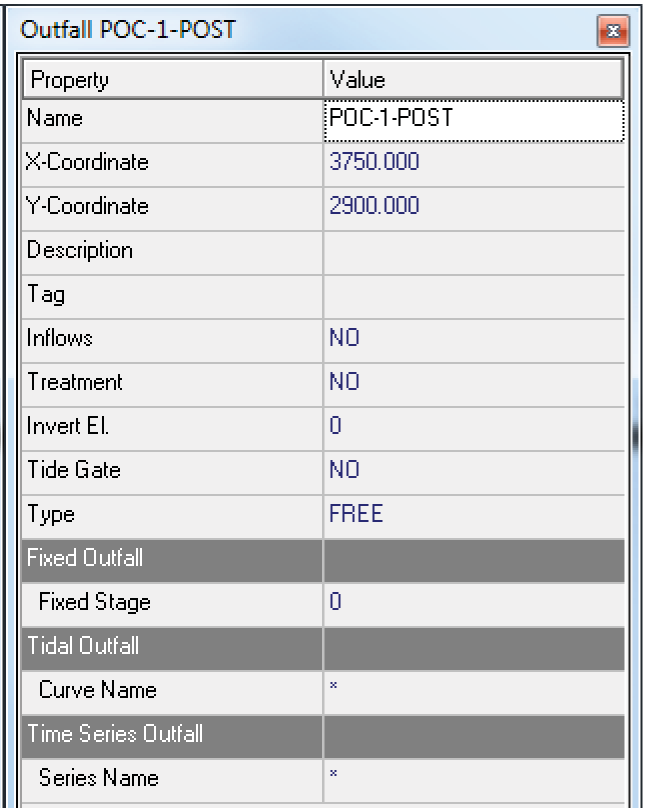
PRE & POST CONDITIONS





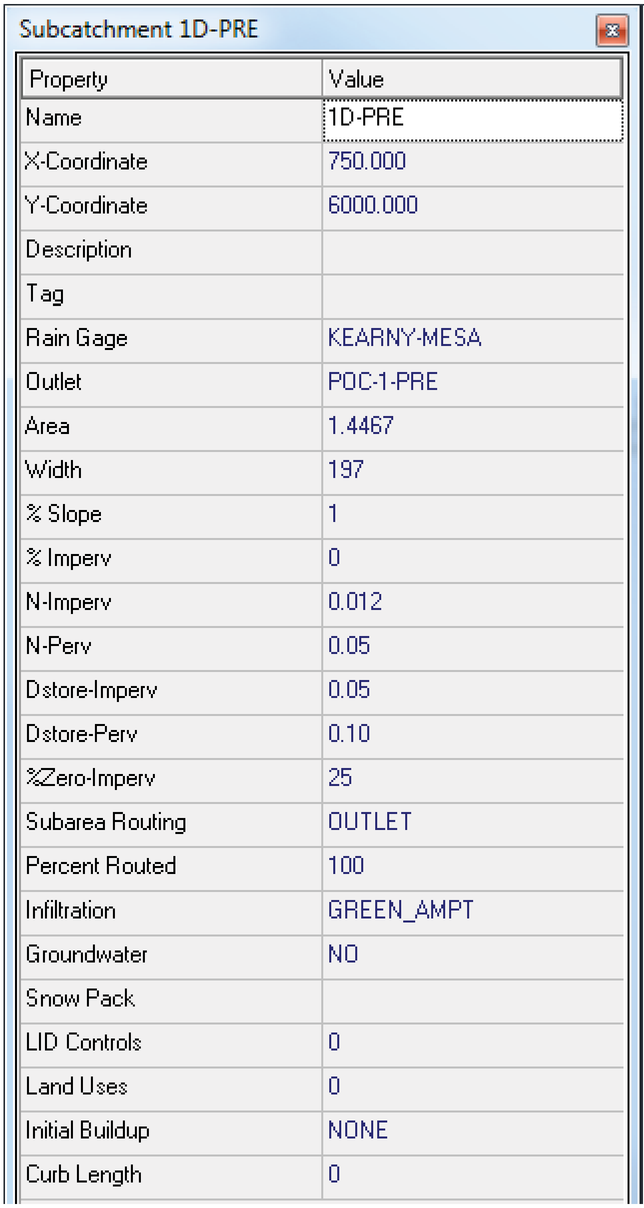
Outfall POC-1-PRE

Property	Value
Name	POC-1-PRE
X-Coordinate	750.000
Y-Coordinate	2900.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*



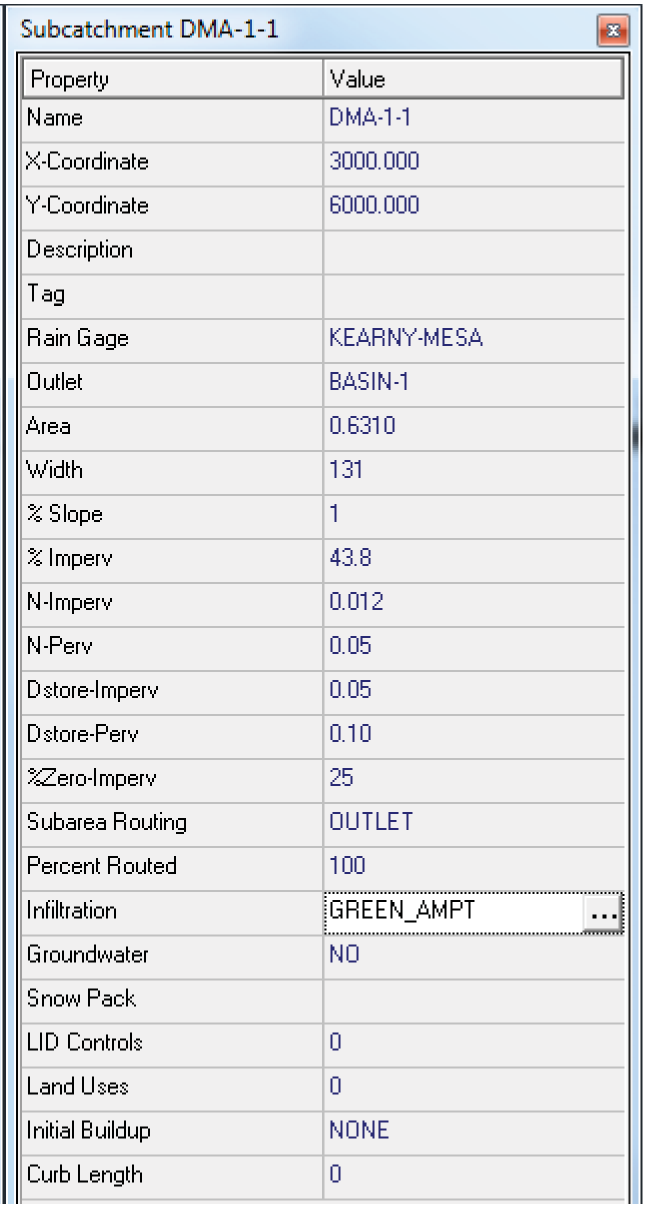
Outfall POC-1-POST

Property	Value
Name	POC-1-POST
X-Coordinate	3750.000
Y-Coordinate	2900.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*



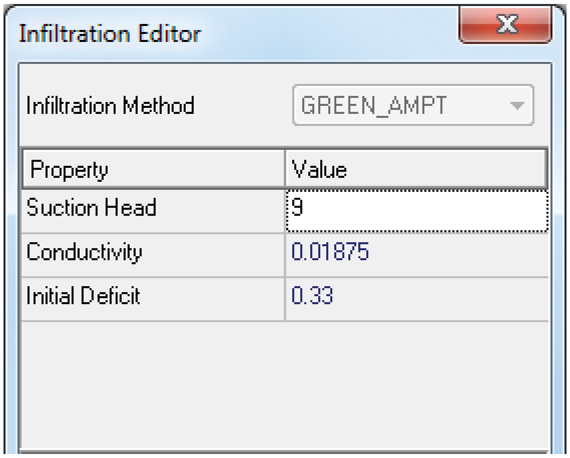
Subcatchment 1D-PRE

Property	Value
Name	1D-PRE
X-Coordinate	750.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	POC-1-PRE
Area	1.4467
Width	197
% Slope	1
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0



Subcatchment DMA-1-1

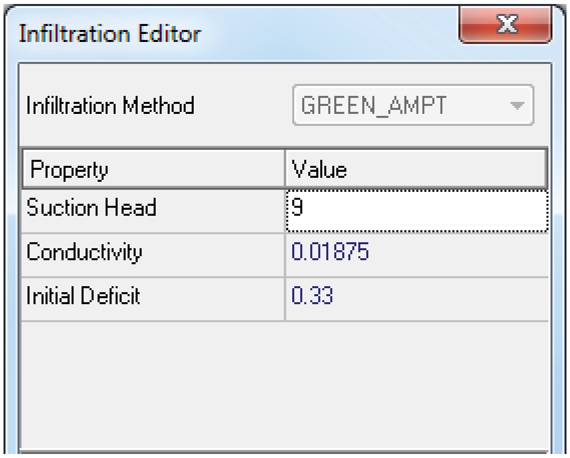
Property	Value
Name	DMA-1-1
X-Coordinate	3000.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	BASIN-1
Area	0.6310
Width	131
% Slope	1
% Imperv	43.8
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0



Infiltration Editor

Infiltration Method: GREEN_AMPT

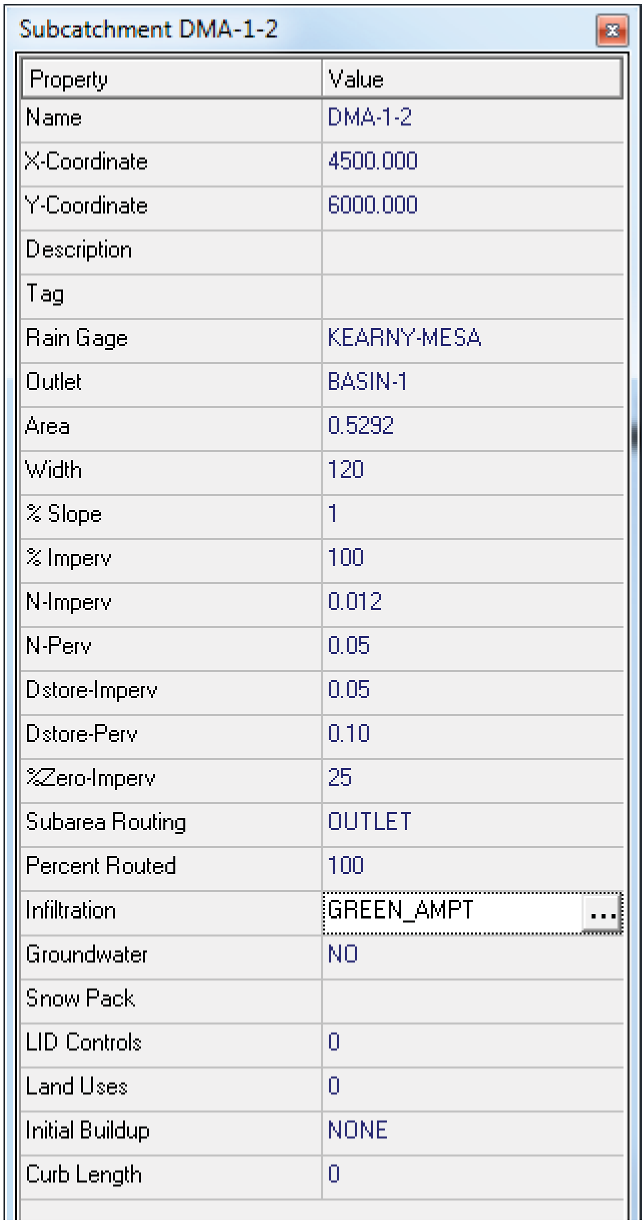
Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



Infiltration Editor

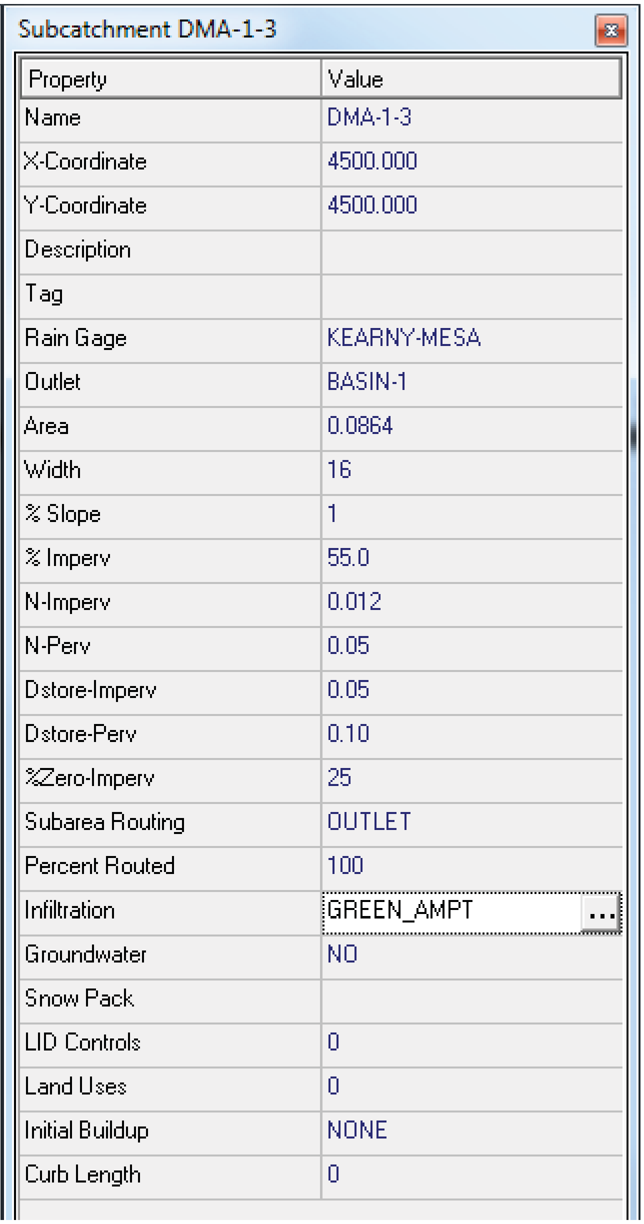
Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



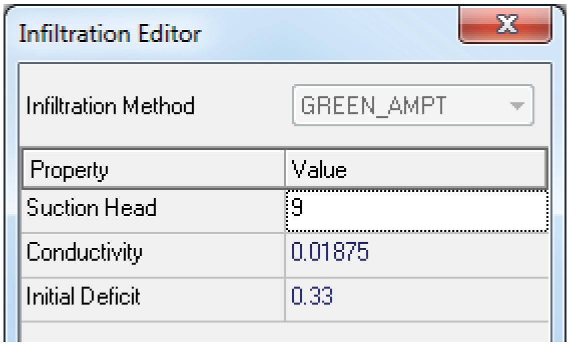
Subcatchment DMA-1-2

Property	Value
Name	DMA-1-2
X-Coordinate	4500.000
Y-Coordinate	6000.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	BASIN-1
Area	0.5292
Width	120
% Slope	1
% Imperv	100
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0



Subcatchment DMA-1-3

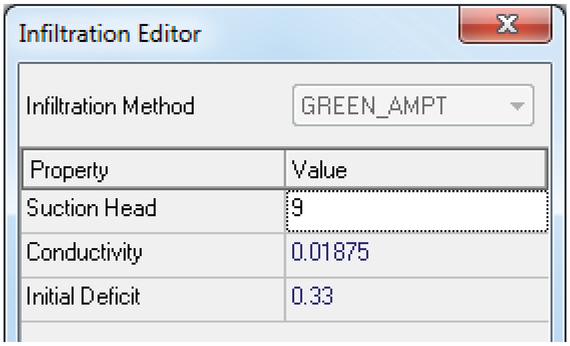
Property	Value
Name	DMA-1-3
X-Coordinate	4500.000
Y-Coordinate	4500.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	BASIN-1
Area	0.0864
Width	16
% Slope	1
% Imperv	55.0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0



Infiltration Editor

Infiltration Method: GREEN_AMPT

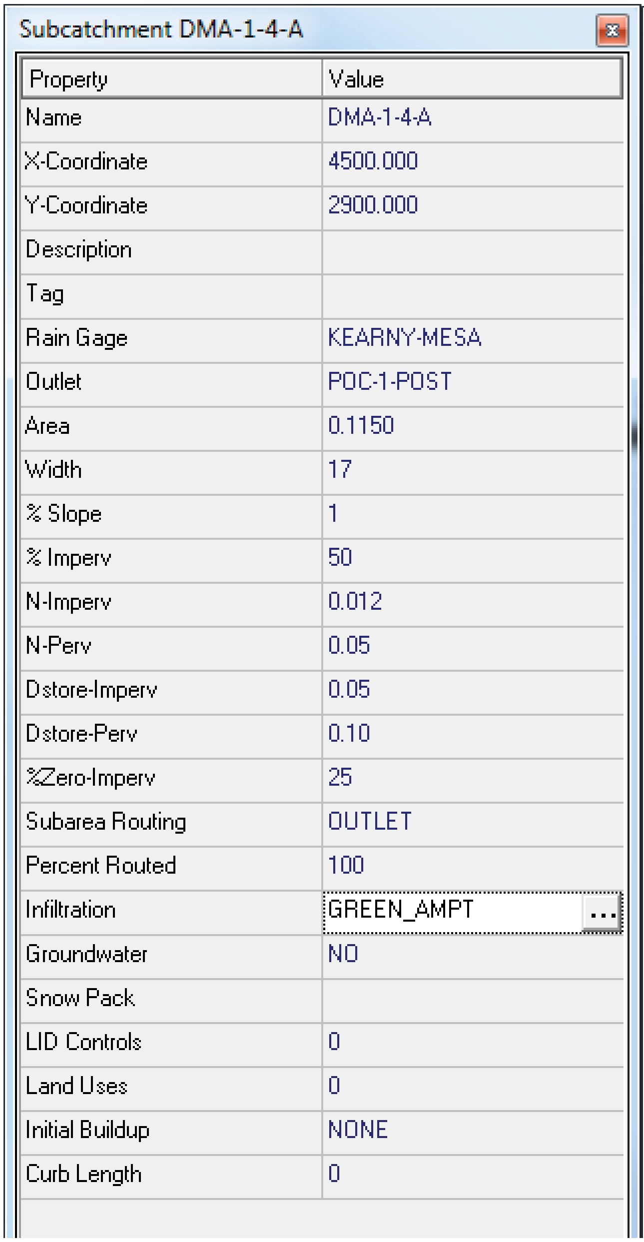
Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



Infiltration Editor

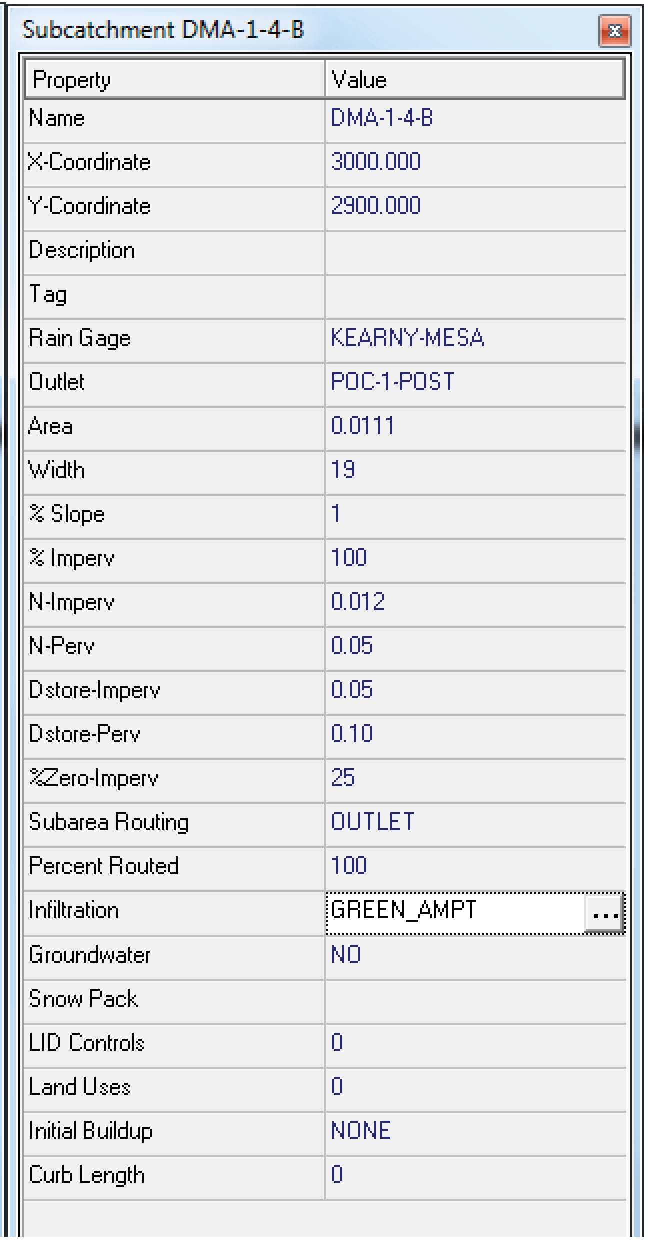
Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



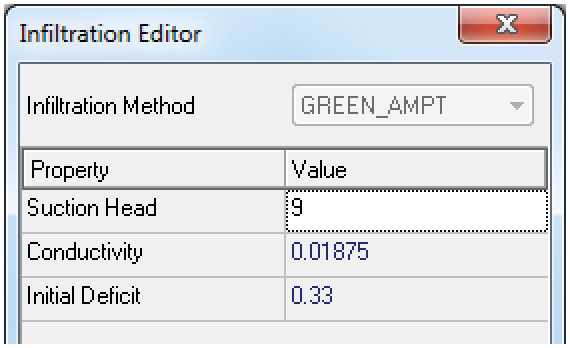
Subcatchment DMA-1-4-A

Property	Value
Name	DMA-1-4-A
X-Coordinate	4500.000
Y-Coordinate	2900.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	POC-1-POST
Area	0.1150
Width	17
% Slope	1
% Imperv	50
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0



Subcatchment DMA-1-4-B

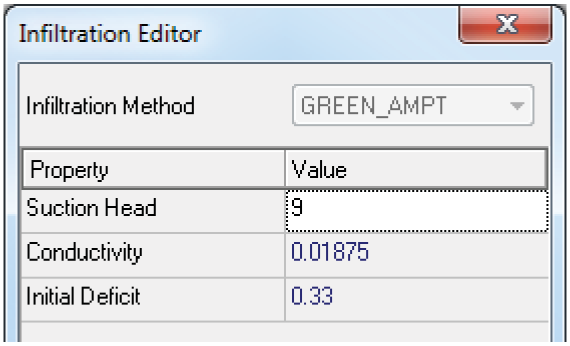
Property	Value
Name	DMA-1-4-B
X-Coordinate	3000.000
Y-Coordinate	2900.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	POC-1-POST
Area	0.0111
Width	19
% Slope	1
% Imperv	100
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0



Infiltration Editor

Infiltration Method: GREEN_AMPT

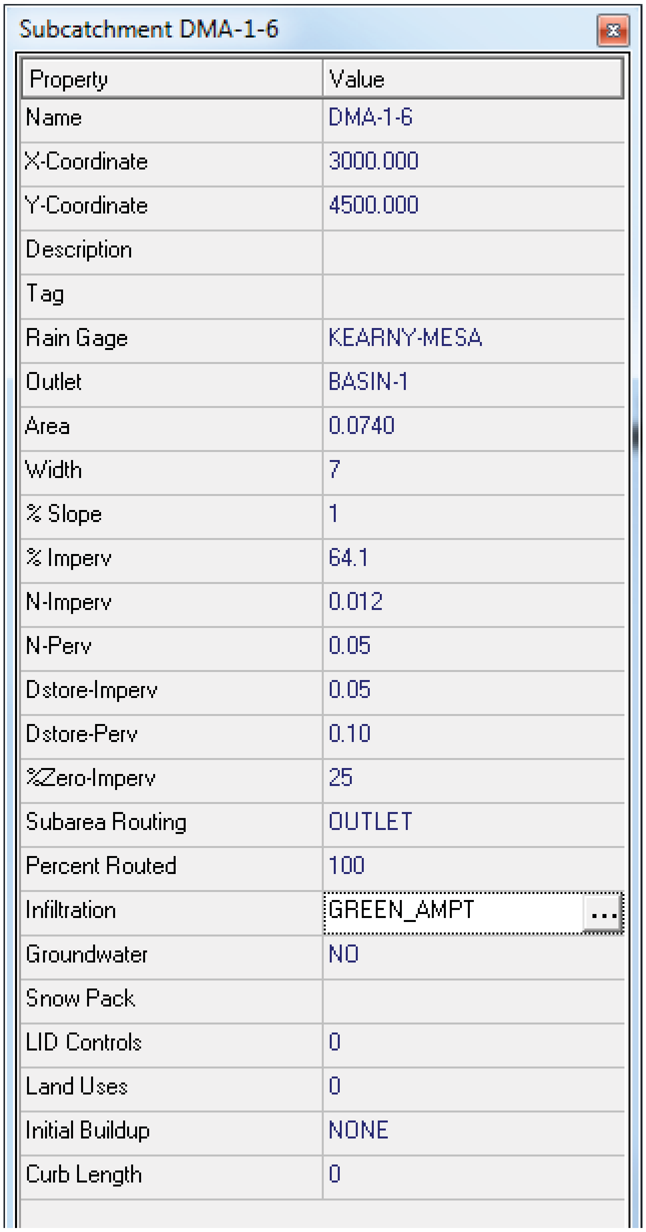
Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



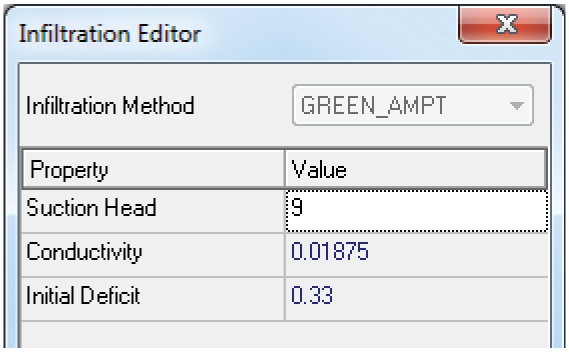
Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



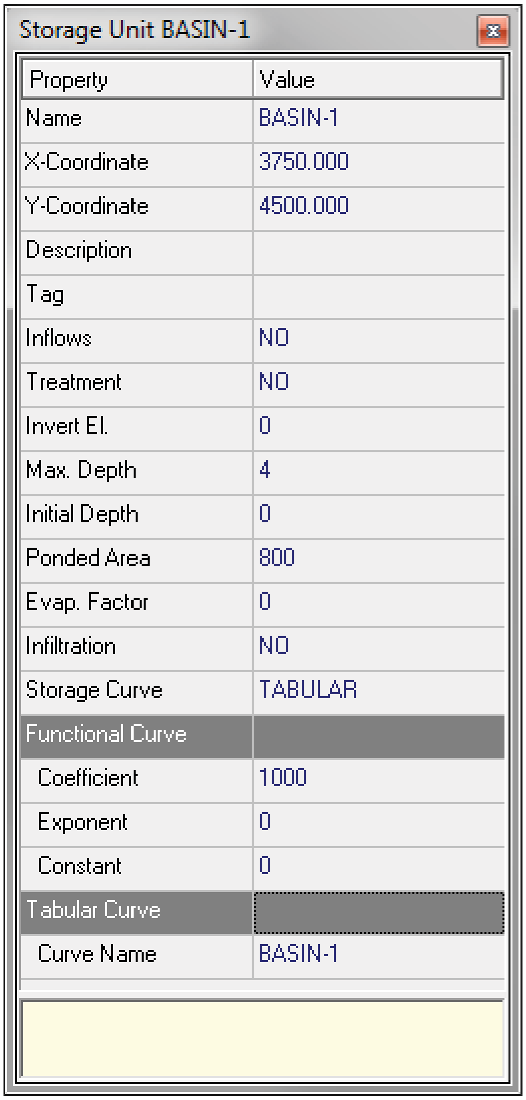
Property	Value
Name	DMA-1-6
X-Coordinate	3000.000
Y-Coordinate	4500.000
Description	
Tag	
Rain Gage	KEARNY-MESA
Outlet	BASIN-1
Area	0.0740
Width	7
% Slope	1
% Imperv	64.1
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0



Infiltration Method: GREEN_AMPT

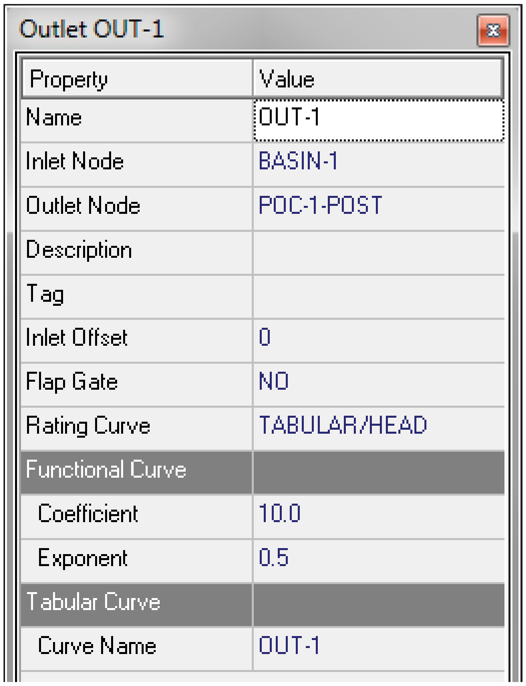
Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Detention Basin 1



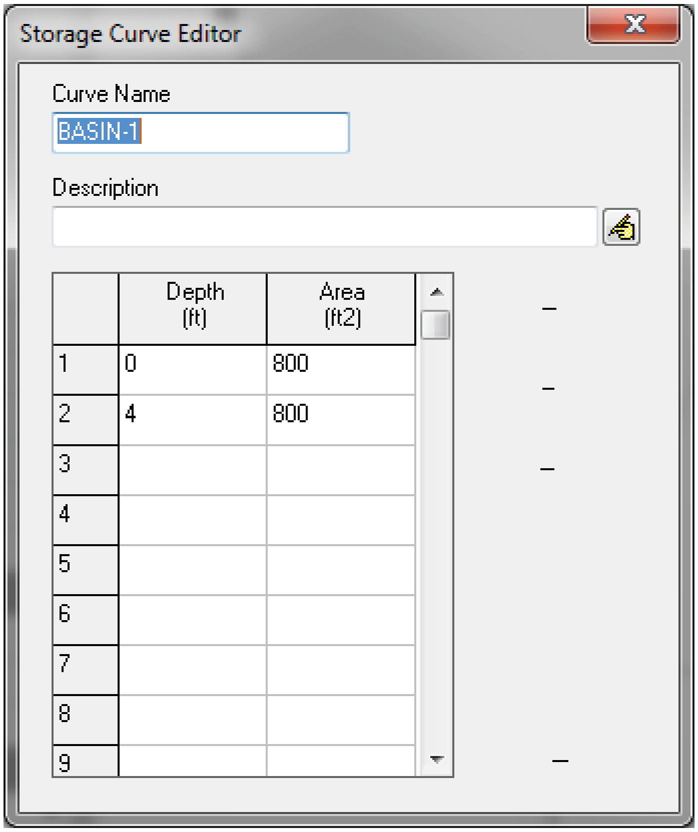
Storage Unit BASIN-1

Property	Value
Name	BASIN-1
X-Coordinate	3750.000
Y-Coordinate	4500.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	4
Initial Depth	0
Ponded Area	800
Evap. Factor	0
Infiltration	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	BASIN-1



Outlet OUT-1

Property	Value
Name	OUT-1
Inlet Node	BASIN-1
Outlet Node	POC-1-POST
Description	
Tag	
Inlet Offset	0
Flap Gate	NO
Rating Curve	TABULAR/HEAD
Functional Curve	
Coefficient	10.0
Exponent	0.5
Tabular Curve	
Curve Name	OUT-1

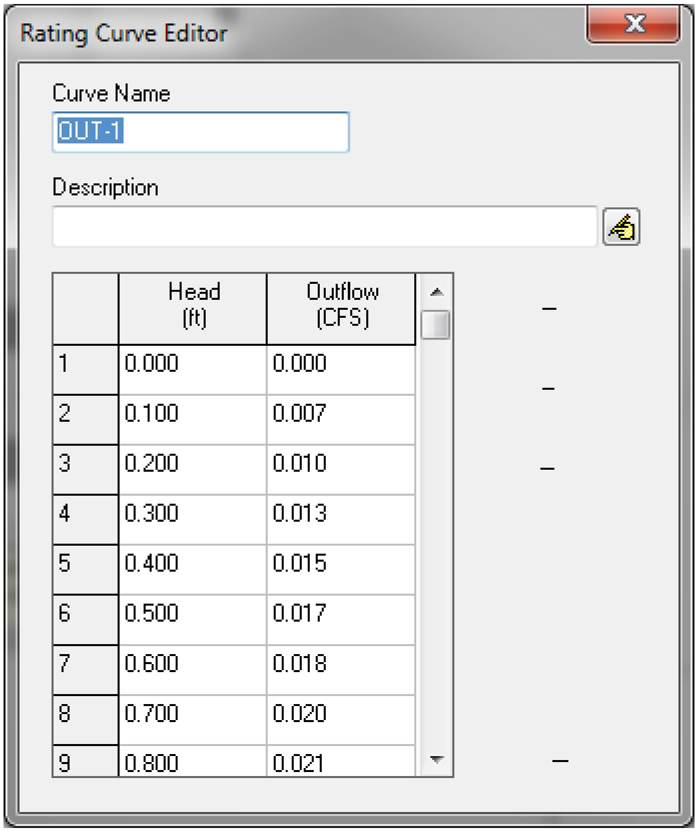


Storage Curve Editor

Curve Name: BASIN-1

Description:

	Depth (ft)	Area (ft2)
1	0	800
2	4	800
3		
4		
5		
6		
7		
8		
9		



Rating Curve Editor

Curve Name: OUT-1

Description:

	Head (ft)	Outflow (CFS)
1	0.000	0.000
2	0.100	0.007
3	0.200	0.010
4	0.300	0.013
5	0.400	0.015
6	0.500	0.017
7	0.600	0.018
8	0.700	0.020
9	0.800	0.021

EXPLANATION OF SELECTED VARIABLES

Sub Catchment Areas:

Please refer to the attached diagrams that indicate the DMA and Bio-Retention BMPs (BMP) sub areas modeled within the project site at both the pre and post developed conditions draining to the POC.

Parameters for the pre- and post-developed models include soil type D as determined from the NRCS websoil survey review (attached at the end of this appendix). Suction head, conductivity and initial deficit corresponds to average values expected for these soils types, according to sources consulted, professional experience, and approximate values obtained by the interim Orange County modeling approach.

REC selected infiltration values, such that the percentage of total precipitation that becomes runoff, is realistic for the soil types and slightly smaller than measured values for Southern California watersheds.

Selection of a Kinematic Approach: As the continuous model is based on hourly rainfall, and the time of concentration for the pre-development and post-development conditions is significantly smaller than 60 minutes, precise routing of the flows through the impervious surfaces, the underdrain pipe system, and the discharge pipe was considered unnecessary. The truncation error of the precipitation into hourly steps is much more significant than the precise routing in a system where the time of concentration is much smaller than 1 hour.

Overland Flow Manning’s Coefficient per TRWE (Reference [6])

appeal of a de facto value, we anticipate that jurisdictions will not be inclined to approve land surfaces other than short prairie grass. Therefore, in order to provide SWMM users with a wider range of land surfaces suitable for local application and to provide Copermittees with confidence in the design parameters, we recommend using the values published by Yen and Chow in Table 3-5 of the EPA SWMM Reference Manual Volume I – Hydrology.

SWMM-Endorsed Values Will Improve Model Quality

In January 2016, the EPA released the SWMM Reference Manual Volume I – Hydrology (SWMM Hydrology Reference Manual). The SWMM Hydrology Reference Manual complements the SWMM 5 User's Manual and SWMM 5 Applications Manual by providing an in-depth description of the program's hydrologic components (EPA 2016). Table 3-5 of the SWMM Hydrology Reference Manual expounds upon SWMM 5 User's Manual Table A.6 by providing Manning's *n* values for additional overland flow surfaces[3]. The values are provided in Table 1:

Table 1: Manning's *n* Values for Overland Flow (EPA, 2016; Yen 2001; Yen and Chow, 1983).

Overland Surface	Light Rain (< 0.8 in/hr)	Moderate Rain (0.8-1.2 in/hr)	Heavy Rain (> 1.2 in/hr)
Smooth asphalt pavement	0.010	0.012	0.015
Smooth impervious surface	0.011	0.013	0.015
Tar and sand pavement	0.012	0.014	0.016
Concrete pavement	0.014	0.017	0.020
Rough impervious surface	0.015	0.019	0.023
Smooth bare packed soil	0.017	0.021	0.025
Moderate bare packed soil	0.025	0.030	0.035
Rough bare packed soil	0.032	0.038	0.045
Gravel soil	0.025	0.032	0.045
Mowed poor grass	0.030	0.038	0.045
Average grass, closely clipped sod	0.040	0.050	0.060
Pasture	0.040	0.055	0.070
Timberland	0.060	0.090	0.120
Dense grass	0.060	0.090	0.120
Shrubs and bushes	0.080	0.120	0.180
Land Use			
Business	0.014	0.022	0.035
Semibusiness	0.022	0.035	0.050
Industrial	0.020	0.035	0.050
Dense residential	0.025	0.040	0.060
Suburban residential	0.030	0.055	0.080
Parks and lawns	0.040	0.075	0.120

For purposes of local hydromodification management BMP design, these Manning's *n* values are an improvement upon the values presented by Engman (1986) in SWMM 5 User's Manual Table A.6. Values from SWMM 5 User's Manual Table A.6, while completely suitable for the intended application to certain agricultural land covers, comes with the disclaimer that the provided Manning's *n* values are valid for shallow-depth overland flow that match the conditions in the experimental plots (Engman,

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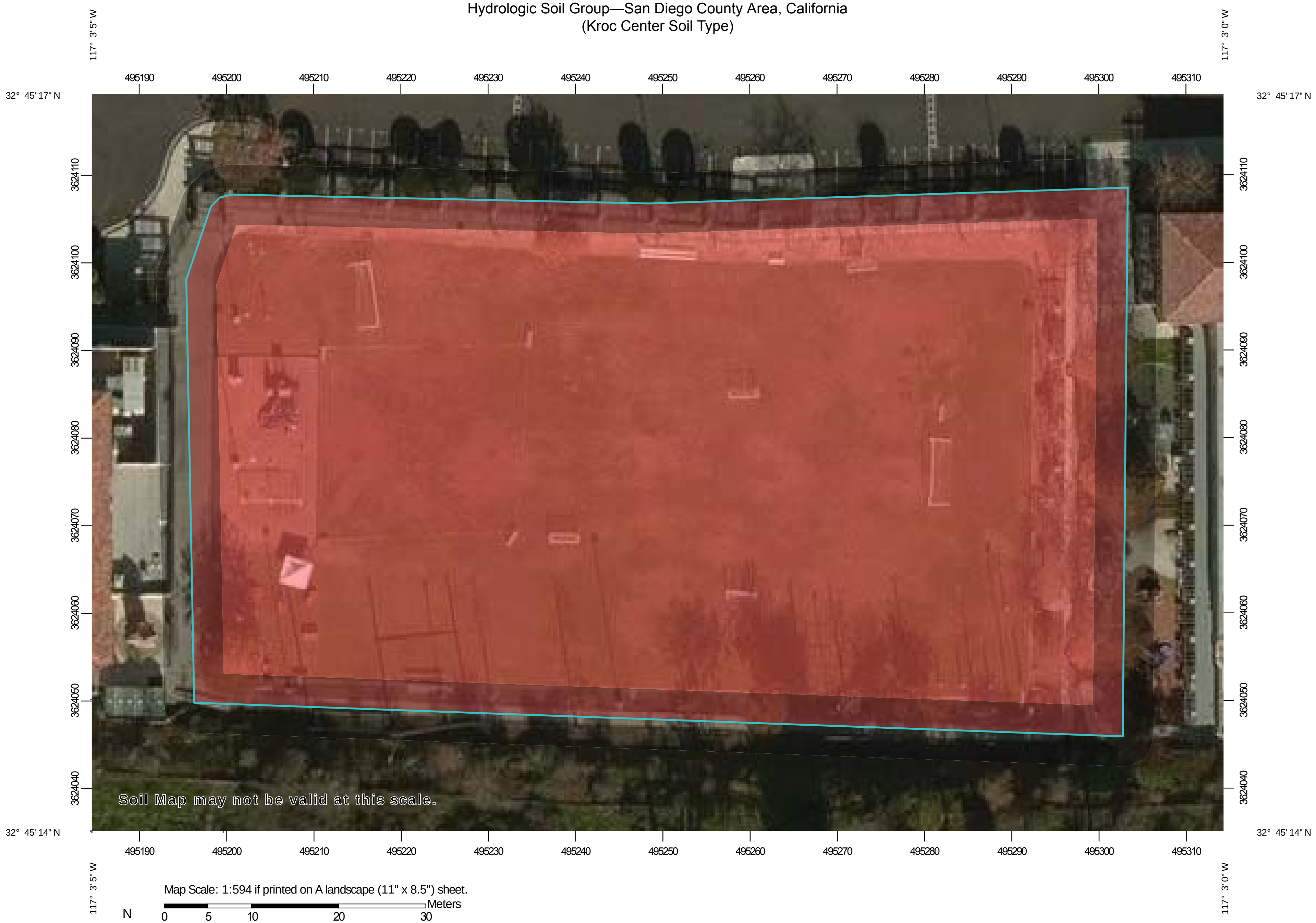
[3] Further discussion is provided on page 6 under "Discussion of Differences Between Manning's *n* Values"

ATTACHMENT 8

Geotechnical Documentation

Hydrologic Soil Group—San Diego County Area, California
(Kroc Center Soil Type)



Map Scale: 1:594 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- □ Area of Interest (AOI)

Soils

Soil Rating Polygons

- ■ A
- ■ A/D
- ■ B
- ■ B/D
- ■ C
- ■ C/D
- ■ D
- □ Not rated or not available

Soil Rating Lines

- 〰 A
- 〰 A/D
- 〰 B
- 〰 B/D
- 〰 C
- 〰 C/D
- 〰 D
- 〰 Not rated or not available

Soil Rating Points

- ■ A
- ■ A/D
- ■ B
- ■ B/D
- ■ C
- ■ C/D
- ■ D
- □ Not rated or not available

Water Features

- 〰 Streams and Canals

Transportation

- ┼┼┼ Rails
- 〰 Interstate Highways
- 〰 US Routes
- 〰 Major Roads
- 〰 Local Roads

Background

- ■ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 10, Sep 12, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 7, 2014—Jan 4, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
OkC	Olivenhain-Urban land complex, 2 to 9 percent slopes	D	1.6	100.0%
Totals for Area of Interest			**1.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT 9

Summary Files from the SWMM Model

PRE & POST_DEV

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ SEP-09-1964 00:00:00
Ending Date .............. SEP-08-2008 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       117.846       488.750
Evaporation Loss .........         9.724        40.330
Infiltration Loss ........        58.348       241.993
Surface Runoff ...........        51.010       211.556
Final Surface Storage ....         0.000         0.000
Continuity Error (%) .....        -1.049


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        51.010        16.622
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        50.996        16.618
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.027


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
```

PRE & POST_DEV

```
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00


***************************
Subcatchment Runoff Summary
***************************

------------------------------------------------------------------------------------------------------------
                            Total      Total      Total      Total      Total       Total     Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                   in         in         in         in         in     10^6 gal      CFS
------------------------------------------------------------------------------------------------------------
1D-PRE                     488.75       0.00      18.61     365.13     109.64        4.31     1.79   0.224
DMA-1-2                    488.75       0.00      84.40       0.00     409.63        5.89     0.75   0.838
DMA-1-1                    488.75       0.00      46.20     202.26     246.27        4.22     0.84   0.504
DMA-1-4-A                  488.75       0.00      50.87     180.42     262.99        0.82     0.15   0.538
DMA-1-4-B                  488.75       0.00      80.11       0.00     416.63        0.13     0.02   0.852
DMA-1-3                    488.75       0.00      53.86     161.77     278.97        0.65     0.12   0.571
DMA-1-6                    488.75       0.00      61.63     129.73     302.05        0.61     0.10   0.618


******************
Node Depth Summary
******************

---------------------------------------------------------------------
                                 Average  Maximum  Maximum  Time of Max
                                   Depth    Depth      HGL   Occurrence
Node                 Type           Feet     Feet     Feet  days hr:min
---------------------------------------------------------------------
POC-1-PRE            OUTFALL        0.00     0.00     0.00     0  00:00
POC-1-POST           OUTFALL        0.00     0.00     0.00     0  00:00
BASIN-1              STORAGE        0.03     3.68     3.68  3738  09:00


*******************
Node Inflow Summary
*******************

-------------------------------------------------------------------------------------
                                  Maximum  Maximum                  Lateral       Total
                                  Lateral    Total  Time of Max      Inflow      Inflow
                                   Inflow   Inflow   Occurrence      Volume      Volume
Node                 Type             CFS      CFS  days hr:min    10^6 gal    10^6 gal
-------------------------------------------------------------------------------------
POC-1-PRE            OUTFALL         1.79     1.79  3738  09:00       4.307       4.307
POC-1-POST           OUTFALL         0.17     1.97  3738  09:00       0.947      12.310
BASIN-1              STORAGE         1.80     1.80  3738  09:00      11.367      11.367


**********************
Node Surcharge Summary
**********************

Surcharging occurs when water rises above the top of the highest conduit.
---------------------------------------------------------------------
                                              Max. Height   Min. Depth
                                   Hours      Above Crown    Below Rim
Node                 Type     Surcharged             Feet         Feet
---------------------------------------------------------------------
BASIN-1              STORAGE    385703.02            3.684        0.316


*********************
Node Flooding Summary
*********************

No nodes were flooded.
```

PRE & POST_DEV

```
**********************
Storage Volume Summary
**********************

---------------------------------------------------------------------------------------------
                       Average     Avg   E&I       Maximum     Max    Time of Max    Maximum
                        Volume    Pcnt  Pcnt        Volume    Pcnt     Occurrence    Outflow
Storage Unit          1000 ft3    Full  Loss      1000 ft3    Full    days hr:min        CFS
---------------------------------------------------------------------------------------------
BASIN-1                  0.027       1     0         2.947      92    3738  09:00       1.80


***********************
Outfall Loading Summary
***********************

-----------------------------------------------------------
                      Flow       Avg.      Max.       Total
                      Freq.      Flow      Flow      Volume
Outfall Node          Pcnt.       CFS       CFS    10^6 gal
-----------------------------------------------------------
POC-1-PRE              0.43      0.10      1.79       4.307
POC-1-POST             5.91      0.02      1.97      12.310
-----------------------------------------------------------
System                 3.17      0.12      3.75      16.617


********************
Link Flow Summary
********************

-----------------------------------------------------------------------------
                               Maximum  Time of Max   Maximum    Max/    Max/
                                |Flow|   Occurrence   |Veloc|    Full    Full
Link                 Type          CFS  days hr:min    ft/sec    Flow   Depth
-----------------------------------------------------------------------------
OUT-1                DUMMY        1.80  3738  09:00


*************************
Conduit Surcharge Summary
*************************

No conduits were surcharged.


Analysis begun on:  Wed Feb 07 16:05:42 2018
Analysis ended on:  Wed Feb 07 16:05:59 2018
Total elapsed time: 00:00:17
```

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Project Name: The Salvation Army, Ray and Joan Kroc Center

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3	Maintenance Agreement (Form DS-3247) (when applicable)	☑ Included ☐ Not applicable

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

Attachment 3: For private entity operation and maintenance, Attachment 3 must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

- ☑ Vicinity map
- ☑ Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
- ☑ BMP and HMP location and dimensions
- ☑ BMP and HMP specifications/cross section/model
- ☑ Maintenance recommendations and frequency
- ☑ LID features such as (permeable paver and LS location, dim, SF).

The City *of*
SAN DIEGO

RECORDING REQUESTED BY:
THE CITY OF SAN DIEGO AND
WHEN RECORDED MAIL TO:

____

____

______________________________ ________

(THIS SPACE IS FOR RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:	ASSESSORS PARCEL NUMBER:	PROJECT NUMBER:
	474-130-16	552436

This agreement is made by and between the City of San Diego, a municipal corporation [City] and
Palm Avenue Realty,
the owner or duly authorized representative of the owner [Property Owner] of property located at
6845 University Avenue, San Diego, California 92115
(Property Address)

and more particularly described as: The Salvation Army, Ray and Joan Kroc Community Center
(Legal Description of Property)

in the City of San Diego, County of San Diego, State of California.

Property Owner is required pursuant to the City of San Diego Municipal Code, Chapter 4, Article 3, Division 3, Chapter 14, Article 2, Division 2, and the Land Development Manual, Storm Water Standards to enter into a Storm Water Management and Discharge Control Maintenance Agreement [Maintenance Agreement] for the installation and maintenance of Permanent Storm Water Best Management Practices [Permanent Storm Water BMP's] prior to the issuance of construction permits. The Maintenance Agreement is intended to ensure the establishment and maintenance of Permanent Storm Water BMP's onsite, as described in the attached exhibit(s), the project's Storm Water Quality Management Plan [SWQMP] and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): 15024.

Property Owner wishes to obtain a building or engineering permit according to the Grading and/or Improvement Plan Drawing No(s) or Building Plan Project No(s): 15024.

Continued on Page 2

NOW, THEREFORE, the parties agree as follows:

1. Property Owner shall have prepared, or if qualified, shall prepare an Operation and Maintenance Procedure [OMP] for Permanent Storm Water BMP's, satisfactory to the City, according to the attached exhibit(s), consistent with the Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): 15024.

2. Property Owner shall install, maintain and repair or replace all Permanent Storm Water BMP's within their property, according to the OMP guidelines as described in the attached exhibit(s), the project's SWQMP and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s) 15024.

3. Property Owner shall maintain operation and maintenance records for at least five (5) years. These records shall be made available to the City for inspection upon request at any time.

This Maintenance Agreement shall commence upon execution of this document by all parties named hereon, and shall run with the land.

Executed by the City of San Diego and by Property Owner in San Diego, California.

See Attached Exhibit(s): ____________________

____
(Owner Signature)

Arthur Stillwell, Project Director
(Print Name and Title)

The Salvation Army
(Company/Organization Name)

08/10/2018
(Date)

THE CITY OF SAN DIEGO

APPROVED:

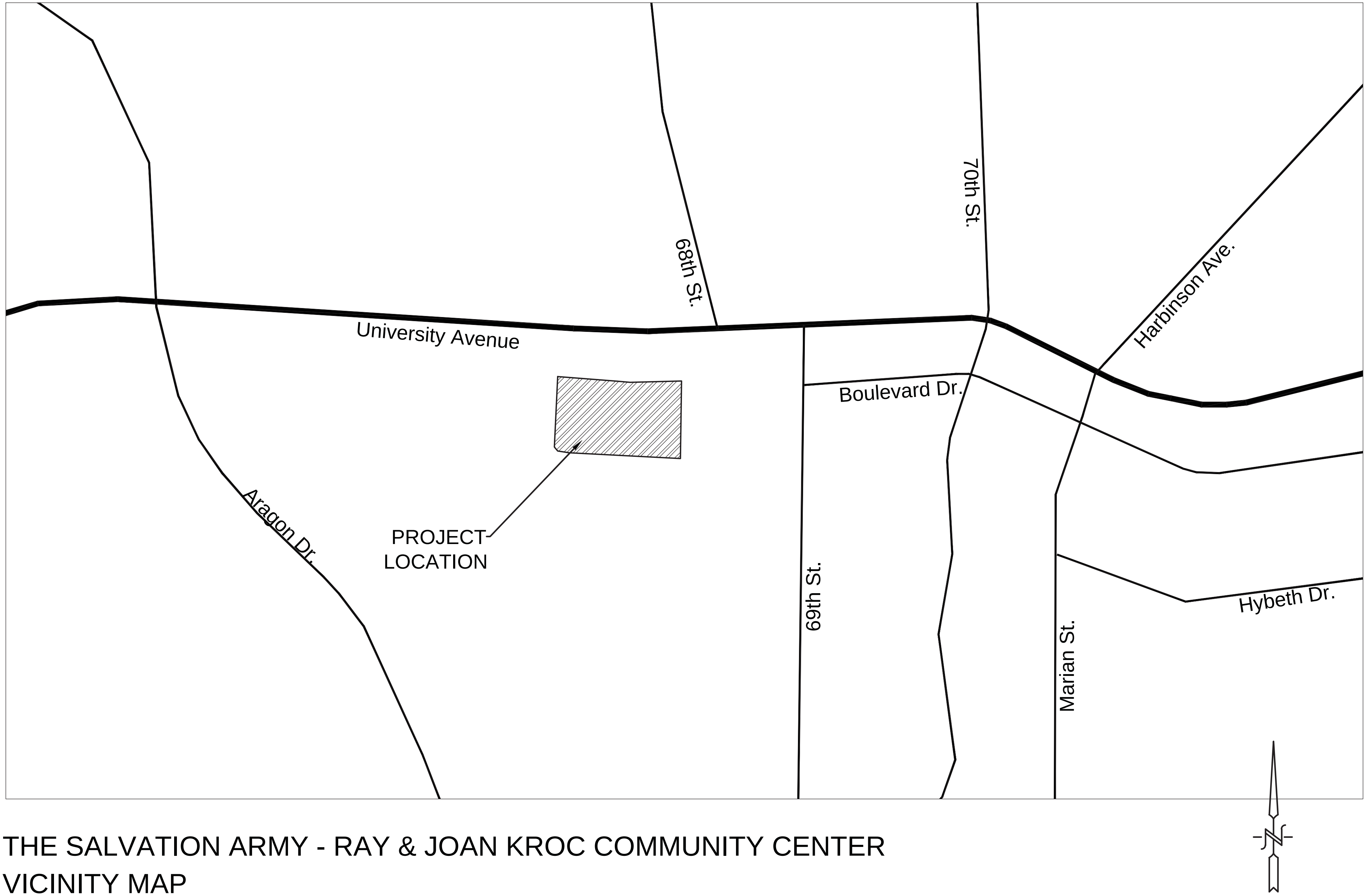
____
(City Control Engineer Signature)

____
(Print Name)

____
(Date)

NOTE: ALL SIGNATURES MUST INCLUDE NOTARY ACKNOWLEDGMENTS PER CIVIL CODE SEC. 1180 ET.SEQ.

MAINTENANCE AGREEMENT EXHIBIT



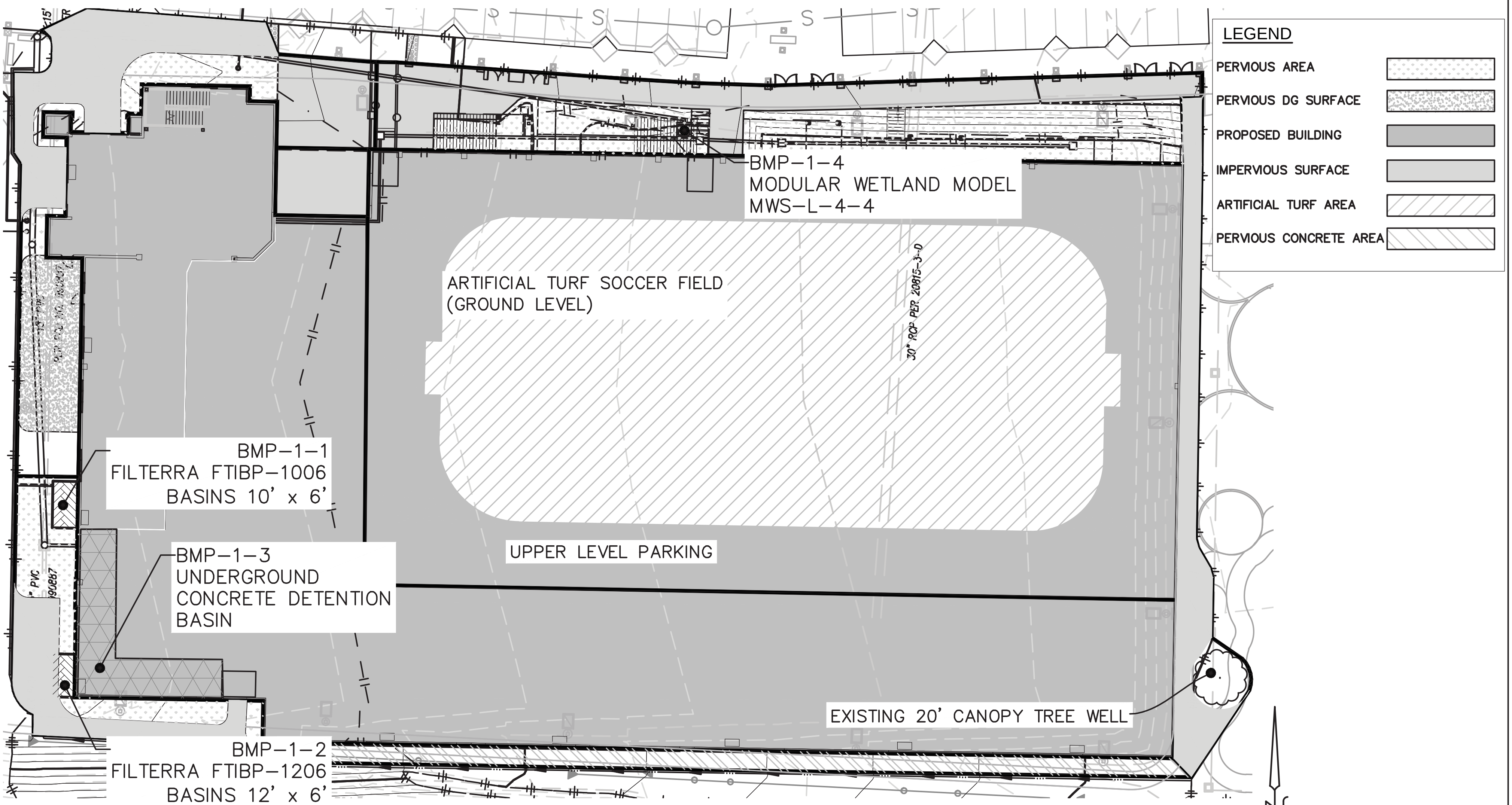
THE SALVATION ARMY - RAY & JOAN KROC COMMUNITY CENTER

VICINITY MAP

SHEET 1OF 6

NTS

MAINTENANCE AGREEMENT EXHIBIT



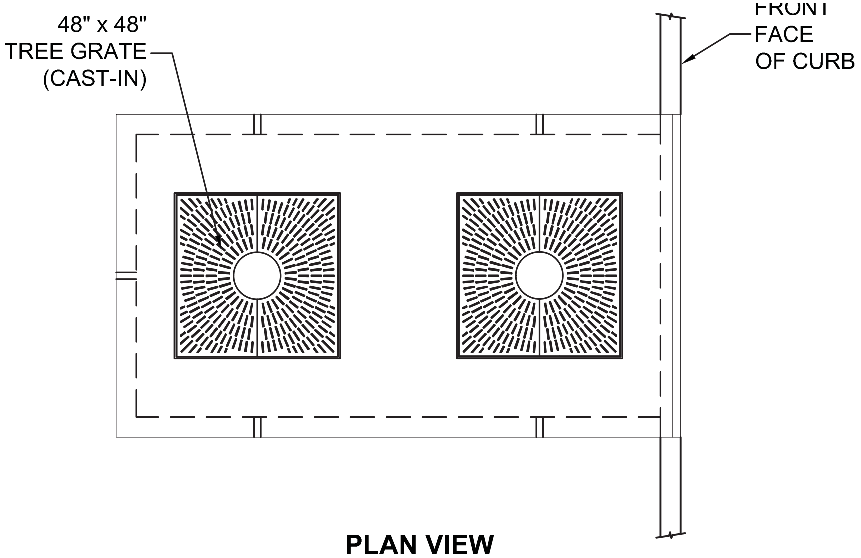
SCALE: 1" = 40'

THE SALVATION ARMY - RAY & JOAN KROC COMMUNITY CENTER

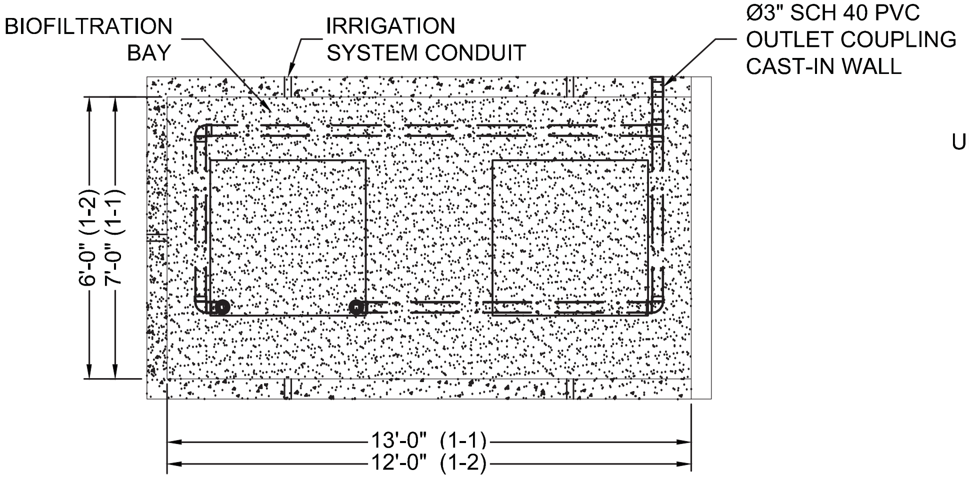
SITE PLAN- BMP LOCATION

SHEET 2 OF 6

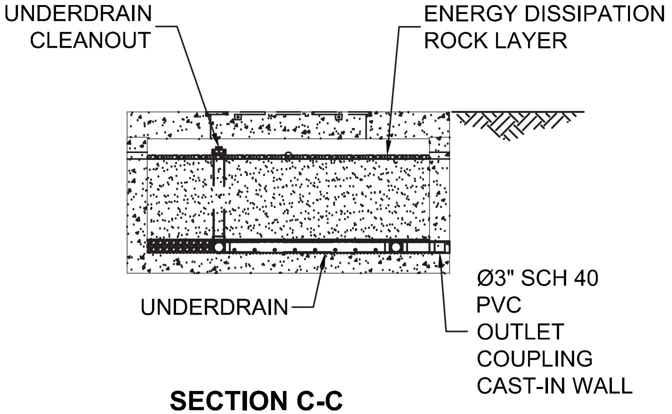
MAINTENANCE AGREEMENT EXHIBIT



PLAN VIEW



SECTION B-B

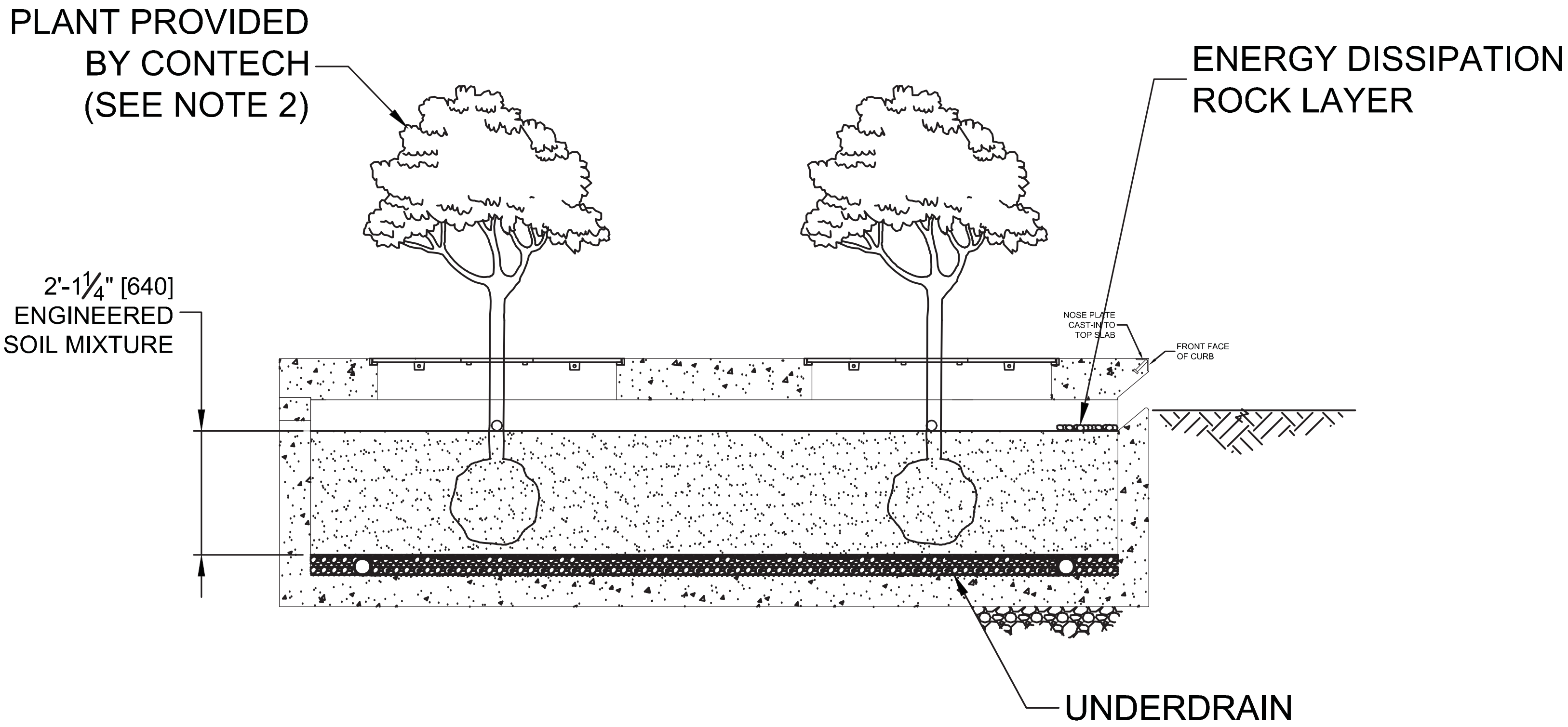


SECTION C-C

FILTERRA FTIBP DETAIL-1

NTS

MAINTENANCE AGREEMENT EXHIBIT



SECTION A-A

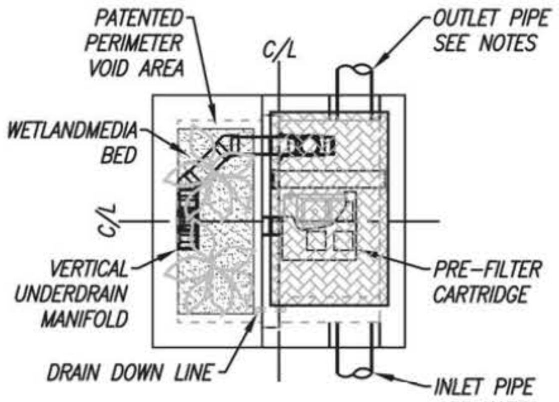
FILTERRA FTIBP DETAIL-2

NTS

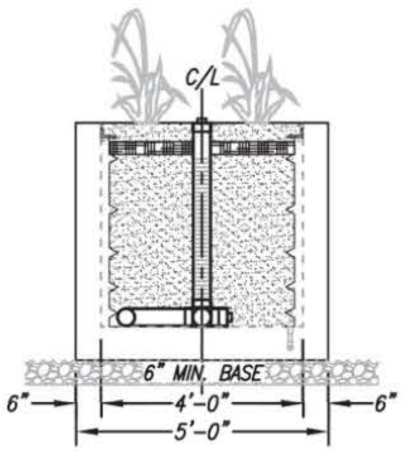
MAINTENANCE AGREEMENT EXHIBIT

SITE SPECIFIC DATA

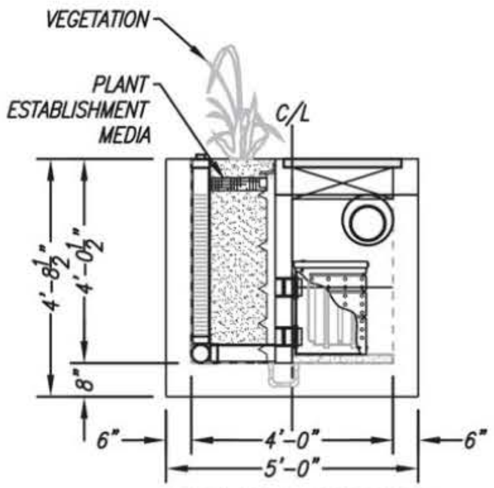
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	24" x 42"	N/A	N/A
WETLANDMEDIA VOLUME (CY)			0.83
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø1.03"
MAXIMUM PICK WEIGHT (LBS)			9000
NOTES:			



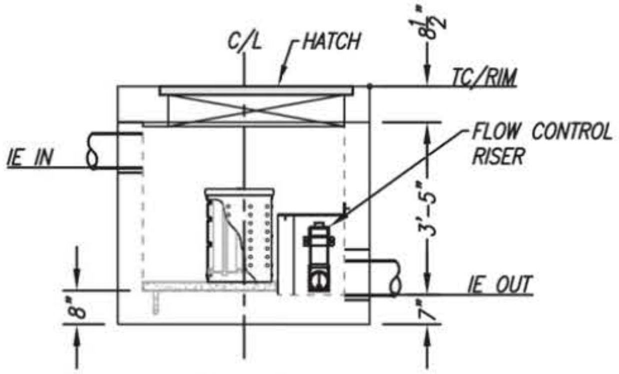
PLAN VIEW



LEFT END VIEW
BIOFILTRATION



ELEVATION VIEW



RIGHT END VIEW
PRETREATMENT/DISCHARGE

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

GENERAL NOTES

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

TREATMENT FLOW (CFS)	0.052
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

THE PRODUCT DESCRIBED MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

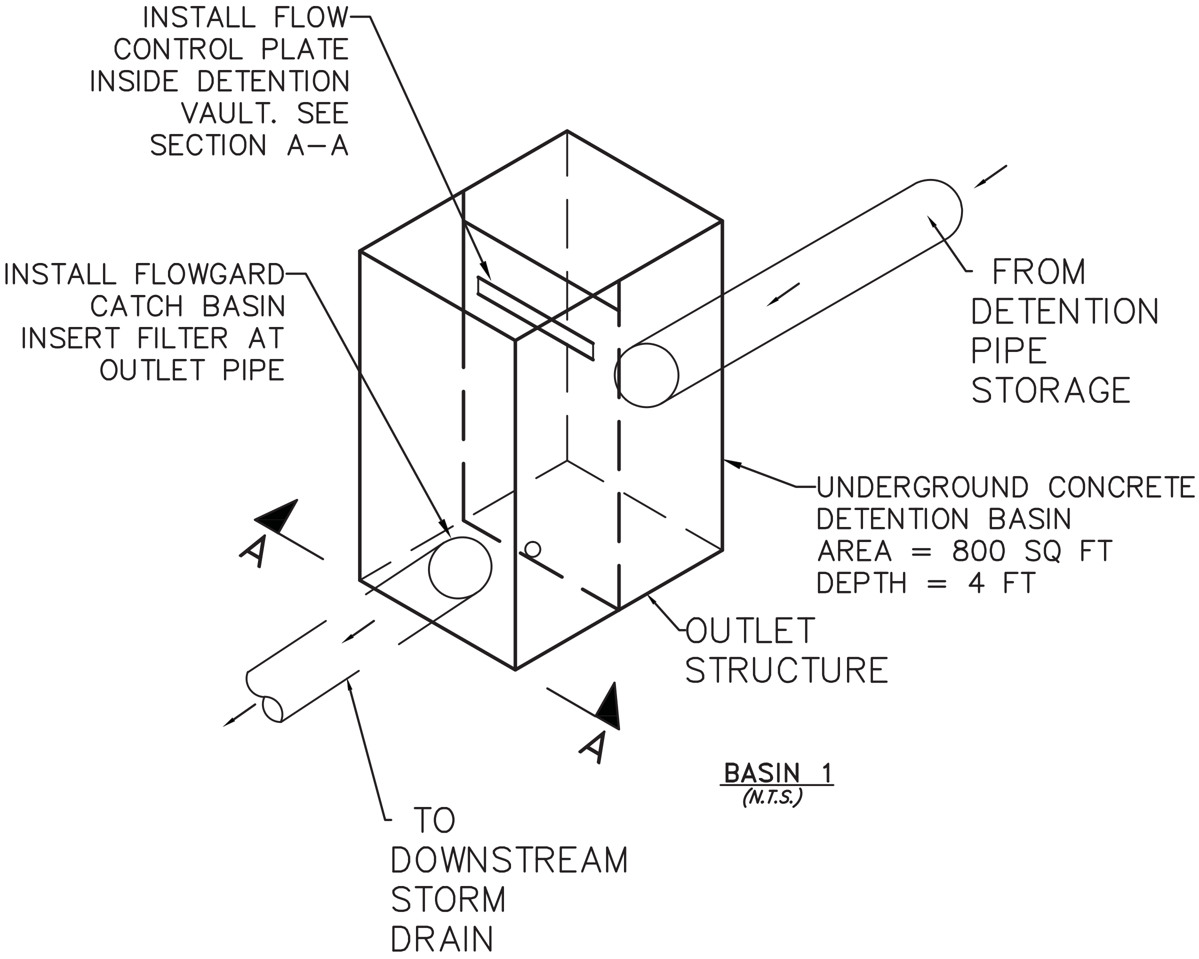
PROPRIETARY AND CONFIDENTIAL:

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MODULAR WETLANDS SYSTEMS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MODULAR WETLANDS SYSTEMS IS PROHIBITED.

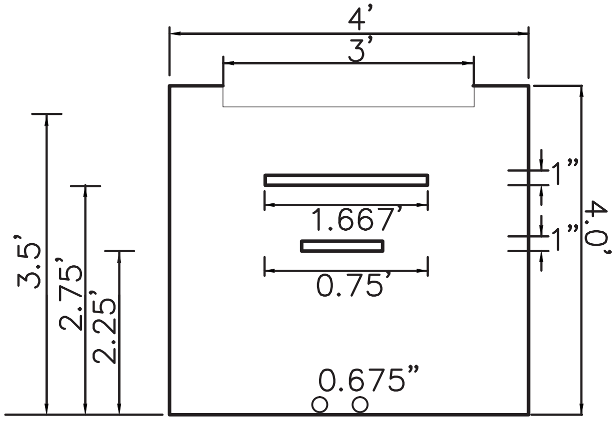
MODULAR WETLANDS
www.ModularWetlands.com | (855) 5MOD-WET

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

MAINTENANCE AGREEMENT EXHIBIT



BASIN 1
(N.T.S.)



SECTION A–A
(N.T.S.)

DETENTION VAULT DETAIL

NTS

SHEET 6 OF 6

CONTECH®
ENGINEERED SOLUTIONS

filterra®
Bioretention Systems
A Growing Idea in Stormwater Filtration

Filterra® Maintenance Steps

1. Inspection of Filterra and surrounding area

2. Removal of tree grate and erosion control stones

3. Removal of debris, trash and mulch

4. Mulch replacement

5. Clean area around Filterra

6. Complete paperwork and record plant height and width

Contech has created a network of Certified Maintenance Providers (CCMP's) to provide maintenance on Filterra systems. To find a CCMP in your area please visit www.conteches.com/maintenance

Operation & Maintenance (OM) Manual v01

filterra®

Bioretention Systems

CONTECH®
ENGINEERED SOLUTIONS

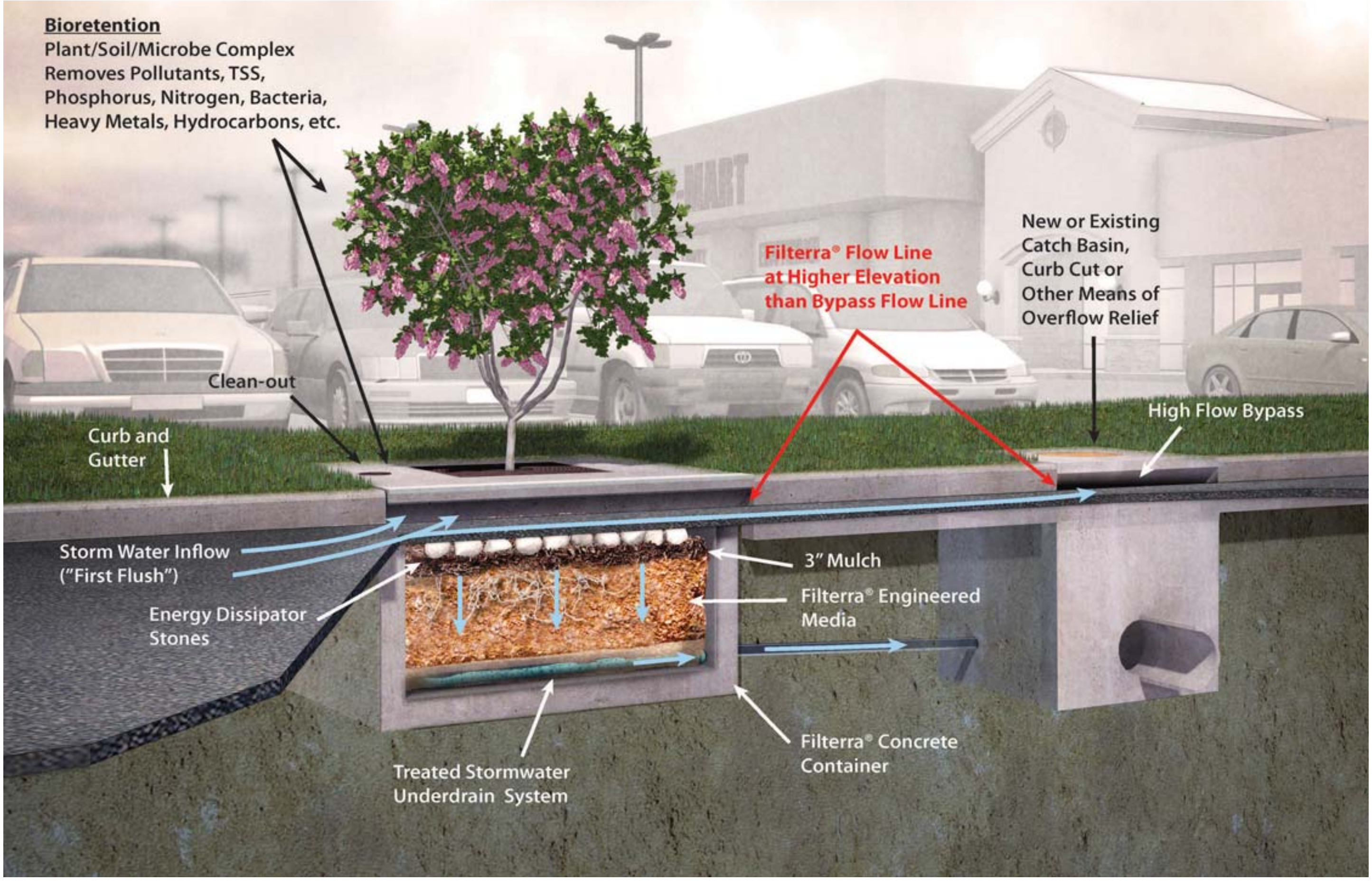
filterra®
Bioretention Systems

Table of Contents

CONTECH®
ENGINEERED SOLUTIONS

General Description

The following general specifications describe the general operations and maintenance requirements for the Contech Engineered Solutions LLC stormwater bioretention filtration system, the Filterra®. The system utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system is a fully equipped, pre-constructed drop-in place unit designed for applications in the urban landscape to treat contaminated runoff.



Stormwater flows through a specially designed filter media mixture contained in a landscaped concrete container. The mixture immobilizes pollutants which are then decomposed, volatilized and incorporated into the biomass of the Filterra® system's micro/macro fauna and flora. Stormwater runoff flows through the media and into an underdrain system at the bottom of the container, where the treated water is discharged. Higher flows bypass the Filterra® to a downstream inlet or outfall. Maintenance is a simple, inexpensive and safe operation that does not require confined space access, pumping or vacuum equipment or specialized tools. Properly trained landscape personnel can effectively maintain Filterra® Stormwater systems by following instructions in this manual.

Basic Operations

Filterra® is a bioretention system in a concrete box. Contaminated stormwater runoff enters the filter box through the curb inlet spreading over the 3-inch layer of mulch on the surface of the filter media. As the water passes through the mulch layer, most of the larger sediment particles and heavy metals are removed through sedimentation and chemical reactions with the organic material in the mulch. Water passes through the soil media where the finer particles are removed and other chemical reactions take place to immobilize and capture pollutants in the soil media. The cleansed water passes into an underdrain and flows to a pipe system or other appropriate discharge point. Once the pollutants are in the soil, the bacteria begin to break down and metabolize the materials and the plants begin to uptake and metabolize the pollutants. Some pollutants such as heavy metals, which are chemically bound to organic particles in the mulch, are released over time as the organic matter decomposes to release the metals to the feeder roots of the plants and the cells of the bacteria in the soil where they remain and are recycled. Other pollutants such as phosphorus are chemically bound to the soil particles and released slowly back to the plants and bacteria and used in their metabolic processes. Nitrogen goes through a very complex variety of biochemical processes where it can ultimately end up in the plant/bacteria biomass, turned to nitrogen gas or dissolves back into the water column as nitrates depending on soil temperature, pH and the availability of oxygen. The pollutants ultimately are retained in the mulch, soil and biomass with some passing out of the system into the air or back into the water.

Design and Installation

Each project presents different scopes for the use of Filterra® systems. To ensure the safe and specified function of the stormwater BMP, Contech reviews each application before supply. Information and help may be provided to the design engineer during the planning process. Correct Filterra® box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra units as shown in approved plans. A comprehensive installation manual is available at www.conteches.com.

Maintenance

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement.

- Avoid legal challenges from your jurisdiction's maintenance enforcement program.
- Prolong the expected lifespan of your Filterra media.
- Avoid more costly media replacement.
- Help reduce pollutant loads leaving your property.

Simple maintenance of the Filterra® is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the throat. This may include trash, silt and leaves etc. which will be contained within the void below the top grate and above the mulch layer. Too much silt may inhibit the Filterra's® flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Contech includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated for full operation. Full operation is defined as the unit installed, curb and gutter and transitions in place and activation (by Supplier) when mulch and plant are added and temporary throat protection removed.

Activation cannot be carried out until the site is fully stabilized (full landscaping, grass cover, final paving and street sweeping completed). Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing).

Exclusion of Services

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra® system.

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra® (where the cleaned runoff drains to, such as drop inlet) and block off the throat of the Filterra®. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra® and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra®
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.). Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each unit size. Mulch should be a double shredded, hardwood variety; do not use colored or dyed mulch. Some visits may require additional Filterra® engineered soil media available from the Supplier.

Box Length	Box Width	Filter Surface Area (ft^2)	Volume at 3” (ft^3)	# of 2 ft^3 Mulch Bags
4	4	16	4	2
6	4	24	6	3
8	4	32	8	4
6	6	36	9	5
8	6	48	12	6
10	6	60	15	8
12	6	72	18	9
13	7	91	23	12

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.

1. Inspection of Filterra® and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water yes | no
Damage to Box Structure yes | no
Damage to Grate yes | no
Is Bypass Clear yes | no

If yes answered to any of these observations, record with close-up photograph (numbered).

2. Removal of tree grate and erosion control stones

- Remove cast iron grates for access into Filterra® box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

Record on Maintenance Report the following:

Silt/Clay yes | no
Cups/ Bags yes | no
Leaves yes | no
# of Buckets Removed ________

3. Removal of debris, trash and mulch

- After removal of mulch and debris, measure distance from the top of the Filterra® engineered media soil to the bottom of the top slab. If this distance is greater than 12", add Filterra® media (not top soil or other) to recharge to a 9" distance

Record on Maintenance Report the following:

Distance of Bottom of Top Slab (inches) ________
# of Buckets of Media Added ________

4. Mulch replacement

- Please see mulch specifications.
- Add double shredded mulch evenly across the entire unit to a depth of 3”.
- Ensure correct repositioning of erosion control stones by the Filterra® inlet to allow for entry of trash during a storm event.
- Replace Filterra® grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.

5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant’s health and replace if dead.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate ______________(ft)
Width at Widest Point ______________(ft)
Health alive | dead
Damage to Plant yes | no
Plant Replaced yes | no

6. Clean area around Filterra®

- Clean area around unit and remove all refuse to be disposed of appropriately.

7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Contech during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Filterra.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive.	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks.	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.

Maintenance is ideally to be performed twice annually.

CONTECH®
ENGINEERED SOLUTIONS

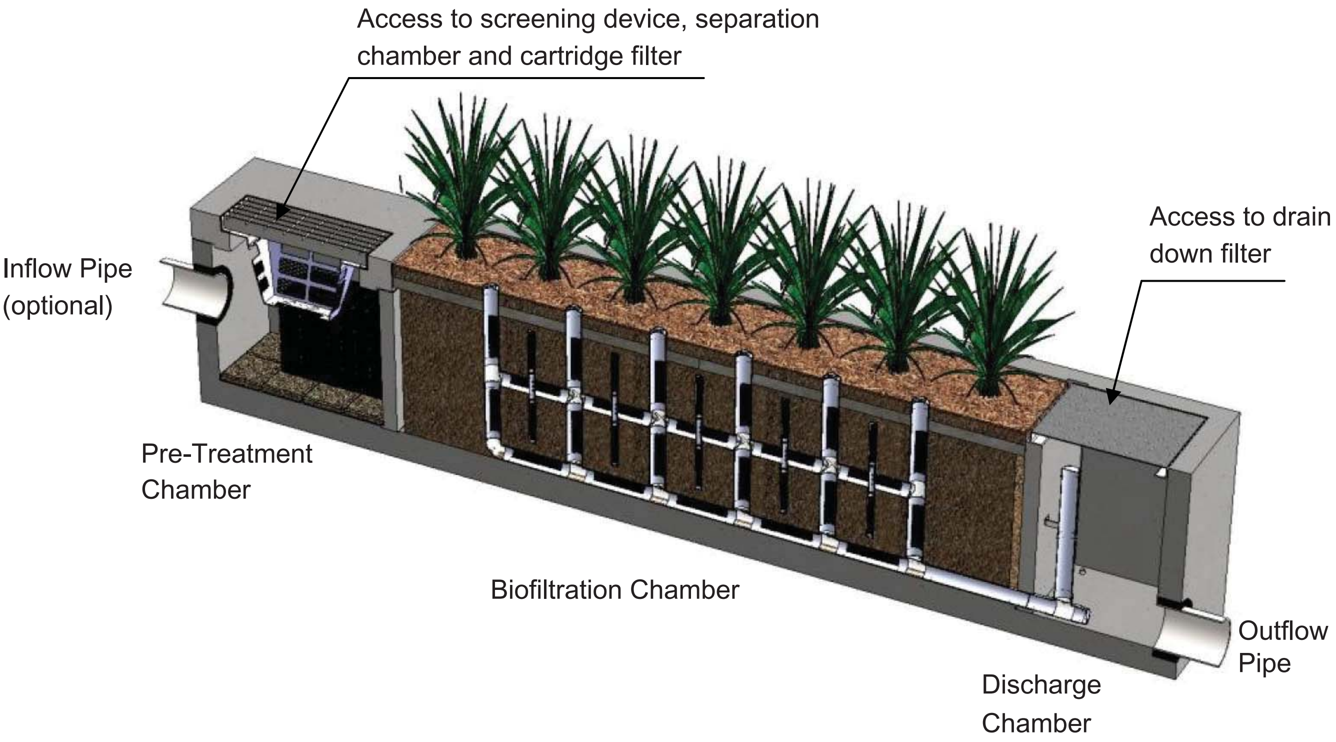
Revised 6/22/2015

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

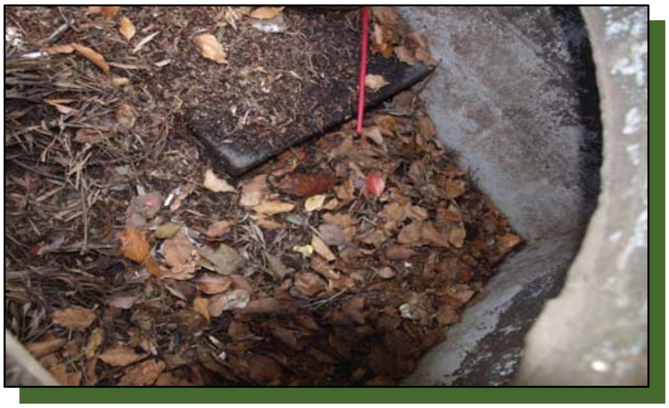
Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

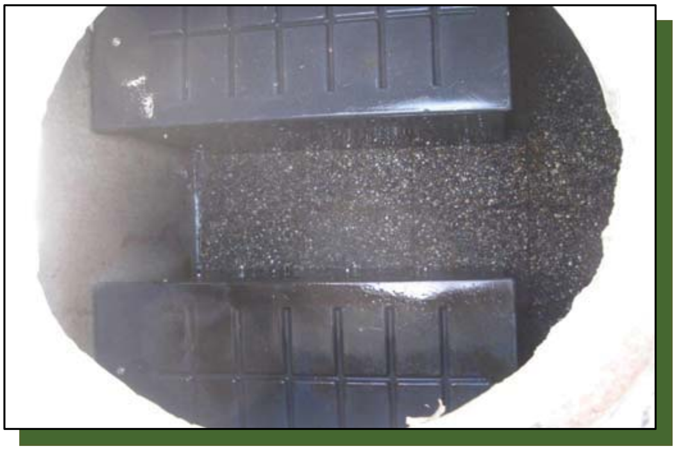
Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.



Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.

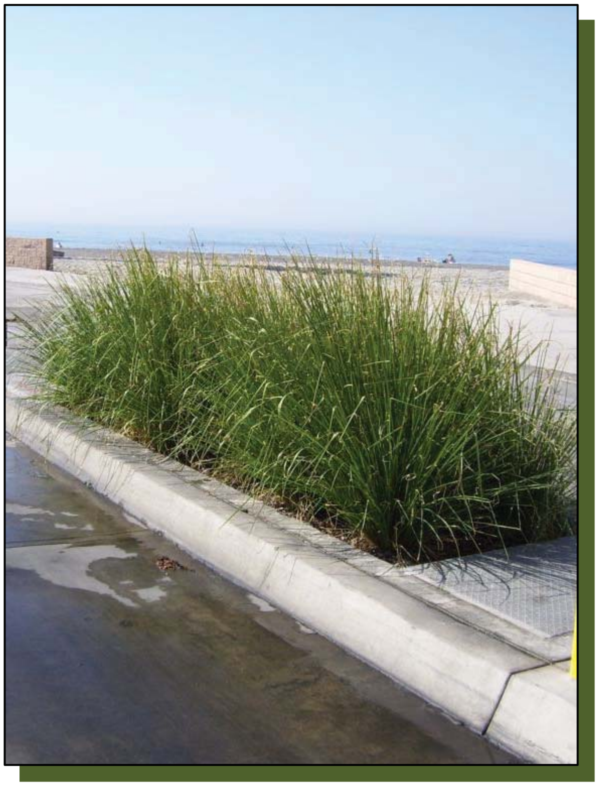


Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.



Inspection Form

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

BIO CLEAN
ENVIRONMENTAL SERVICES, INC.

Inspection Report
Modular Wetlands System

MODULAR WETLANDS

For Office Use Only

(Reviewed By)

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

Project Name ____________________

Project Address ____________________ (city) (Zip Code)

Owner / Management Company ____________________

Contact ____________________ Phone ( ) –

Inspector Name ____________________ Date ____/____/______ Time ________ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition ____________________ Additional Notes ____________________

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): ____________ Size (22', 14' or etc.): ____________

Structural Integrity:	**Yes**	**No**	**Comments**	
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?				
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?				
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?				
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?				
Working Condition:				
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?				
Is there standing water in inappropriate areas after a dry period?				
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?				
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.				Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:	
Any signs of improper functioning in the discharge chamber? Note issues in comments section.				
Other Inspection Items:				
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?				
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.				
Is there a septic or foul odor coming from inside the system?				

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: ____________________

2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176

Maintenance Report

Modular Wetland System, Inc.
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E. Info@modularwetlands.com

www.modularwetlands.com

Cleaning and Maintenance Report
Modular Wetlands System

Project Name ______________________________

Project Address ______________________________
(city) (Zip Code)

Owner / Management Company ______________________________

Contact ______________________ Phone ( ) –

Inspector Name ______________________ Date ____/____/______ Time __________ AM / PM

For Office Use Only

(Reviewed By)

(Date)

Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm

Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition ______________________

Additional Notes ______________________

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

5 Operations and Maintenance Considerations

5.1 Operations and Maintenance Plan

Regular inspections and maintenance can help to ensure that the detention tank system is able to perform as required during a storm event. The owner/Management Corporation Strata Title (MCST)/Managing Agent (MA)/Town Council should understand the importance of regular and proper upkeep of the detention tank system to ensure smooth operations of the system as part of stormwater management. An operations and maintenance plan can be developed to provide guidance on these aspects. The plan should also include the personnel in charge of the tasks as well as the frequency and method of maintenance.

A log recording the dates and description of the inspection and maintenance activities performed as well as the findings from the inspection shall be maintained. Water level or flow logs and pump operation logs may also be kept. A sample of an operations and maintenance checklist for an on-site stormwater detention system can be found in Appendix F. This checklist should serve as a general guide for the operation and maintenance regime.

5.2 Inspections

Inspections should be carried out at least once per month and after significant storm events. The detention tank systems should be inspected for the physical condition of the tank (including structural damage), stagnant water, clogging at trash racks or inlet and outlet structures, sedimentation, condition of ancillary fittings and equipment such as pumps and generators and clear access of pathways and openings. Immediate rectification works should be carried out if the detention system is found not to be in order.

5.3 Maintenance

General maintenance and servicing of mechanical and electrical equipment should be carried out at least once per year, preferably before the year-end monsoon season. Where applicable, maintenance works should include desilting/cleaning the detention tank, cleaning trash screens, servicing/testing the pumps, pump starters and the instrumentation and control systems and servicing the standby generator. A desilting pump may be needed to remove silt and sediments from the detention system.

If the pump house is located away from the control room, it should be outfitted with a pressure gauge so that it can be monitored remotely to ensure that the pumps are working. The owner/MCST/MA/Town Council should refer to the maintenance regime specified by their respective pump manufacturers or suppliers for proper maintenance of their systems.

SD-1
Tree Wells

BMP MAINTENANCE FACT SHEET
FOR
SITE DESIGN BMP SD-1 TREE WELLS

Tree wells as site design BMPs are trees planted in configurations that allow storm water runoff to be directed into the soil immediately surrounding the tree. The tree may be contained within a planter box or structural cells. The surrounding area will be graded to direct runoff to the tree well. There may be features such as tree grates, suspended pavement design, or shallow surface depressions designed to allow runoff into the tree well. Typical tree well components include:

- Trees of the appropriate species for site conditions and constraints
- Available growing space based on tree species, soil type, water availability, surrounding land uses, and project goals
- Entrance/opening that allows storm water runoff to flow into the tree well (e.g., a curb opening, tree grate, or surface depression)
- Optional suspended pavement design to provide structural support for adjacent pavement without requiring compaction of underlying layers
- Optional root barrier devices as needed; a root barrier is a device installed in the ground, between a tree and the sidewalk, intended to guide roots down and away from the sidewalk in order to prevent sidewalk lifting from tree roots
- Optional tree grates; to be considered to maximize available space for pedestrian circulation and to protect tree roots from compaction related to pedestrian circulation; tree grates are typically made up of porous material that will allow the runoff to soak through
- Optional shallow surface depression for ponding of excess runoff
- Optional planter box drain

Normal Expected Maintenance

Tree health shall be maintained as part of normal landscape maintenance. Additionally, ensure that storm water runoff can be conveyed into the tree well as designed. That is, the opening that allows storm water runoff to flow into the tree well (e.g., a curb opening, tree grate, or surface depression) shall not be blocked, filled, re-graded, or otherwise changed in a manner that prevents storm water from draining into the tree well. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

Non-Standard Maintenance or BMP Failure

Tree wells are site design BMPs that normally do not require maintenance actions beyond routine landscape maintenance. The normal expected maintenance described above ensures the BMP functionality. If changes have been made to the tree well entrance / opening such that runoff is prevented from draining into the tree well (e.g., a curb inlet opening is blocked by debris or a grate is clogged causing runoff to flow around instead of into the tree well, or a surface depression has been filled so runoff flows away from the tree well), the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance will be required to restore drainage into the tree well as designed.

Surface ponding of runoff directed into tree wells is expected to infiltrate/evapotranspirate within 24-96 hours following a storm event. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging or compaction of the soils surrounding the tree. Loosen or replace the soils to restore drainage.

Other Special Considerations

Site design BMPs, such as tree wells, installed within a new development or redevelopment project are components of an overall storm water management strategy for the project. The presence of site design BMPs within a project is usually a factor in the determination of the amount of runoff to be managed with structural BMPs (i.e., the amount of runoff expected to reach downstream retention or biofiltration basins that process storm water runoff from the project as a whole). When site design BMPs are not maintained or are removed, this can lead to clogging or failure of downstream structural BMPs due to greater delivery of runoff and pollutants than intended for the structural BMP. Therefore, the [City Engineer] may require confirmation of maintenance of site design BMPs as part of their structural BMP maintenance documentation requirements. Site design BMPs that have been installed as part of the project should not be removed, nor should they be bypassed by re-routing roof drains or re-grading surfaces within the project. If changes are necessary, consult the [City Engineer] to determine requirements.

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR SD-1 TREE WELLS

The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district.

Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.

Threshold/Indicator	Maintenance Action	Typical Maintenance Frequency
Tree health	Routine actions as necessary to maintain tree health.	• Inspect monthly. • Maintenance when needed.
Dead or diseased tree	Remove dead or diseased tree. Replace per original plans.	• Inspect monthly. • Maintenance when needed.
Standing water in tree well for longer than 24 hours following a storm event Surface ponding longer than approximately 24 hours following a storm event may be detrimental to tree health	Loosen or replace soils surrounding the tree to restore drainage.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology	Disperse any standing water from the tree well to nearby landscaping. Loosen or replace soils surrounding the tree to restore drainage (and prevent standing water).	• Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed
Entrance / opening to the tree well is blocked such that storm water will not drain into the tree well (e.g., a curb inlet opening is blocked by debris or a grate is clogged causing runoff to flow around instead of into the tree well; or a surface depression is filled such that runoff drains away from the tree well)	Make repairs as appropriate to restore drainage into the tree well.	• Inspect monthly. • Maintenance when needed.

References

American Mosquito Control Association.
http://www.mosquito.org/
County of San Diego. 2014. Low Impact Development Handbook.
http://www.sandiegocounty.gov/content/sdc/dpw/watersheds/susmp/lid.html
San Diego County Copermittees. 2016. Model BMP Design Manual, Appendix E, Fact Sheet SD-1.
http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=250&Itemid=220

SD-1

Tree Wells

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

Property / Development Name:	Responsible Party Name and Phone Number:
Property Address of BMP:	Responsible Party Address:

INSPECTION AND MAINTENANCE CHECKLIST FOR SD-1 TREE WELLS PAGE 1 of 2

Threshold/Indicator	Maintenance Recommendation	Date	Description of Maintenance Conducted
Dead or diseased tree Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased tree ☐ Replace per original plans ☐ Other / Comments:		
Standing water in tree well for longer than 24 hours following a storm event Surface ponding longer than approximately 24 hours following a storm event may be detrimental to tree health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Loosen or replace soils surrounding the tree to restore drainage ☐ Other / Comments:		

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR SD-1 TREE WELLS PAGE 2 of 2

Threshold/Indicator	Maintenance Recommendation	Date	Description of Maintenance Conducted
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Disperse any standing water from the tree well to nearby landscaping ☐ Loosen or replace soils surrounding the tree to restore drainage (and prevent standing water) ☐ Other / Comments:		
Entrance / opening to the tree well is blocked such that storm water will not drain into the tree well (e.g., a curb inlet opening is blocked by debris or a grate is clogged causing runoff to flow around instead of into the tree well; or a surface depression is filled such that runoff drains away from the tree well) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make repairs as appropriate to restore drainage into the tree well ☐ Other / Comments:		

Attachment 4

Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

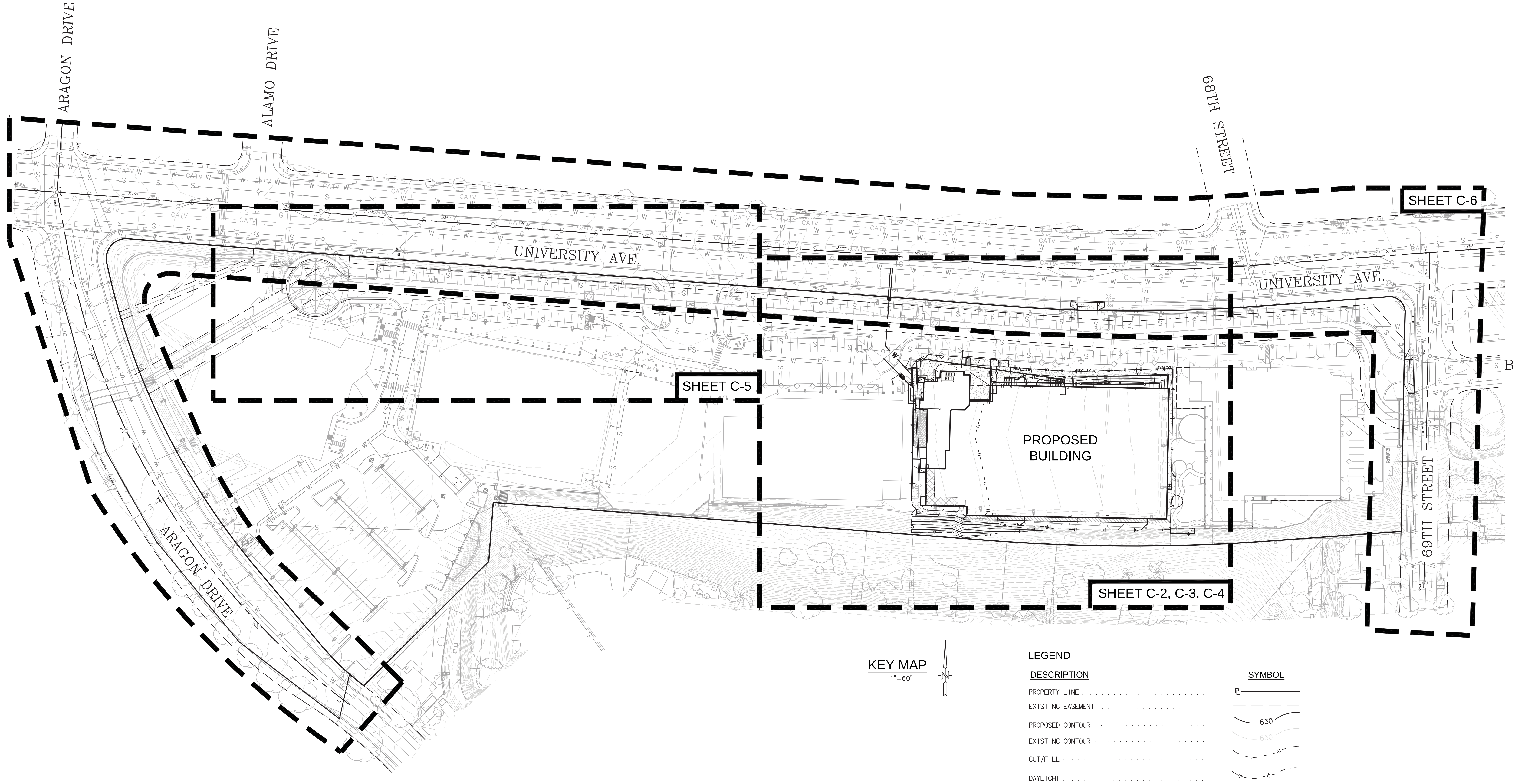
Project Name: The Salvation Army, Ray and Joan Kroc Center

Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

☑ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
☑ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
☑ Details and specifications for construction of structural BMP(s)
☑ Signage indicating the location and boundary of structural BMP(s) as required by the City Engineer
☑ How to access the structural BMP(s) to inspect and perform maintenance
☑ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☑ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☑ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☑ Recommended equipment to perform maintenance
☑ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
☑ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
☑ All BMPs must be fully dimensioned on the plans
☑ When proprietary BMPs are used, site specific cross section with outflow, inflow and model number shall be provided. Broucher photocopies are not allowed.

GRADING AND IMPROVEMENT PLAN



KEY MAP
1"=60'

LEGEND

DESCRIPTION	SYMBOL
PROPERTY LINE	ℙ───
EXISTING EASEMENT	— — —
PROPOSED CONTOUR	630
EXISTING CONTOUR	630
CUT/FILL	
DAYLIGHT	
EXISTING SEWER	— S —
DIRECTION OF FLOW	←
EXISTING SPOT ELEVATION	(386.13) FS
PROPOSED SPOT ELEVATION	386.13 FS
PROPOSED CONCRETE SIDEWALK	
PROPOSED DECOMPOSED GRANITE (PVT)	
PROPOSED PERMEABLE CONCRETE	▨
RAISED PLANTER BOX (FILTERRA UNIT)	▭
DRAINAGE VAULT	▩
MODULAR WETLAND	▣
PROPOSED DRIVEWAY (SDG-133)	
EX. 20' CANOPY TREE WELL	

DIGALERT
DIAL TOLL FREE
1-800-422-4133
AT LEAST TWO DAYS
BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

JONATHAN RAAB RYDEEN
RCE ~ 64811
EXP 6/30/19

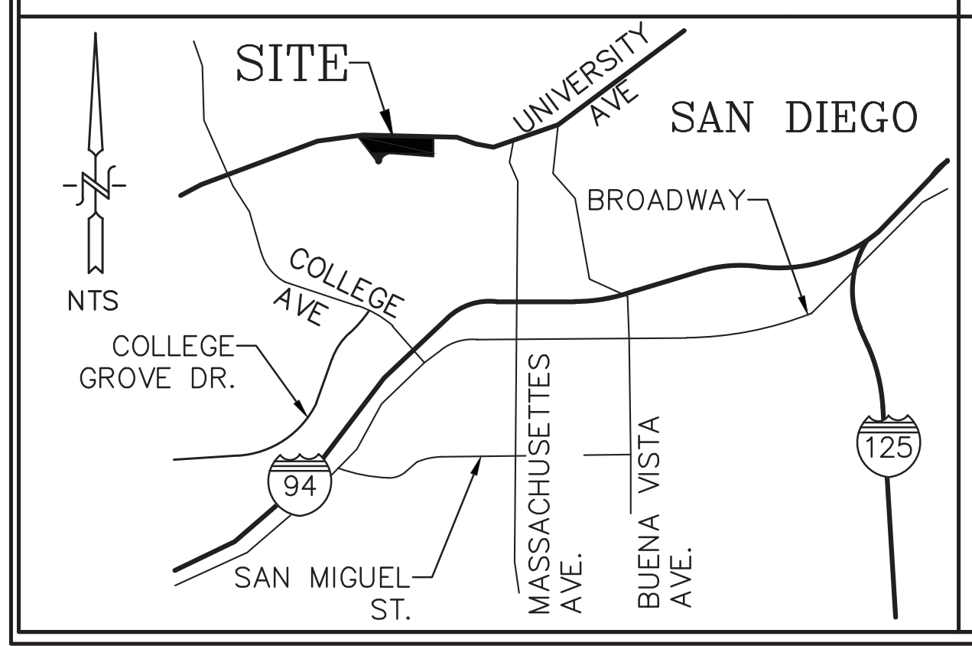
GENERAL NOTES:

1. PRIOR TO ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL ENTER INTO A MAINTENANCE AGREEMENT FOR THE ONGOING PERMANENT BMP MAINTENANCE, SATISFACTORY TO THE CITY ENGINEER
2. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL INCORPORATE ANY CONSTRUCTION BEST MANAGEMENT PRACTICES NECESSARY TO COPMPLY WITH CHAPTER 14, ARTICLE 2, DIVISION 1 (GRADING REGULATIONS) OF THE SAN DIEGO MUNICIPAL CODE, INTO THE CONSTRUCTION PLANS OR SPECIFICATIONS.

SHEET INDEX:

SHEET C-1_________ TITLE SHEET
SHEET C-2_________ SITE PLAN
SHEET C-3_________ PRELIMINARY GRADING PLAN
SHEET C-4_________ UTILITY PLAN
SHEET C-5_________ UTILITY PLAN
SHEET C-6_________ PUBLIC IMPROVEMENT PLAN
SHEET C-7_________ EXISTING PVT DRIVEWAYS TO REMAIN
SHEET C-8_________ EXISTING PVT DRIVEWAYS AND CURB RAMP TO BE REMOVED AND REPLACED
SHEET C-9 TO C-10__ POST-CONSTRUCTION BMP PLAN

VICINITY MAP



OWNER INFORMATION

NAME:	THE SALVATION ARMY
ADDRESS:	6845 UNIVERSITY AVENUE
CITY:	SAN DIEGO
STATE:	CALIFORNIA
ZIP:	92115
PHONE:	(619) 269-1410
FAX:	(619) 287-2236
CONTACT:	KEVIN FORREY

CONTACT INFORMATION

NAME:	THE SALVATION ARMY
ADDRESS:	6845 UNIVERSITY AVENUE
CITY:	SAN DIEGO
STATE:	CALIFORNIA
ZIP:	92115
PHONE:	(619) 269-1410
FAX:	(619) 287-2236
CONTACT:	KEVIN FORREY

PARCEL INFORMATION

APN: 474-130-16
SITE ADDRESS: 6845 UNIVERSITY AVE.
SAN DIEGO, CALIFORNIA

I CERTIFY THAT I HAVE READ ALL ZONING REGULATIONS AND BEST MANAGEMENT PRACTICES (BMPs) NOTES AND THAT I AM THE DESIGNER OF THE PROPOSED PROJECT:

JONATHAN R. RYDEEN
DATE

PROJECT INFORMATION

EXISTING:
RECREATIONAL PARK

PROPOSED:

DISTRUBED AREA:	1.35 GROSS ACRES
PROPOSED BUILDING AREA:	48,995 SF GROUND FLOOR
PROPOSED LANDSCAPE AREA:	4,370 SF
PROPOSED PAVING AREA:	34,931 SF

TYPE OF DEVELOPMENT: COMMERCIAL

EARTHWORK

EXCAVATION:	3,900 C.Y.
FILL:	300 C.Y.
EXPORT:	3,600 C.Y.

LEGAL DESCRIPTION:

PARCEL 1 OF PARCEL MAP NO. 13069, IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, FILED IN THE OFFICE OF THE RECORDER OF SAN DIEGO COUNTY, DECEMBER 23, 1983

REC Consultants, Inc.
Civil Engineering·Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

KENNETH D. SMITH
ARCHITECT
& ASSOCIATES, INC.
500 FESLER ST. SUITE 102
EL CAJON - CA - 92020
PH / 619 444 2182
Fax / 619 442 2699

DATE: 08-23-2017
JOB NO: 15024
DRAWN BY: RJD
CHECKED BY: Checker

Revision Schedule

#	Date	Description

ORIGINAL PREPERATION DATE:
7/8/17

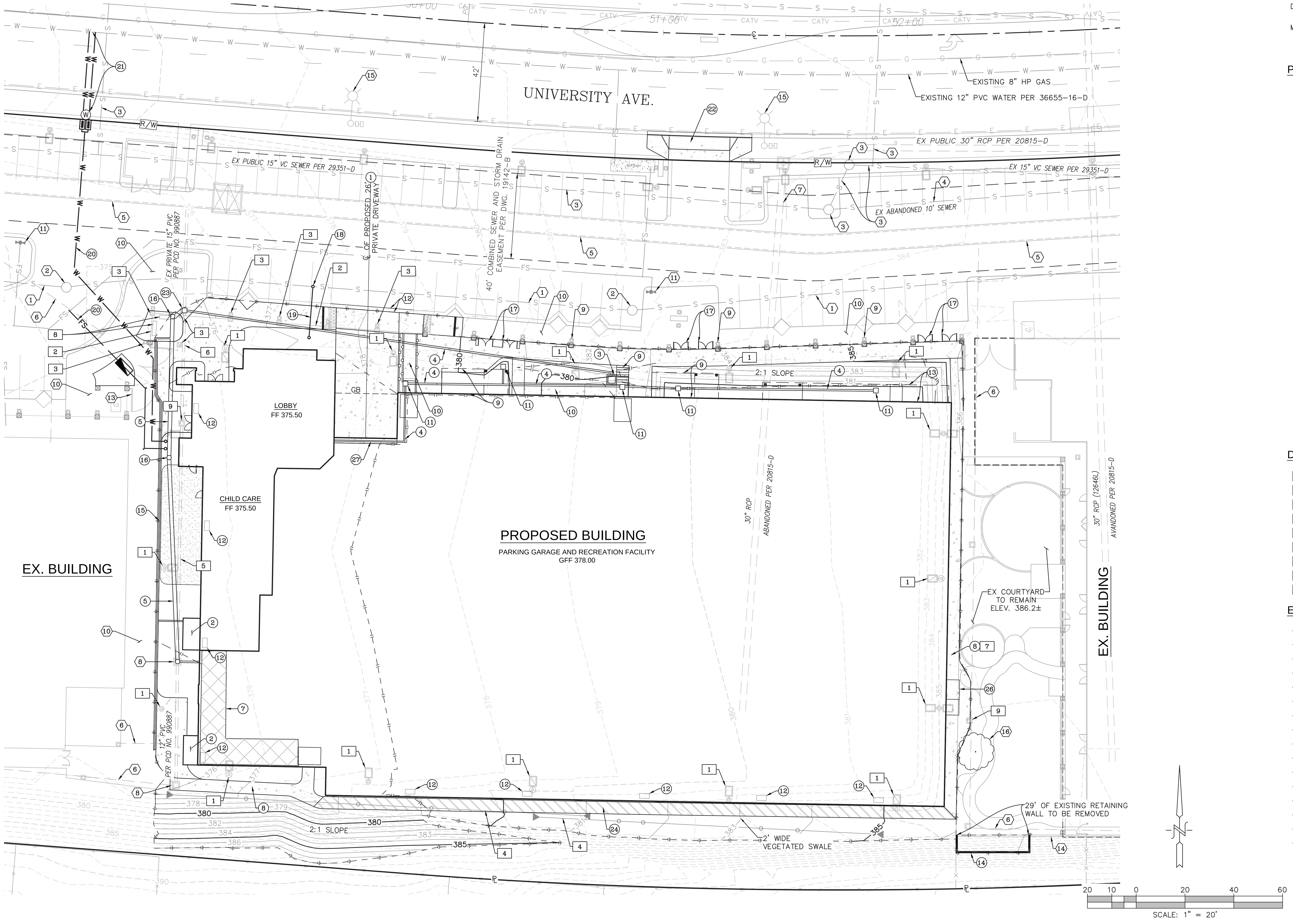
REVISION DATE(S):

project: Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

C-1
SHEET: of

SAVE DATE: 8/30/2018 ~ PLOT DATE: 8/30/2018 ~ FILE NAME: P:\Acad\1290 Kroc Center\Civil\Grading Plan\Kroc Center – Grading Plan.dwg

SITE PLAN



LEGEND

PROPOSED CONCRETE SIDEWALK	▨
PROPOSED DECOMPOSED GRANITE (PVT)	▨
PROPOSED PERMEABLE CONCRETE	▨
RAISED PLANTER BOX (FILTERRA UNIT)	▭
DRAINAGE VAULT	▩
MODULAR WETLAND	▣

PROPOSED CONSTRUCTION NOTES:

① PROPOSED 26' PRIVATE DRIVEWAY
② PROPOSED PRIVATE FILTERRA PLANTER BOX SEE GRADING AND STORM DRAIN SHEET C-3 AND DETAILS ON SHEET C-9 & C-10
③ PROPOSED PRIVATE 4'x4' MODULAR WETLAND UNIT SEE GRADING AND STORM DRAIN SHEET C-3 AND DETAILS ON SHEET C-9 & C-10
④ PROPOSED PRIVATE 8" PVC SD PIPE
⑤ PROPOSED PRIVATE 15" PVC SD PIPE
⑥ NOT USED
⑦ PROPOSED PRIVATE 800 SQ FT SUBTERRANEAN DRAINAGE VAULT SEE GRADING AND STORM DRAIN SHEET C-3
⑧ PROPOSED PRIVATE PCC 5' SIDEWALK.
⑨ PROPOSED STAIRWAY SEE ARCHITECTURAL PLANS FOR DETAILS
⑩ PROPOSED ADA ACCESSIBLE RAMP PER ARCHITECTURAL PLANS
⑪ PROPOSED PRIVATE AREA DRAIN
⑫ PROPOSED BUILDING DOWNSPOUTS
⑬ PROPOSED PEDESTRIAN RAMP TO 2ND FLOOR PER ARCHITECTURAL PLANS
⑭ PROPOSED RETAINING WALL PER SEPARATE PERMIT
⑮ 2 ~ PROPOSED 170' (LENGTH) SIDE-BY-SIDE SLOTTED DRAIN INLET.
⑯ PROPOSED STORM DRAIN CLEANOUT
⑰ PROPOSED GATE SEE ARCHITECTURAL PLAN FOR DETAIL
⑱ PROPOSED PRIVATE SEWER CLEANOUT
⑲ PROPOSED PRIVATE SEWER SERVICE. SEE UTLITY PLAN SHEET C-4 AND C-5
⑳ PROPOSED PRIVATE WATER SERVICE. SEE UTLITY PLAN SHEET C-4 AND C-5
㉑ PROPOSED WATER CONNECTION, METER AND BACKFLOW PREVENTOR. SEE UTLITY PLAN SHEET C-4
㉒ REMOVED AND REPLACE EXISTING DRIVEWAY TO CURRENT STANDARD SDG-159. SEE IMPROVEMENT SHEET C-8 DRIVEWAY #4
㉓ PROPOSED 24"x24" BROOKS BOX WITH TRAFFIC RATED LID
㉔ PROPOSED PERMEABLE CONCRETE
㉕ PROPOSED PRIVATE FIRE SERVICE. SEE UTLITY PLAN SHEET C-4 AND C-5
㉖ PROPOSED STAIRCASE PER ARCHITECTURAL PLANS
㉗ PROPOSED 26' (LENGTH) SLOTTED DRAIN INLET

DEMOLITION NOTES:

1 EX. PRIVATE FIELD LIGHT TO BE REMOVED
2 PORTION OF EX. FENCE TO BE REMOVED
3 PORTION COLUMN TO BE REMOVED
4 EX. FENCE TO BE RELOCATED
5 95' OF EX 15" PVC PER PCD NO. 990887 TO BE REMOVED
6 44' OF EX 15" PVC PER PCD NO. 990887 TO BE REMOVED
7 EX SIDEWALK TO BE REMOVED
8 EX STRUCTURE TO BE REMOVED
9 EX BROOKS BOX INLET TO BE REMOVED

EXISITNG CONDITIONS NOTES:

1 EX PRIVATE 8" PVC SEWER PER AS-BUILT 99-0887
2 EX PRIVATE SEWER MANHOLE PER AS-BUILT 99-0887
3 EX PUBLIC 15" SEWER & MANHOLE PER CITY DRAWING 29351-D
4 EX ABANDONED SEWER
5 EX PUBLIC 11'x7' RCB PER CITY DRAWING 30265-D TO REMAIN
6 EX PRIVATE STORM DRAIN SYSTEM PER AS-BUILT 99-0887
7 EX 30" RCP PER CITY DRAWING 30553-D
8 EX BROOKS 24"x24" PRECAST CATCH BASIN TO REMAIN ADJUST TO GRADE AND REPLACE GRATED INLET WITH LID
9 EX FENCE AND PLASTER COLUMNS TO REMAIN (TYP)
10 EX SIDEWALK TO REMAIN
11 EX FIRE HYDRANT TO REMAIN PER AS-BUILT 99-0887
12 EX PRIVATE 1.5' DRIVEWAY CROSS GUTTER TO REMAIN AND PROTECTED
13 EX PRIVATE GATE TO REMAIN
14 PORTION OF EX RETAINING WALL TO REMAIN
15 EX STREET LIGHT TO REMAIN
16 EX 20' CANOPY TREE TO REMAIN AND UTILIZED AS TREE WELL

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UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

JONATHAN RAAB RYDEEN
RCE ~ 64811
EXP 6/30/19

PARCEL INFORMATION

APN: 474-130-16
SITE ADDRESS: 6845 UNIVERSITY AVE.
SAN DIEGO, CALIFORNIA

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PROPOSED BUILDING AREA:	48,995 SF GROUND FLOOR
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PROPOSED PAVING AREA:	34,931 SF

TYPE OF DEVELOPMENT: COMMERCIAL

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EL CAJON - CA - 92020
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DATE: 08-23-2017
JOB NO: 15024
DRAWN BY: RJD
CHECKED BY: Checker

Revision Schedule

#	Date	Description

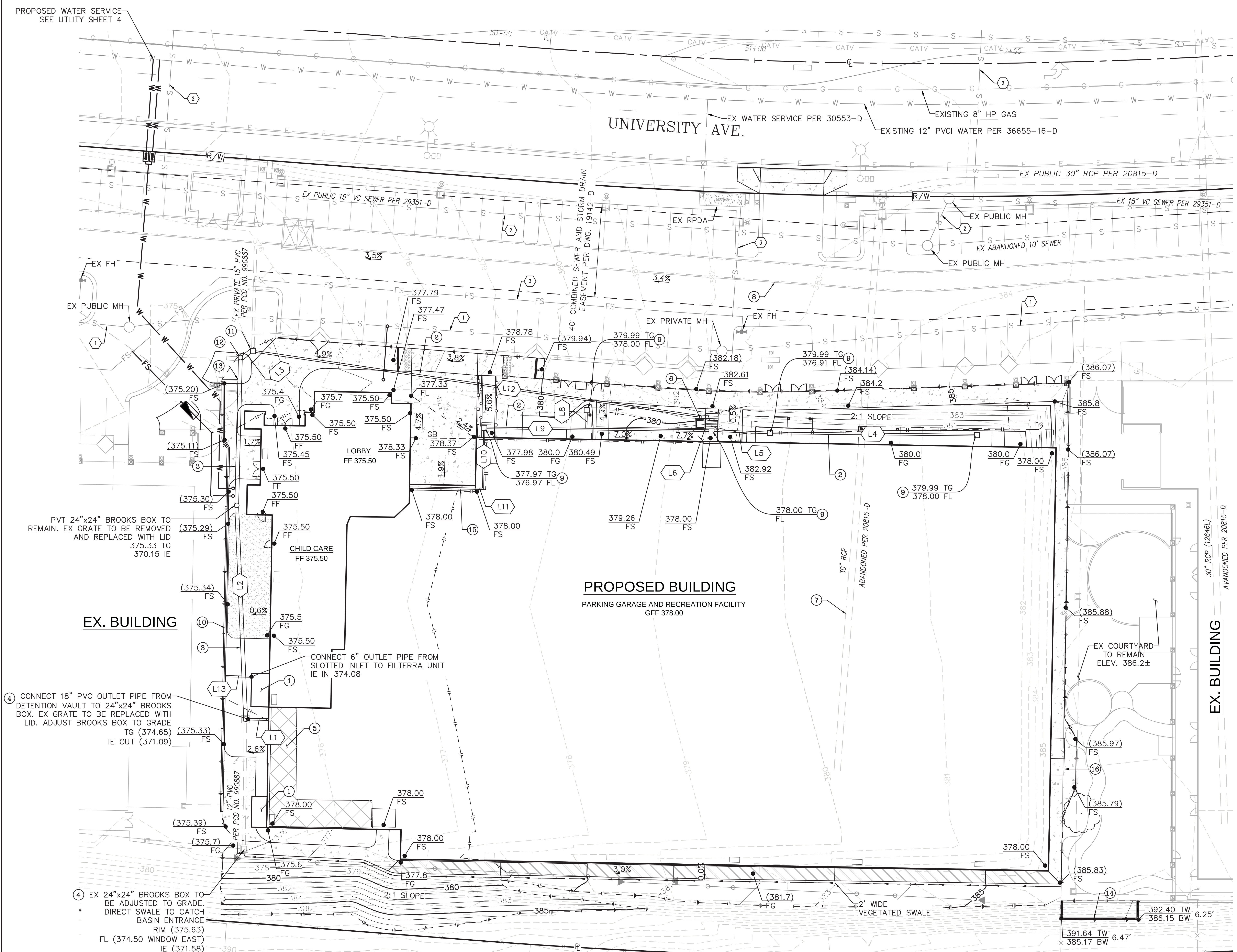
ORIGINAL PREPERATION DATE:
7/8/17

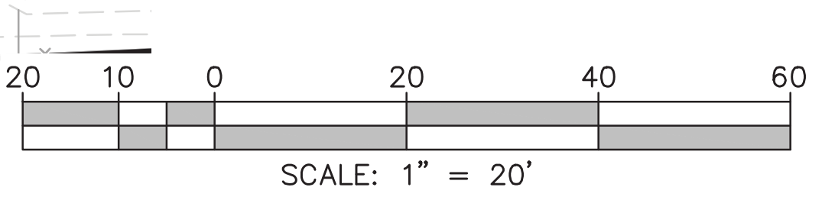
REVISION DATE(S):

project: Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

C-2
SHEET: of

GRADING AND STORM DRAIN PLAN





GRADING AND STORM DRAIN NOTES:

① PROPOSED PRIVATE FILTERRA PLANTER BOX. SEE POST-CONSTRUCTION BMP SHEET C-9 TO C-10 FOR DETAILS
TOP OF BOX (IE IN) 375.50
ELEV OUT 371.75

② PROPOSED PRIVATE 8" PVC SD PIPE

③ PROPOSED PRIVATE 16" PVC SD PIPE

④ EX. STORM DRAIN INLETS TO REMAIN AND ADJUSTED TO GRADE

⑤ PROPOSED PRIVATE 800 SQ FT SUBTERRANEAN DRAINAGE VAULT SEE POST-CONSTRUCTION BMP SHEET C-9 TO C-10 FOR DETAILS
ELEV AT TOP OF BOX 374.0
IE IN 371.25
IE OUT 371.14

⑥ PROPOSED PRIVATE 4'x4' MODULAR WETLAND UNIT. SEE POST-CONSTRUCTION BMP SHEET C-9 TO C-10 FOR DETAILS
IE IN 376.55
IE OUT 373.72

⑦ ABANDONED 30" ACP STORM DRAIN TO BE FIELD VERIFIED AND REMOVED UNDER BUILDING IF CONFLICTS WITH OTHER UTILITIES ARE FOUND.

⑧ EX PUBLIC 11'x7' CONCRETE CULVERT TO REMAIN

⑨ PROPOSED PRIVATE AREA DRAIN

⑩ 2 ~ PROPOSED 170' (LENGTH) SIDE-BY-SIDE SLOTTED DRAIN INLET. WESTERLY DRAIN INLET TO DRAIN TO THE NORTH. EASTERLY DRAIN INLET TO DRAIN TO FILTERRA UNIT

⑪ PROPOSED PVT 24"x24" BROOKS BOX
TG 375.93
IE 369.68

⑫ PROPOSED PVT 24"x24" BROOKS BOX
TG 375.85
IE 369.71

⑬ CONNECT WESTERLY SLOTTED DRAIN TO STORM DRAIN

⑭ PROPOSED RETAINING WALL PER SEPARATE PERMIT. SEE LANDSCAPE PLAN FOR SCREENING DETAILS

⑮ PROPOSED 26' (LENGTH) SLOTTED DRAIN INLET

⑯ PROPOSED STAIRCASE PER ARCHITECTURAL PLANS

STORM DRAIN DATA TABLE

#	BEARING/DELTA	RADIUS	LENGTH	NOTES
L1	N 88°58'23" W		8.04'	8" PVC
L2	N 02°24'03" W		81.21'	16" PVC
L3	N 49°52'55" E		3.83'	16" PVC
L4	S 89°23'01" E		79.02'	8" PVC
L5	S 87°33'25" E		20.85'	8" PVC
L6	S 89°18'34" E		3.45'	8" PVC
L8	S 01°06'20" W		6.42'	8" PVC
L9	S 89°18'19" E		83.44'	8" PVC
L10	N 01°10'25" E		22.83'	8" PVC
L11	S 88°58'27" E		3.00'	8" PVC
L12	S 81°42'42" E		175.90'	8" PVC
L13	N 88°58'18" W		10.17'	8" PVC

6" PVC

EXISTING SEWER AND WATER NOTES:

⟨1⟩ EX PRIVATE 8" SEWER & MANHOLE PER AS-BUILT 99-0887

⟨2⟩ EX PUBLIC 15" SEWER & MANHOLE PER CITY DRAWING 29351-D

⟨3⟩ EX PRIVATE 8" FIRE SERVICE SERVICE PER AS-BUILT 99-0887

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JONATHAN RAAB RYDEN
RCE ~ 64811
EXP 6/30/19

PROJECT INFORMATION

EXISTING:
RECREATIONAL PARK

PROPOSED:

DISTRUBED AREA:	1.35 GROSS ACRES
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EARTHWORK

EXCAVATION:	3,910 C.Y.
FILL:	310 C.Y.
EXPORT:	3,600 C.Y.

LEGAL DESCRIPTION:

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ARCHITECT
& ASSOCIATES, INC.
500 FESLER ST. SUITE 102
EL CAJON - CA - 92020
PH / 619 444 2182
Fax / 619 442 2699

DATE: 08-23-2017
JOB NO: 15024
DRAWN BY: RJD
CHECKED BY: Checker

Revision Schedule

#	Date	Description

ORIGINAL PREPERATION DATE:
7/8/17

REVISION DATE(S):

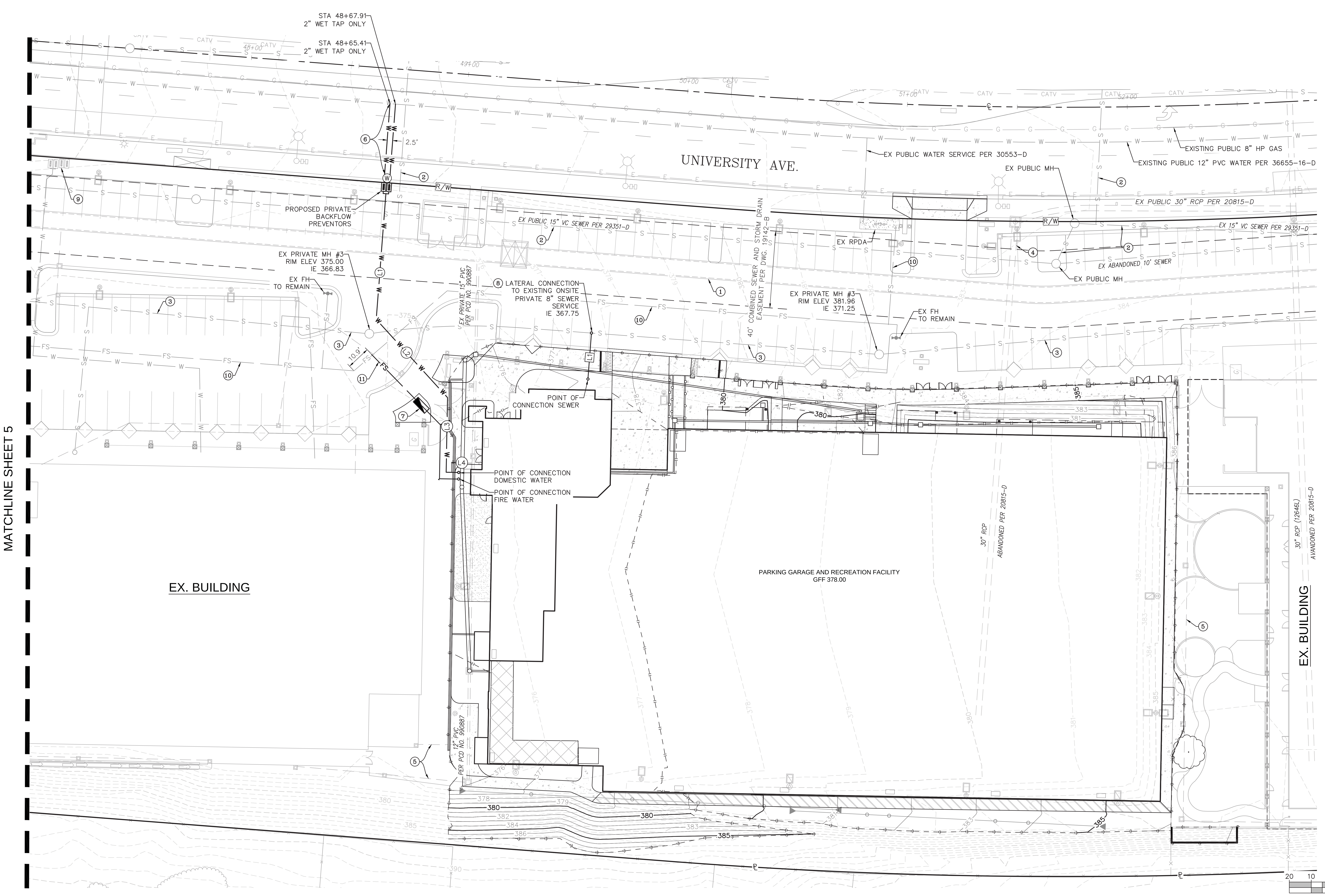
project:
Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

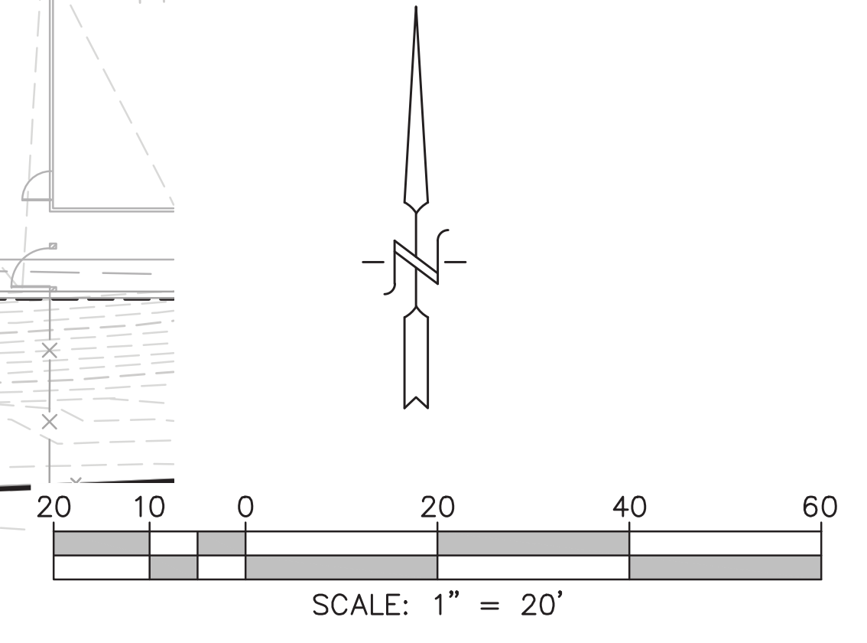
C-3

SHEET: of

SAVE DATE: 8/30/2018 ~ PLOT DATE: 8/30/2018 ~ FILE NAME: P:\Acad\1290 Kroc Center\Civil\Grading Plan\Kroc Center - Grading Plan.dwg

UTILITY PLAN





SCALE: 1" = 20'

#	BEARING/DELTA	RADIUS	LENGTH	NOTES
	FIRE WATER DATA TABLE (PRIVATE)			
L1	S 44°20'23" E		28.74'	6" PVC
L2	S 44°20'23" E		8.82'	6" PVC
L3	S 01°01'33" W		24.52'	6" PVC
L4	S 88°58'27" E		8.70'	6" PVC

SEWER DATA TABLE (PRIVATE)

#	BEARING/DELTA	RADIUS	LENGTH	NOTES
L1	S 04°22'27" W		21.00'	6" PVC

WATER DATA TABLE (PRIVATE)

#	BEARING/DELTA	RADIUS	LENGTH	NOTES
L1	S 04°22'27" W		58.36'	3" PVC
L2	S 42°18'05" E		48.14'	3" PVC
L3	S 01°01'33" W		33.95'	3" PVC
L4	S 88°58'27" E		5.70'	3" PVC

NOTES:

① EX PUBLIC 11'x17' RCB PER CITY DRAWING 30265-D
② EX PUBLIC 15" SEWER & MANHOLE PER CITY DRAWING 29351-D
③ EX PRIVATE 8" SEWER & MANHOLE PER AS-BUILT 99-0887
④ EX PUBLIC STORM DRAIN SYSTEM PER CITY DRAWING 30265-D
⑤ EX PRIVATE STORM DRAIN SYSTEM PER AS-BUILT 99-0887
⑥ PROPOSED 2~2" WATER SERVICE WITH 2~2" MANIFOLD WATER METERS AND BACKFLOW PREVENTORS PER SDW-114
⑦ PROPOSED PRIVATE FDC/PIV
⑧ PROPOSED PRIVATE SEWER CLEANOUT
⑨ EX IRRIGATION SERVICE PER AS-BUILT 99-0887
⑩ EX PRIVATE 8" FIRE SERVICE SERVICE PER AS-BUILT 99-0887
⑪ PROPOSED PRIVATE 8" FIRE SERVICE SERVICE

WATER & SEWER DEMAND NOTES:

TOTAL WATER DEMAND: 948.5 GPM
TOTAL SEWER FLOW GENERATION: 948.5 GPM

WATER METER DATA CARD (FIXTURE COUNT) = 98.5 GPM
FIRE SPRINKLERS FOR PARKING AREA = 500 GPM
FIRE SPRINKLERS FOR FITNESS BUILDING = 350 GPM

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JONATHAN RAAB RYDEEN
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EXP 6/30/19

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DATE: 08-23-2017
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Revision Schedule

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ORIGINAL PREPERATION DATE:
7/8/17

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project: Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

C-4
SHEET: of

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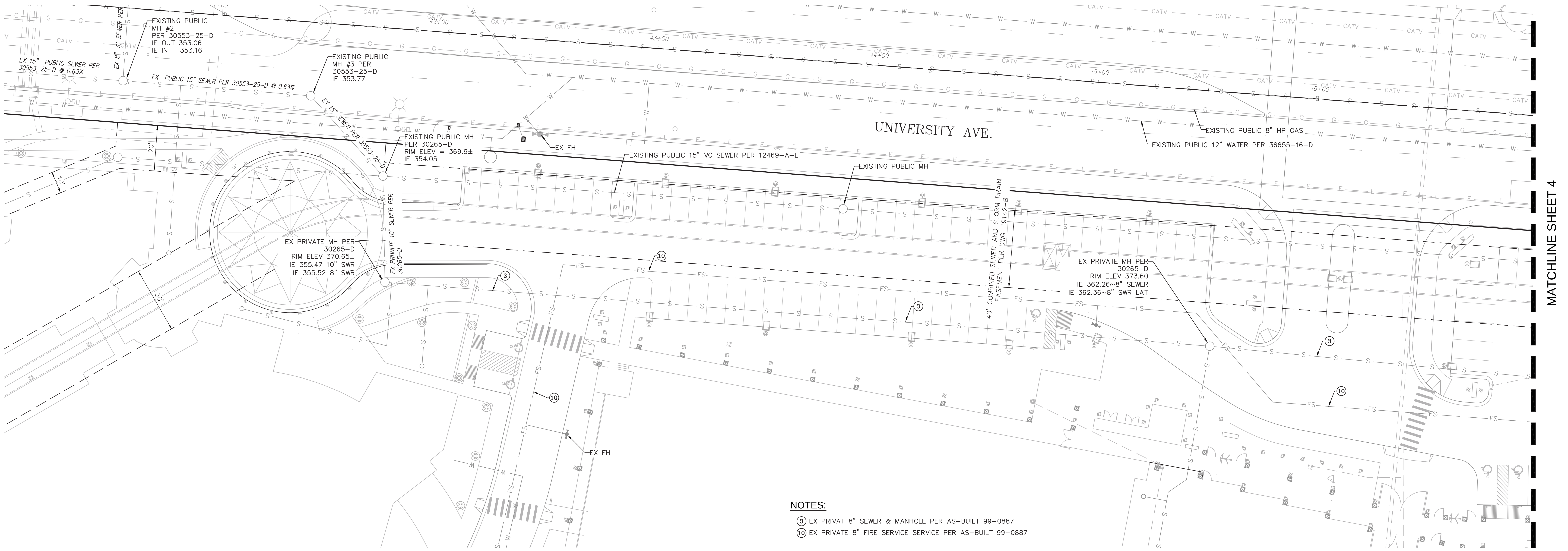
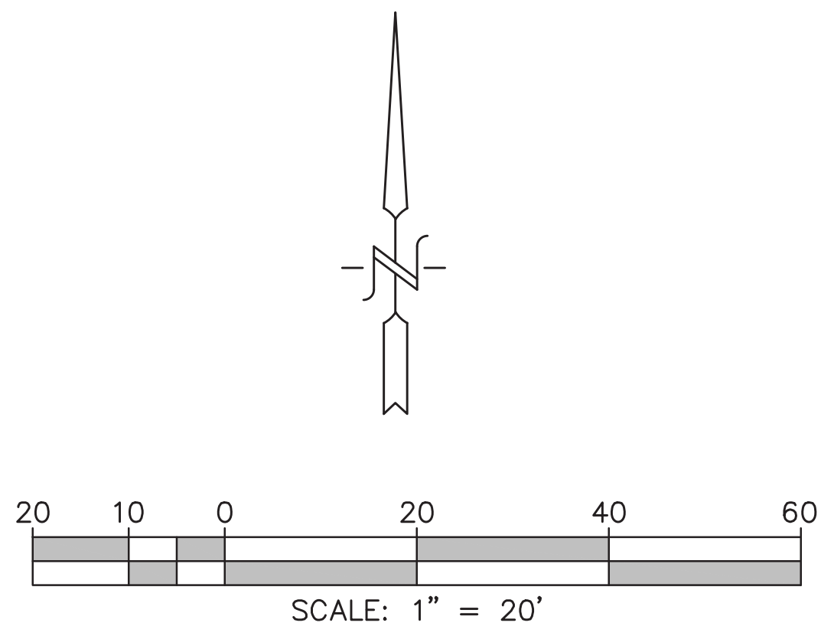
UTILITY PLAN



NOTES:

③ EX PRIVAT 8" SEWER & MANHOLE PER AS-BUILT 99-0887
⑩ EX PRIVATE 8" FIRE SERVICE SERVICE PER AS-BUILT 99-0887



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ORIGINAL PREPERATION DATE:
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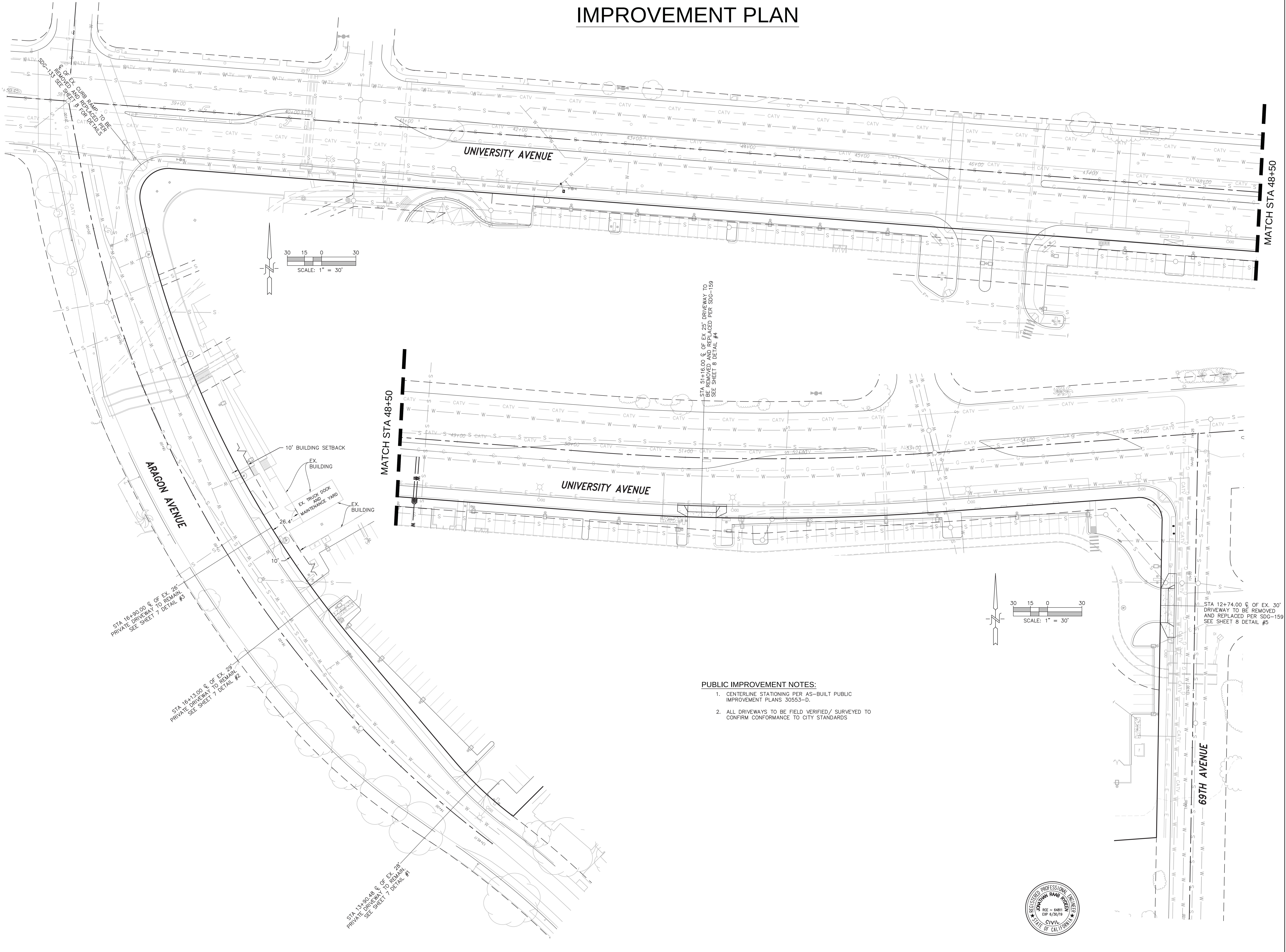
project: Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

C-5
SHEET: of

IMPROVEMENT PLAN



PUBLIC IMPROVEMENT NOTES:

1. CENTERLINE STATIONING PER AS-BUILT PUBLIC IMPROVEMENT PLANS 30553-D.
2. ALL DRIVEWAYS TO BE FIELD VERIFIED/ SURVEYED TO CONFIRM CONFORMANCE TO CITY STANDARDS

JONATHAN RAAB RYDEEN
RCE ~ 64811
EXP 6/30/19
CIVIL

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project: Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

C-6
SHEET: of

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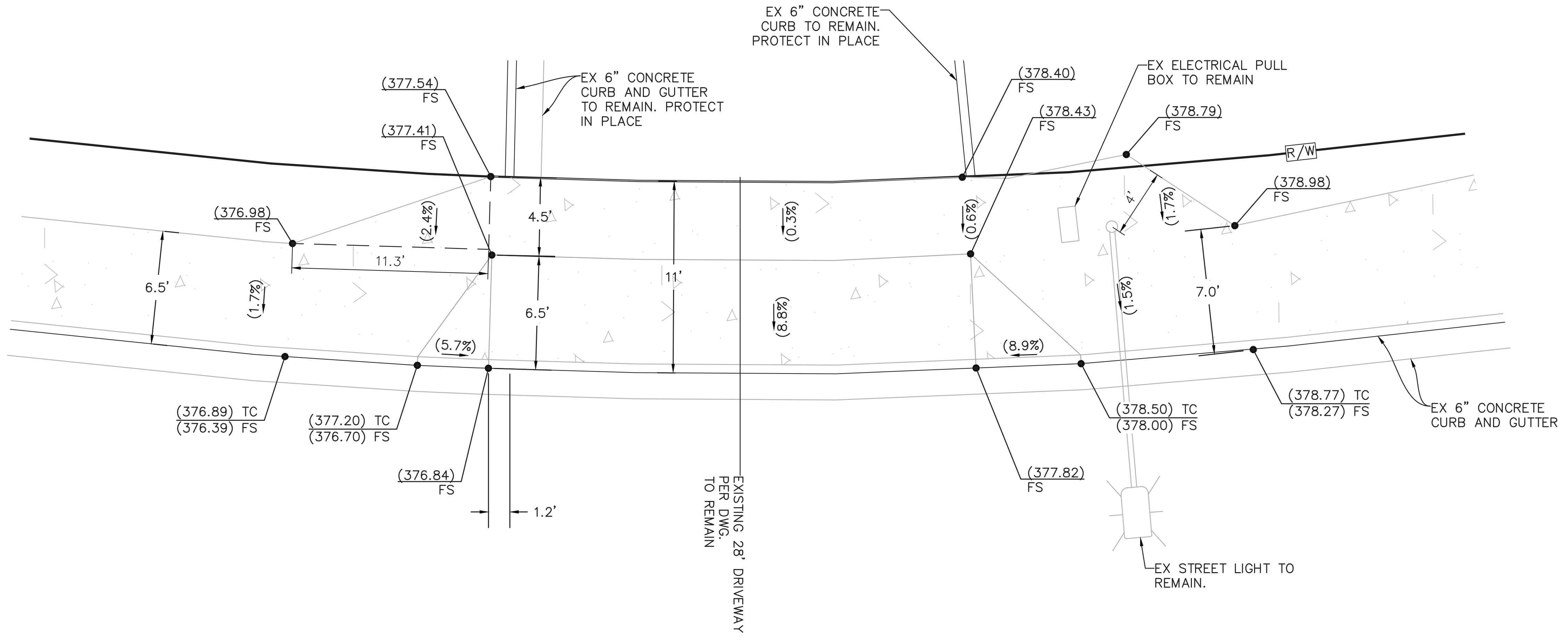
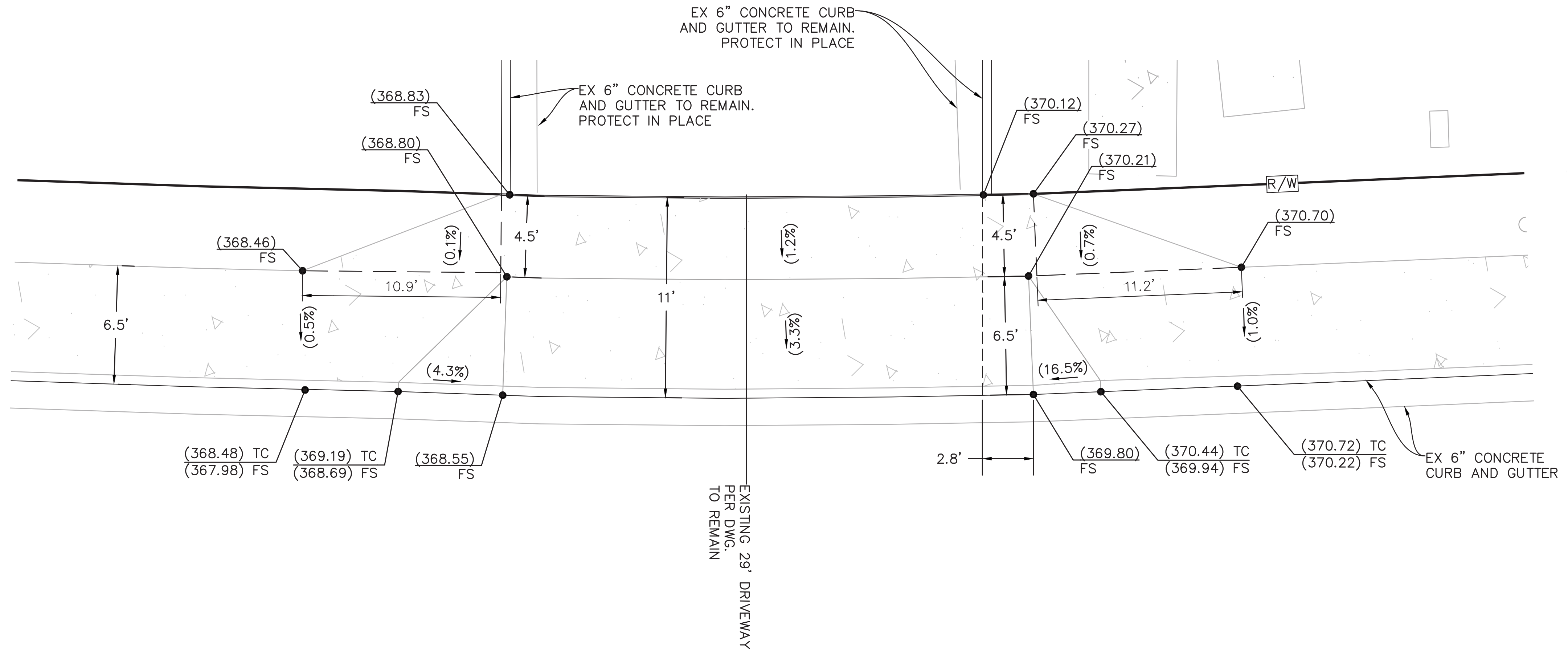
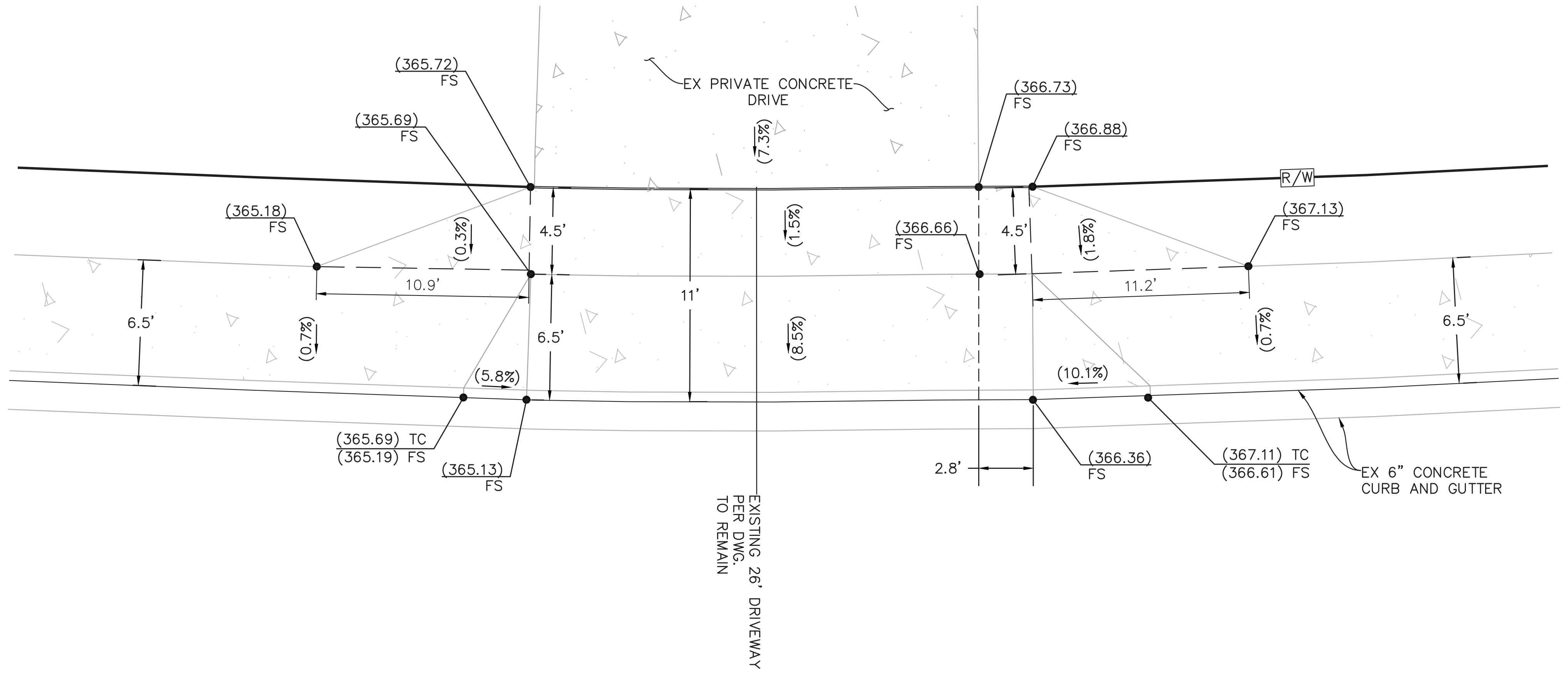
EXISTING PRIVATE DRIVEWAYS TO REMAIN. PROTECT IN PLACE



EXISTING DRIVEWAY #1 DETAIL
SCALE: 1" = 5'



EXISTING DRIVEWAY #2 DETAIL
SCALE: 1" = 5'



EXISTING DRIVEWAY #3 DETAIL
SCALE: 1" = 5'

REGISTERED PROFESSIONAL ENGINEER
JONATHAN RAAB RYDEEN
RCE ~ 64811
EXP 6/30/19
CIVIL
STATE OF CALIFORNIA

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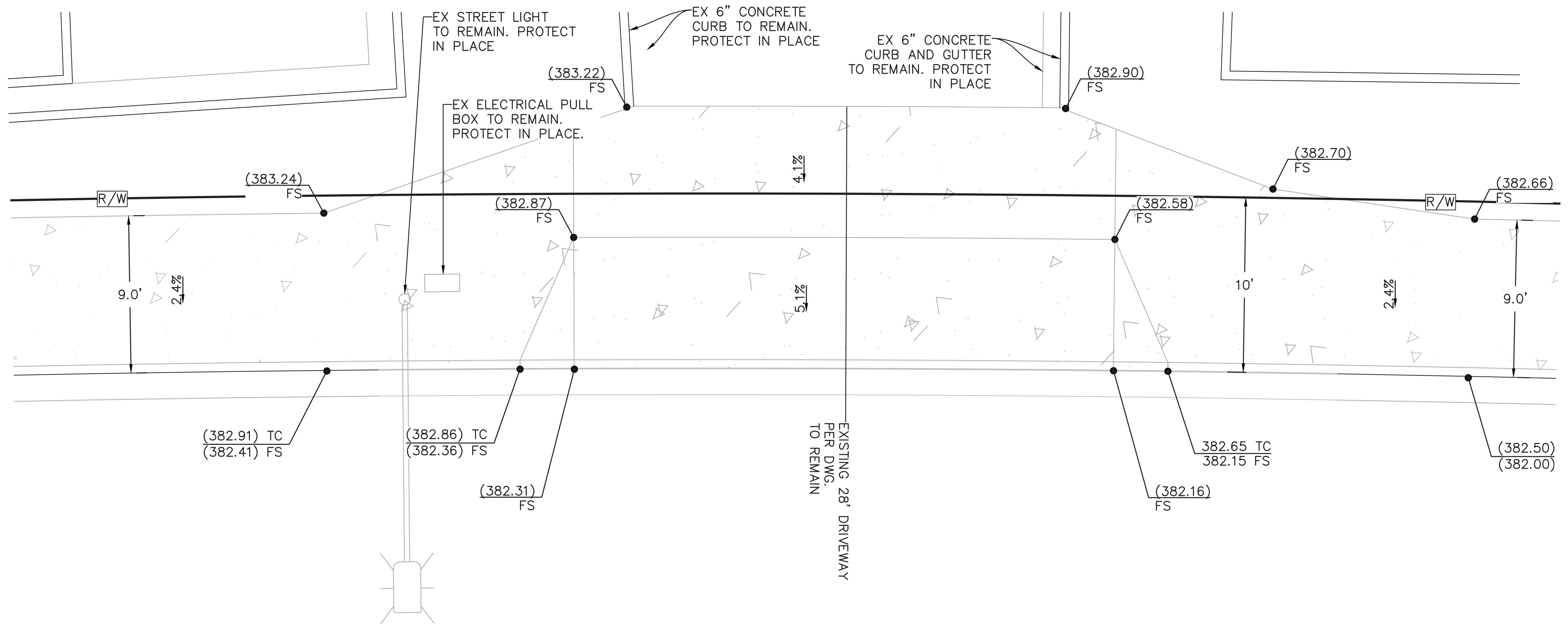
San Diego, CA

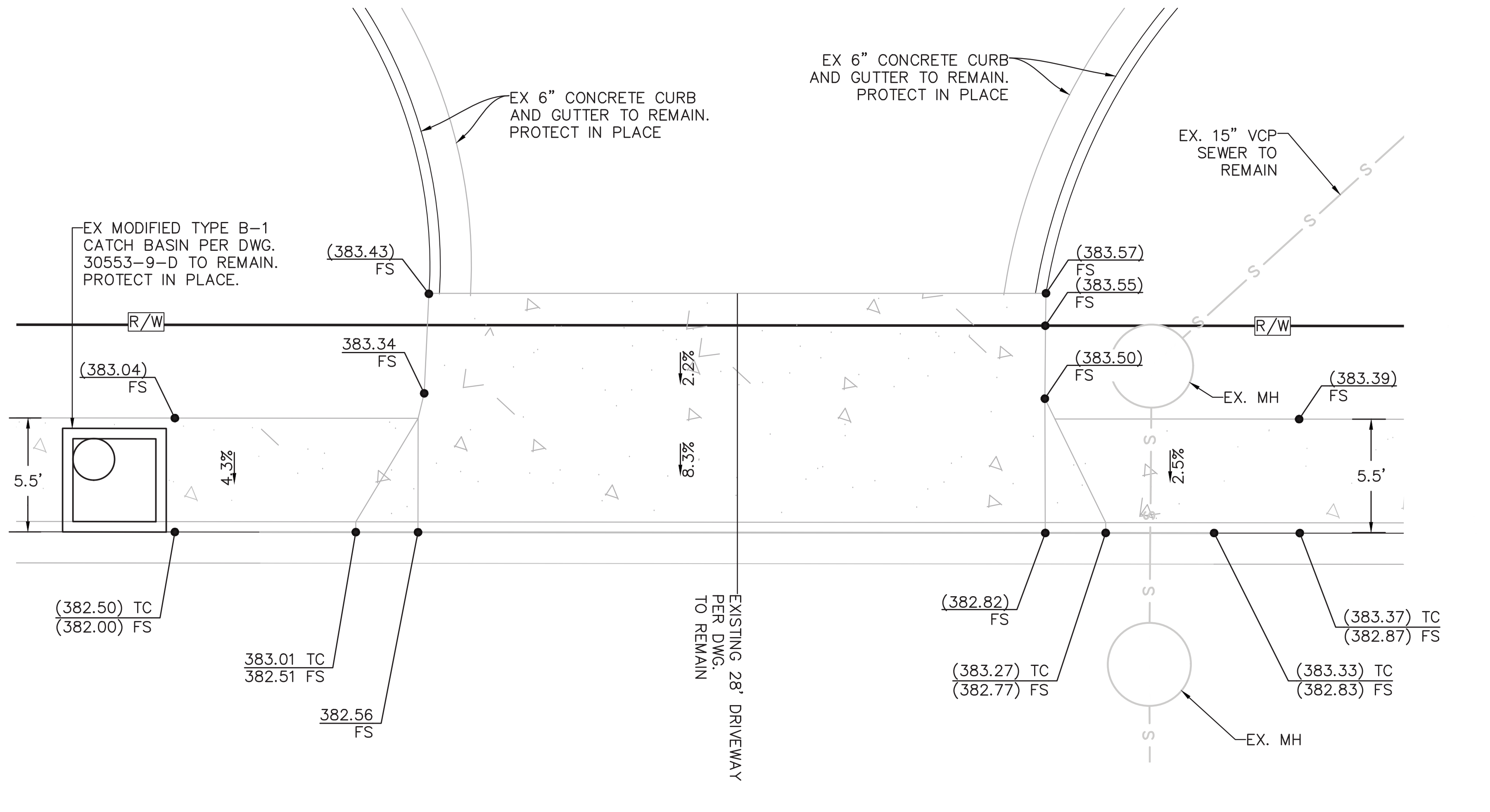
C-7

SHEET: of

EXISTING PRIVATE DRIVEWAYS / PUBLIC CURB RAMP TO BE REMOVED AND REPLACED



EXISTING PRIVATE DRIVEWAY #4
SCALE: 1" = 5'



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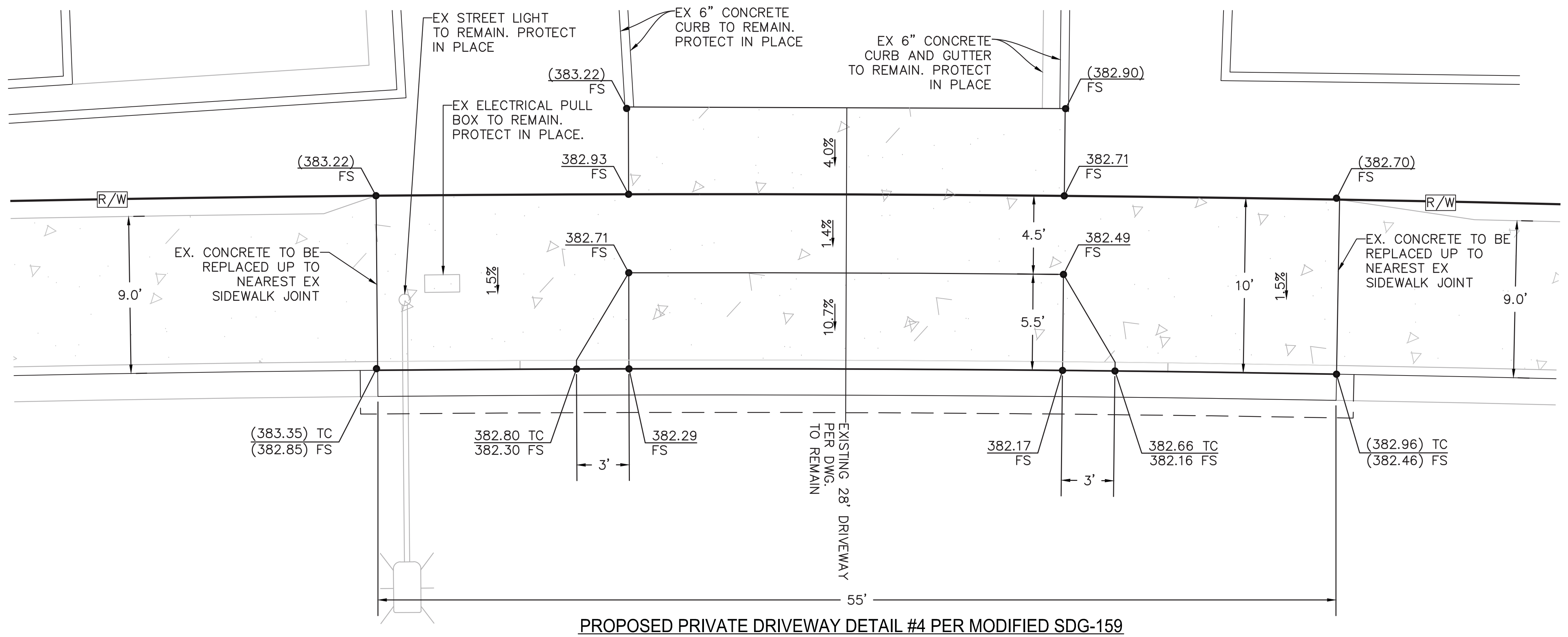

PROPOSED PRIVATE DRIVEWAY DETAIL #4 PER MODIFIED SDG-159
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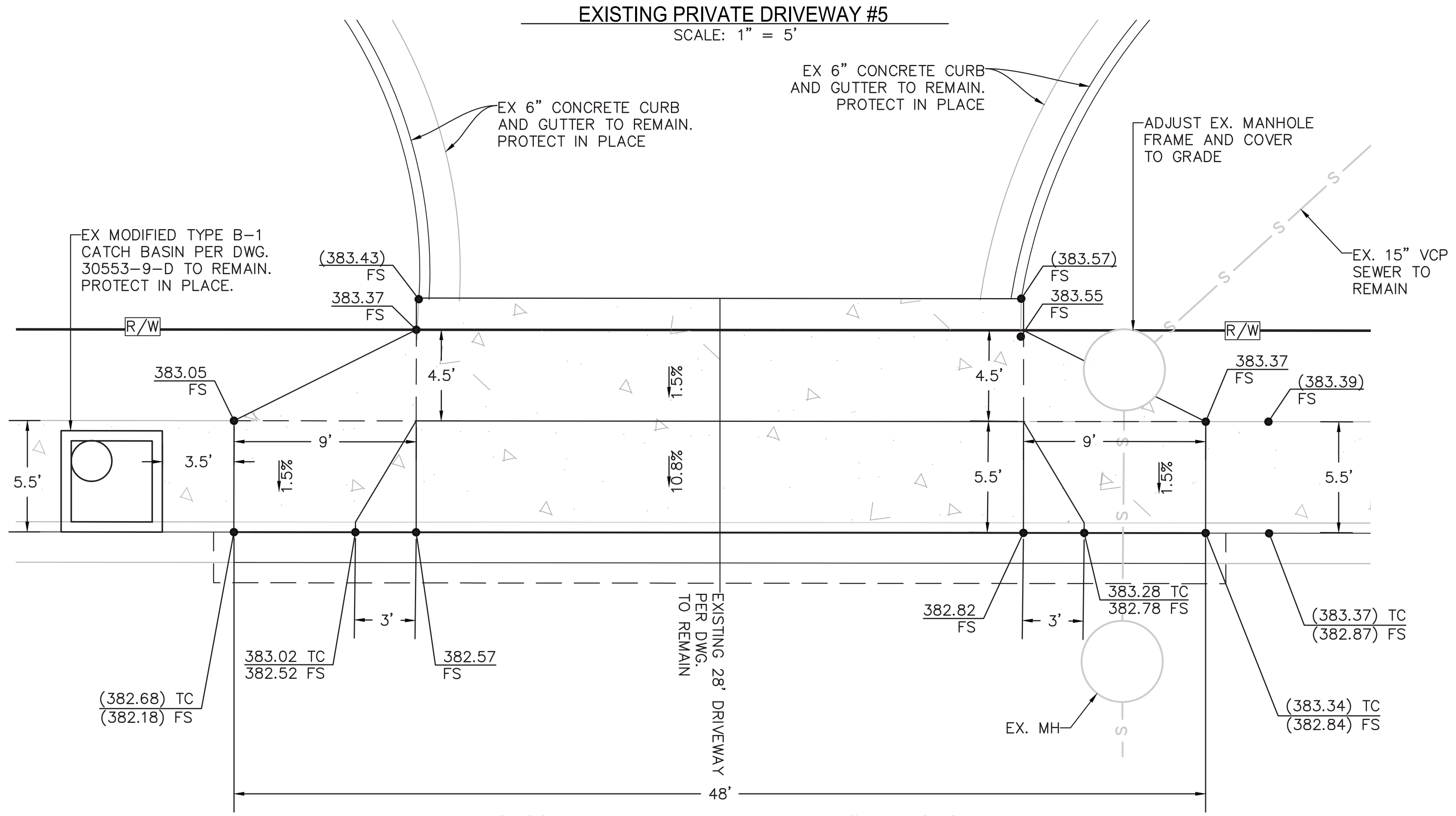

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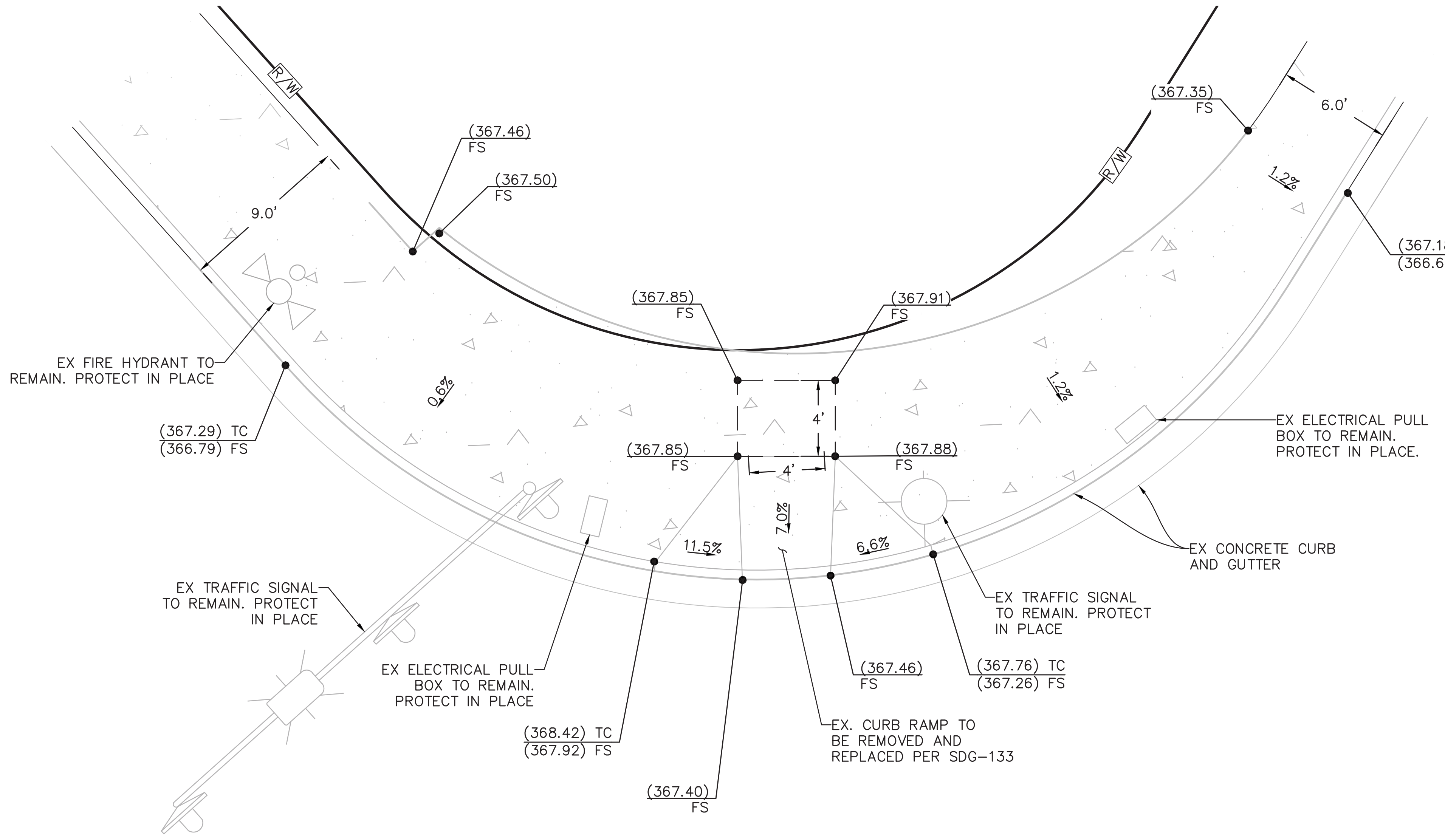

EXISTING CURB RAMP DETAIL
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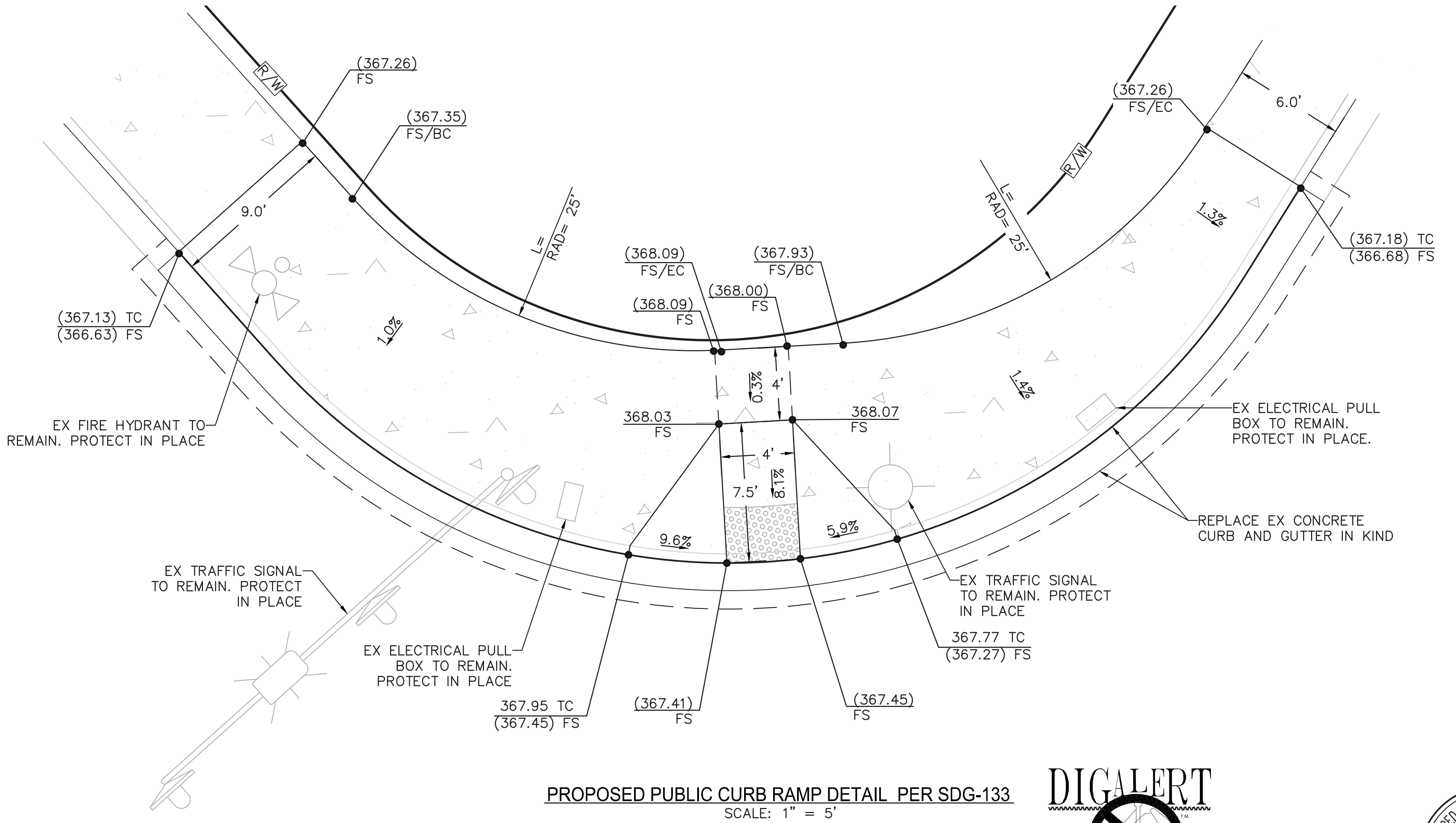

PROPOSED PUBLIC CURB RAMP DETAIL PER SDG-133
SCALE: 1" = 5'

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DATE: 08-23-2017
JOB NO: 15024
DRAWN BY: RJD
CHECKED BY: Checker

Revision Schedule

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ORIGINAL PREPERATION DATE:
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Sports & Wellness Center
San Diego, CA

C-8

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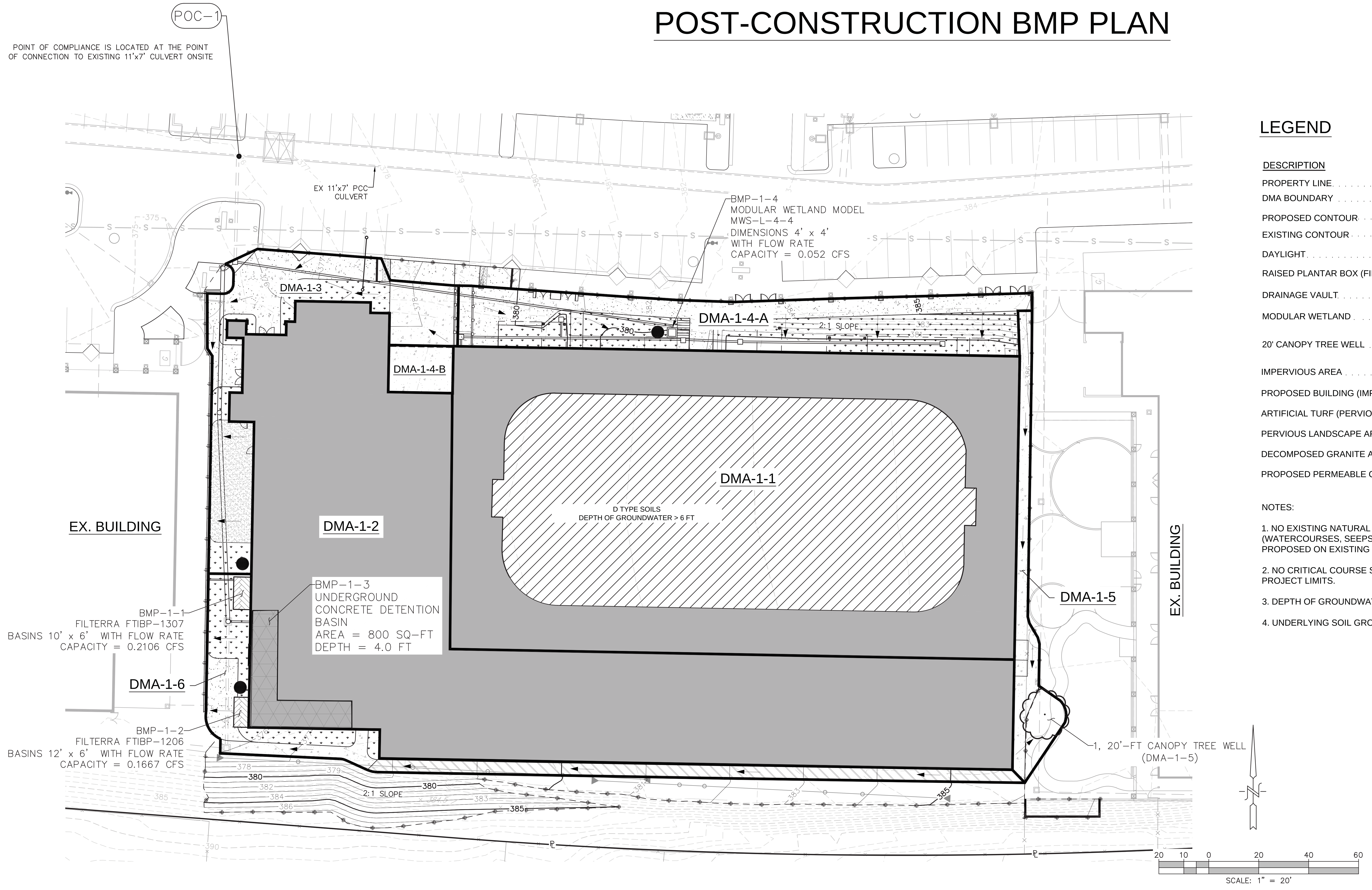

LEGEND

DESCRIPTION	SYMBOL
PROPERTY LINE	PL
DMA BOUNDARY	— — —
PROPOSED CONTOUR	630
EXISTING CONTOUR	630
DAYLIGHT	— ‖ —
RAISED PLANTAR BOX (FILTERRA UNIT)	▨
DRAINAGE VAULT	▨
MODULAR WETLAND	□
20' CANOPY TREE WELL	✿
IMPERVIOUS AREA	▭
PROPOSED BUILDING (IMPERVIOUS)	■
ARTIFICIAL TURF (PERVIOUS)	▨
PERVIOUS LANDSCAPE AREA	▭
DECOMPOSED GRANITE AREA (PERMEABLE)	▒
PROPOSED PERMEABLE CONCRETE	▨

SOURCE CONTROL BMPs

PROHIBITIVE SIGNAGE ●

- MINIMIZED IMPERVIOUS AREA
- MINIMIZED SOIL COMPACTION
- IMPERVIOUS AREA DISPERSION
- LANDSCAPE WITH NATIVE OR DROUGHT TOLERANT SPECIES

Ⓐ PREVENTION OF ILLICIT DISCHARGES TO MS4
Ⓑ STORM DRAIN STENCILING OR SIGNAGE
Ⓒ ON-SITE STORM DRAIN INLETS
Ⓓ INTERIOR FLOOR DRAINS AND ELEVATOR SHAFT SUMP PUMPS
Ⓔ INTERIOR PARKING GARAGES
Ⓕ NEED FOR FUTURE INDOOR AND STRUCTURAL PEST CONTROL
Ⓖ LANDSCAPE/OUTDOOR PESTICIDE USE
Ⓗ FIRE SPRINKLER TEST WATER
Ⓘ PLAZAS, SIDEWALKS, AND PARKING LOTS

SAMPLE PROHIBITIVE SIGNAGE

NTS

NOTES:

1. NO EXISTING NATURAL HYDROLOGIC FEATURES (WATERCOURSES, SEEPS, SPRINGS, WETLANDS). DEVELOPMENT PROPOSED ON EXISTING GRADED LOT.

2. NO CRITICAL COURSE SEDIMENT YIELD AREAS PRESENT WITHIN PROJECT LIMITS.

3. DEPTH OF GROUNDWATER > 6 FT

4. UNDERLYING SOIL GROUP "D"

DMA AREAS

PROPOSED CONDITIONS DMA AREAS								
DMA	SUB-AREA	IMPERVIOUS (AC)	PERVIOUS (AC)	ARTIFICIAL TURF (AC)	PROPOSED DG SURFACE (AC)	TOTAL AREA (AC)	DRAINS TO	POC
1	1-1	0.28	0.00	0.35	0.00	0.63	BMP-1-1	POC-1
	1-2	0.53	0.00	0.00	0.00	0.53	BMP-1-2	
	1-3	0.05	0.02	0.00	0.02	0.09	BMP-1-1	
	1-4-A	0.05	0.06	0.00	0.00	0.12	BMP-1-4	
	1-4-B	0.01	0.00	0.00	0.00	0.01		
	1-5	0.03	0.01	0.00	0.00	0.03	BMP-1-5 (TREE WELL)	
	1-6	0.02	0.02	0.00	0.03	0.07	BMP-1-2	
TOTAL	0	0.96	0.11	0.35	0.05	1.48	-	

TREE WELL SIZING

TREE WELL SUMMARY				
DMA	DCV (CU-FT)	TREE CREDITS (CU-FT)	FINAL DCV (CU-FT)	PROPOSED TREE WELL
1-5	108	180	-72	1, 20-FT CANOPY TREE

DMA	TREE CANOPY DIAMETER (FT)	TREE WELL AMMENDED SOIL SPECIFICATIONS			
		REQUIRED VOLUME (CU-FT)	PROPOSED SOIL DEPTH (FT)	AREA (SQ-FT)	PROPOSED SOIL DIAMETER (FT)
1-5	20	628.3	3	209.4	16.5

FILTERRA BASINS FLOW BASED SIZING

AVAILABLE FILTERRA BOX SIZES			DI = 0.2	C = 1.00	C = 0.85	C = 0.5
L (ft)	W (ft)	FILTERRA SURFACE AREA (sq-ft)	FILTERRA FLOW RATE, Q (cu-ft/s)	100% IMPERVIOUS DA (acres)	COMMERCIAL MAX DA (acres)	RESIDENTIAL MAS DA (acres)
4	4	16	0.037	0.122	0.144	0.245
6	4	24	0.0556	0.184	0.216	0.367
6.5	4	26	0.0602	0.199	0.234	0.398
8	4	32	0.0741	0.245	0.288	0.49
10	4	40	0.0923	0.306	0.26	0.612
12	4	48	0.1111	0.367	0.432	0.735
6	6	36	0.0833	0.275	0.324	0.551
8	6	48	0.1111	0.367	0.432	0.735
10	6	60	0.1389	0.459	0.54	0.918
12	6	72	0.1667	0.551	0.648	1.102
13	7	91	0.2106	0.696	0.819	1.393

MODULAR WETLANDS FLOW BASED SIZING

MODEL #	DIMENSIONS	WETLAND MEDIA SURFACE AREA (sq-ft)	TREATMENT FLOW RATE (CFS)
MWS-L-4-4	4' x 4'	23	0.052
MWS-L-4-6	4' x 6'	32	0.073
MWS-L-4-8	4' x 8'	50	0.115
MWS-L-4-13	4' x 13'	63	0.144
MWS-L-4-15	4' x 15'	76	0.175
MWS-L-4-17	4' x 17'	90	0.206
MWS-L-4-19	4' x 19'	103	0.237
MWS-L-4-22	4' x 21'	117	0.268
MWS-L-8-8	8' x 8'	100	0.23
MWS-L-8-12	8' x 12'	151	0.346
MWS-L-8-16	8' x 16'	201	0.462

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Civil Engineering · Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
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DATE: 02-14-2017
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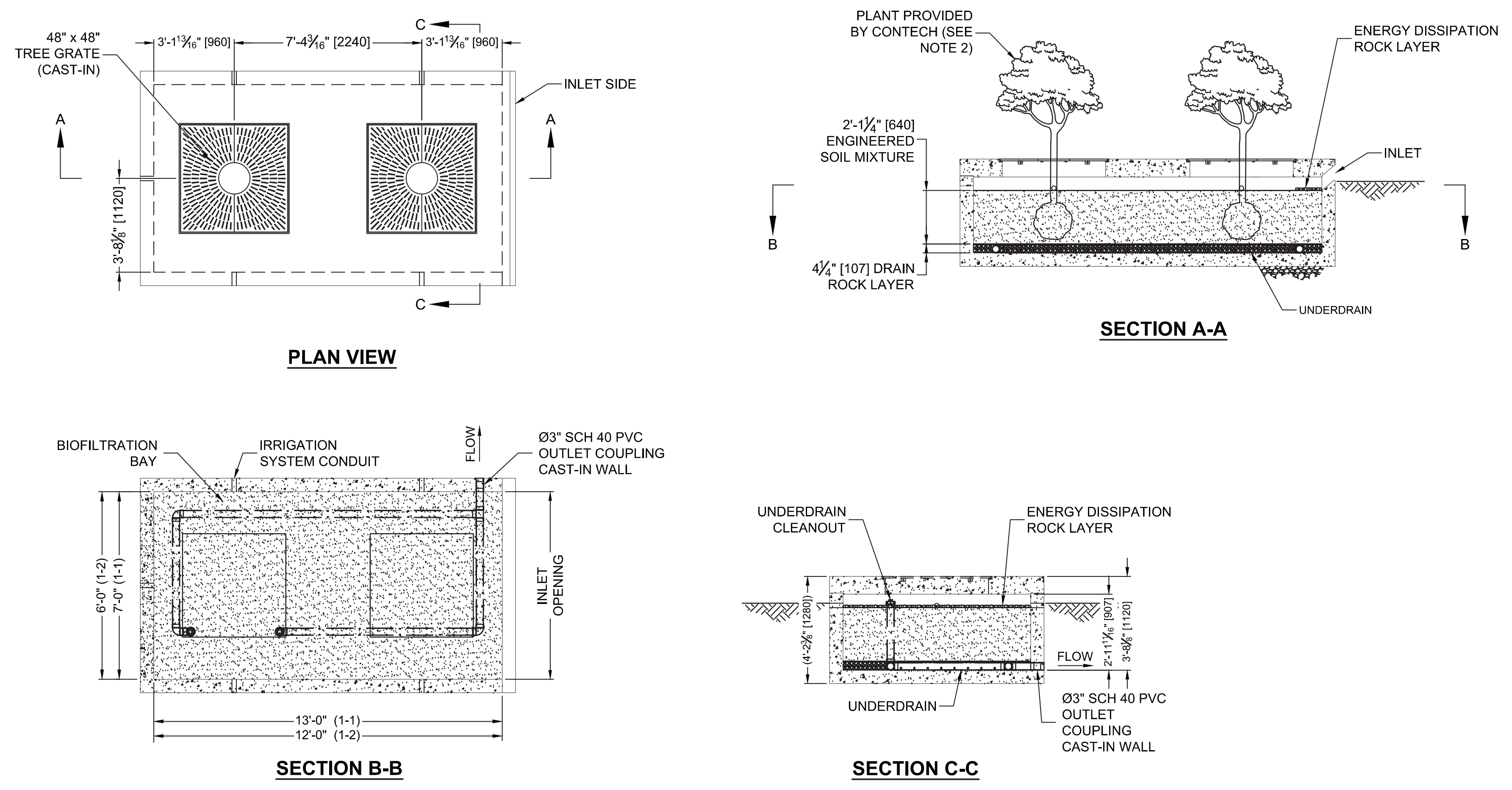
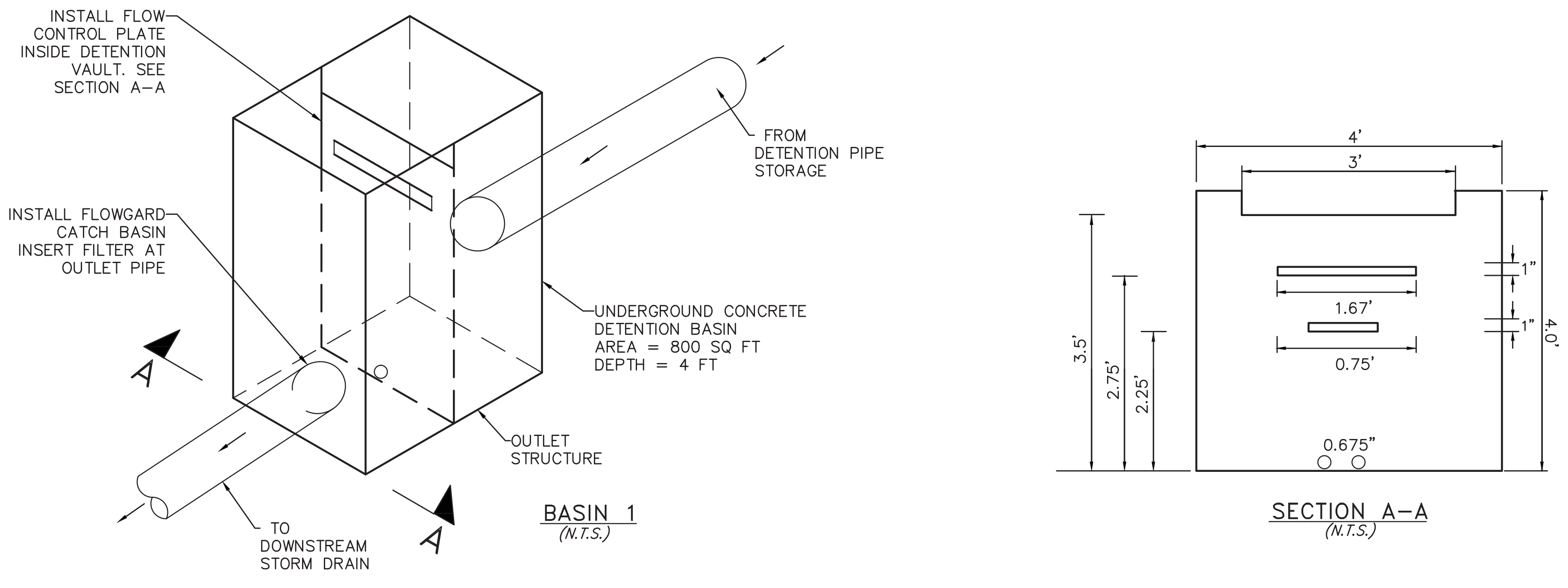


FILTERRA FTIBP DETAIL

NTS



DETENTION VAULT DETAIL

NTS

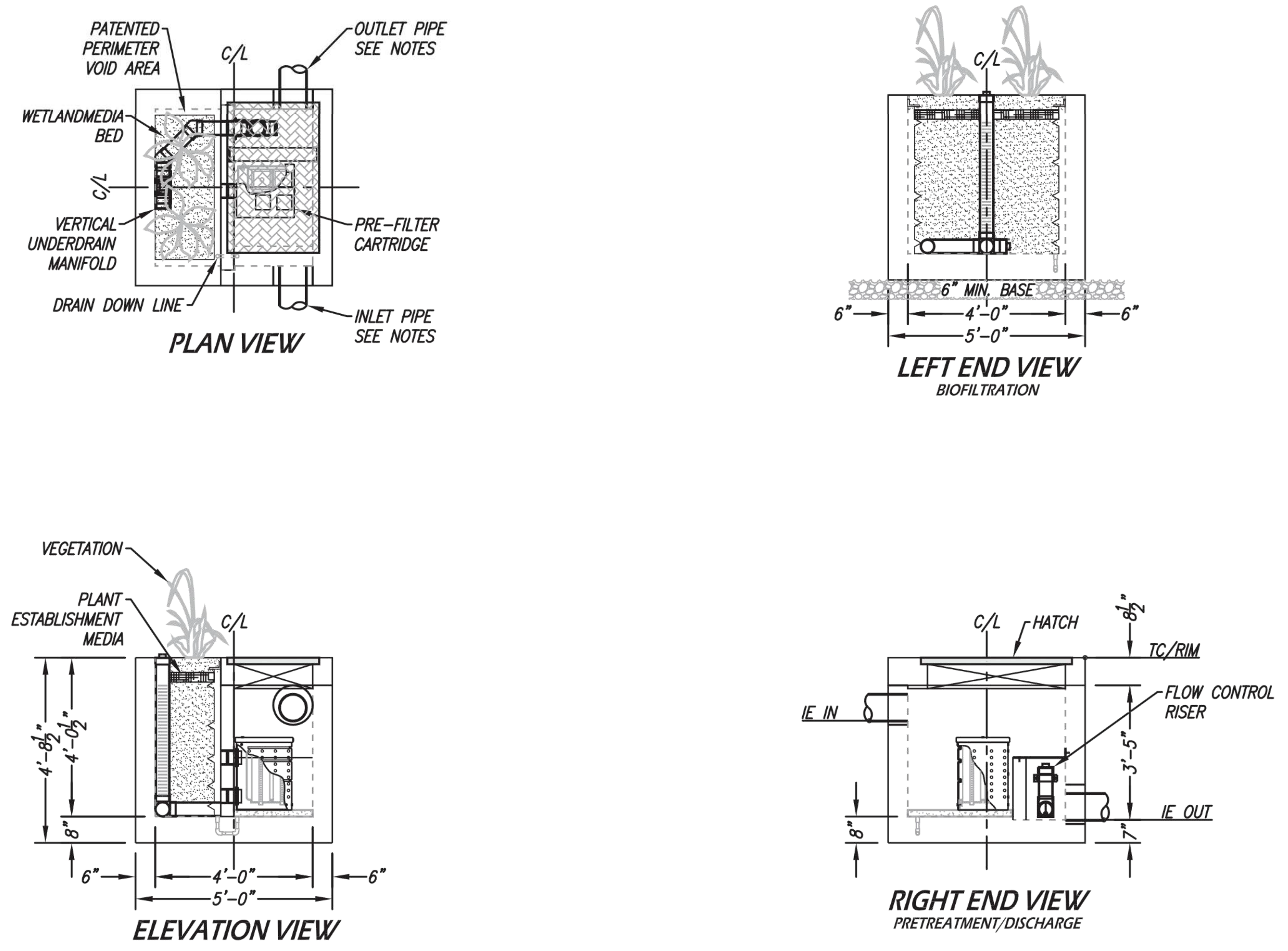
SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	24" x 42"	N/A	N/A
WETLANDMEDIA VOLUME (CY)			0.83
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø1.03"
MAXIMUM PICK WEIGHT (LBS)			9000
NOTES:			

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON–SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

GENERAL NOTES

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



MODULAR WETLAND DETAIL

NTS

TREATMENT FLOW (CFS)	0.052
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

THE PRODUCT DESCRIBED MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

PROPRIETARY AND CONFIDENTIAL:

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STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

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Sports & Wellness Center
San Diego, CA

C-10

SHEET: of

Attachment 5
Drainage Report

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

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R·E·C

100-YEAR ROUTING ANALYSIS

For

RAY & JOAN KROC COMMUNITY CENTER
SAN DIEGO, CA

Prepared For:

The Salvation Army

April 2017, Revised February 2018

REC Consultants
2442 Second Avenue
San Diego, CA 92101

Telephone: (619) 232-9200

Prepared by:

Luis Parra, PhD, CPSWQ, ToR, D.WRE.

R.C.E. 66377

LUIS A PARRA–ROSALES
RCE ~ 66377
EXP 6/30/18

TABLE OF CONTENTS

CHAPTER 1 - EXECUTIVE SUMMARY

1.1 - Introduction

The Kroc Community Center project site is located within the existing Salvation Army Kroc Center at the intersection of Aragon Drive and University Avenue within the City of San Diego, California.

The project site drains to one (1) point of discharge located at the existing storm drain located to the northwest of the proposed improvements within the project site.

This study performs rational method hydrologic analysis and a modified-puls detention routing of developed condition 100-year peak flowrates from the project site to the receiving offsite storm drain infrastructure.

Treatment of storm water runoff from the site has been addressed in a separate report - the “Storm Water Quality Management Plan for the Kroc Community Center” by REC. Hydromodification (HMP) analysis has been presented within the “Technical Memorandum: SWMM Modeling for Kroc Community Center”, dated April, 2017 and updated February of 2018 by REC.

Per 1984 City of San Diego drainage criteria, the Modified Rational Method should be used to determine peak design flowrates when the contributing drainage area is less than 1.0 square mile.

Methodology used for the computation of hydrographs is consistent with criteria set forth in the “2003 County of San Diego Drainage Design Manual.” A more detailed explanation of methodology used for this analysis is listed in Chapter 2 of this report.

Hydraulic Modified-Puls detention basin routing of the modified rational method hydrology was performed using the Army Corps of Engineers HEC-HMS 4.0 software.

1.2 – Summary of Pre-Developed Conditions

In current existing conditions, the overall Salvation Army Kroc Center is a fully developed community use facility including structures, pavements and open space landscaped areas. The project site incorporates a private storm drain system that conveys flows generated by the project site to receiving offsite storm drain systems.

Per the 1984 City of San Diego Drainage Design Manual, a land use runoff coefficient of 0.68 was determined for the existing condition (0.35 for pervious surfaces and 0.9 for impervious areas). A maximum internal flow length of 900 feet was used to determine a time of concentration of 17 minutes. Per the 1984 City of San Diego's Intensity Duration Frequency (IDF) Curve, a corresponding runoff intensity of 2.6 in/hr has been assumed. Table 1 summarizes the pre-developed condition rational method analysis. Calculations are provided in Chapter 3 of this report.

TABLE 1 – SUMMARY OF PRE-DEVELOPED CONDITIONS 100-YEAR EVENT FLOW

Drainage Area	Drainage Area (Ac)	Runoff Coefficient (C)	Intensity (in/hr)	Tc (min)	100-Year Peak Flow (cfs)
Existing Site	14.72	0.68	2.6	17	26.02

1.3 – Summary of Developed Conditions

The Kroc Community Center project comprises of a proposed triple story parking structure incorporating a soccer field constructed on the roof of the structure development. The parking structure is to be constructed on a currently vegetated open space/soccer field site within the Salvation Army Kroc Center campus.

Storm water runoff from the proposed project site is routed to one (1) point of discharge located to the northwest corner of the project site. Runoff from the developed project site is drained to one (1) onsite receiving multi-purpose HMP and Q100 detention facility. Once flows are routed via the proposed detention vault, developed onsite flows are then conveyed to the existing storm drain located within the project site.

Per the 1984 City of San Diego Drainage Design Manual, land use runoff coefficient of 0.71 has been assumed for the existing Salvation Army Kroc Center campus. Runoff coefficients of 0.73 and 0.69 are used for the proposed parking structure improvements. Due to the limited overland flow length of the parking structure, the minimum allowable time of concentration of 5 minutes has been used. The remaining existing Salvation Army Kroc Center will use the same time of concentration calculated in pre-developed conditions given that this area remains untouched by the proposed improvements.

Per the 1984 City of San Diego's Intensity Duration Frequency (IDF) Curve, a corresponding runoff intensity of 4.3 in/hr has been assumed for proposed development area. Table 2 on the following page summarizes the developed condition rational method analysis. Calculations are provided in Chapter 3 of this report.

TABLE 2 – SUMMARY OF DEVELOPED CONDITION 100-YEAR EVENT FLOW

Drainage Area	Drainage Area (Ac)	Runoff Coefficient (C)	Intensity (in/hr)	Tc (min)	100-Year Peak Flow (cfs)
Existing Site	13.24	0.71(1)	2.6	17	24.09
Improvement Tributary Area to Basin	1.32	0.73	4.4	5	4.14
Improvement Area Bypassing Basin	0.16	0.69	4.4	5	0.47
TOTAL	14.72	--	--	--	28.7

Note: (1) Impervious percentage increases given the removal of the soccer field area.

Prior to discharging from the site, first flush runoff will be treated via a BMP in accordance with standards set forth by the Regional Water Quality Control Board and the City of San Diego's Standards (see "Storm Water Quality Management Plan for Kroc Community Center" by REC).

One (1) dual purpose HMP and peak flow detention basin is located within the project site and is responsible for handling hydromodification & peak flow requirements for the project. In developed conditions, the basin vault will have a depth of 4 feet and a riser spillway structure set to 3.5 ft (see dimensions in Tables 3 & 4). Flows will then discharge from the basin via the outlet structure. The riser structure will act as a spillway such that peak flows can be safely discharged to the receiving storm drain system. The basin was sized in such a way that flows from its tributary area could be sufficiently detained ensuring that total runoff to the discharge location is less than in existing conditions.

TABLE 3 – SUMMARY OF DEVELOPED DUAL PURPOSE DETENTION BASIN

BMP	Tributary Area (Ac)	DIMENSIONS					
		HMP Area(1), (ft^2)	Vault Depth (ft)	Vault Volume (ft^3)	Depth Riser Invert (ft)(2)	Weir Length(3) (ft)	Total Depth(4) (ft)
BASIN 1	1.32	800	4.0	3,200	3.5-ft	3-ft	4.0

Notes:
(1): Area of vault base footprint.
(2): Depth of ponding beneath riser structure's surface spillway.
(3): Overflow length of the internal emergency spillway weir.
(4): Total surface depth of BMP from top crest elevation to surface invert.

TABLE 4 – SUMMARY OF RISER DETAILS:

BMP	Lower Orifice			Lower Slot			Upper Slot		
	Diam. (in)	Number	Elev.(1) (ft)	Width (ft)	Height (ft)	Elev.(1) (ft)	Width (ft)	Height (ft)	Elev.(1) (ft)
BR-1	0.675	2	0.00	0.75	0.083	2.25	1.667	0.083	2.75

Notes: (1): Basin ground surface elevation assumed to be 0.00 ft elevation.

The developed condition peak flows for all areas flowing onto the discharge locations were calculated using modified rational method. Hydrographs were developed for the same areas. The hydrograph for the basin tributary area was then routed through the proposed detention facility on the project site in HEC-HMS. The stage-storage analysis for the proposed basin and the outlet structure discharge analysis are inputs in the HEC-HMs model in order to be able to analyze whether or not the dimensions and structure details for the basin are adequate. The HMS Modified-Puls results are summarized in Table 5.

TABLE 5 – SUMMARY OF DETENTION BASIN ROUTING

Detention Basin	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)	Tc (min)	Peak Water Surface Elevation (ft)
BMP-1	4.14	3.73	6	3.93

Input hydrographs for the HMS analysis were generated using the method set forth in the *"2003 County of San Diego Drainage Design Manual"* and are provided in Chapter 3 of this report.

The outflow hydrograph from the detention basin was then confluenced with the offsite and onsite bypass hydrographs to determine a total peak flow of 25.55 cfs as identified in Figure 1.

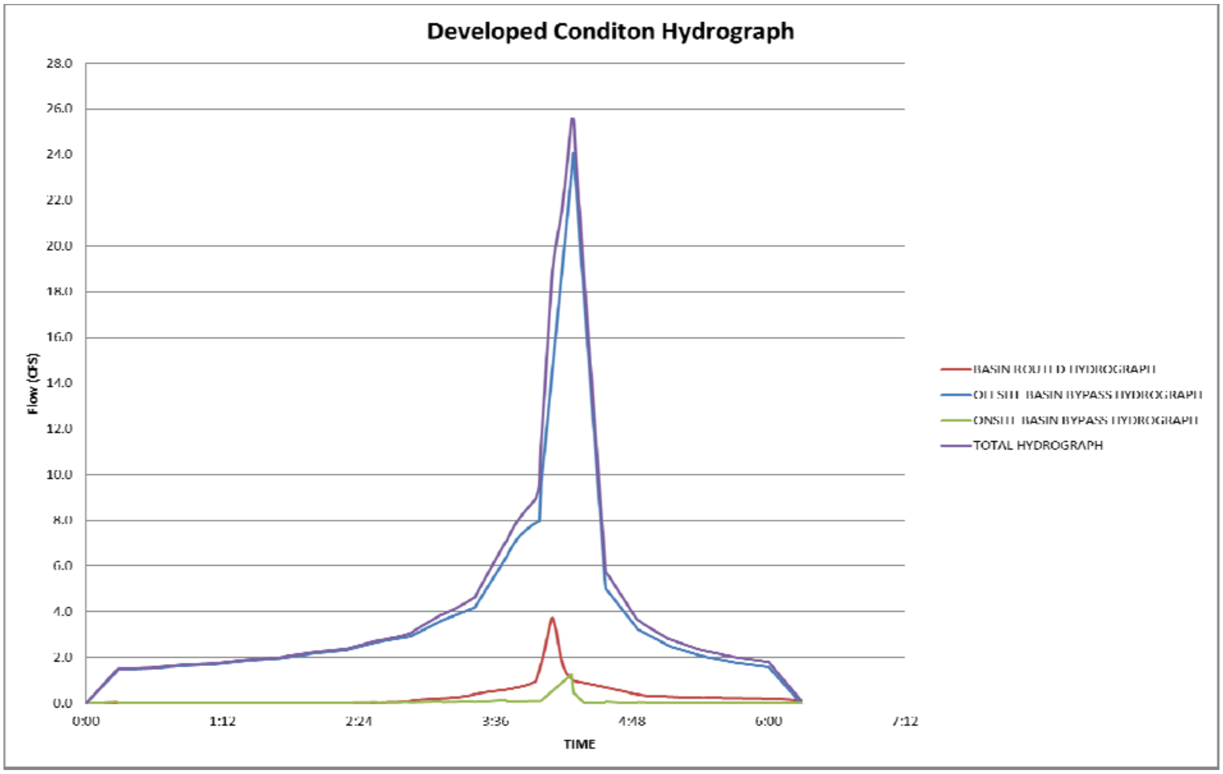


Figure 1 – Developed Conditions Hydrographs

Rational method hydrographs, stage-storage, stage-discharge relationships and HEC-HMS model output is provided in Chapter 3 of this report.

1.4 - Summary of Results

Table 6 below summarizes developed and existing condition drainage areas and resultant 100-year peak flow rates from the Salvation Army Kroc Center.

TABLE 7 – SUMMARY OF PEAK FLOWS

Condition	Drainage Area (Ac)	100 Year Peak Discharge (cfs)
Existing Condition	14.72	26.02
Developed Condition	14.72	25.55
Difference	**0.0**	**- 0.47**

The proposed detention basin has enough capacity to receive flows from its tributary area and to reduce the peak flows sufficiently for the project needs.

As shown in the above table, the improvements of the Kroc Community Center project site will not increase peak when compared to the existing condition.

All developed runoff will receive water quality treatment in accordance with the site specific SWQMP. Additionally, the project is HMP compliant as analyzed in the Hydromodification Technical Memo.

1.5 - References

City of San Diego Drainage Design Manual, April 1984

County of San Diego Design Hydrology Manual, June 2003

"*Storm Water Quality Management Plan for Kroc Community Center*", REC Consulatnts, April, 2017.

"*Technical Memorandum: SWMM Modeling for Kroc Community Center*", REC Consultants, April, 2017.

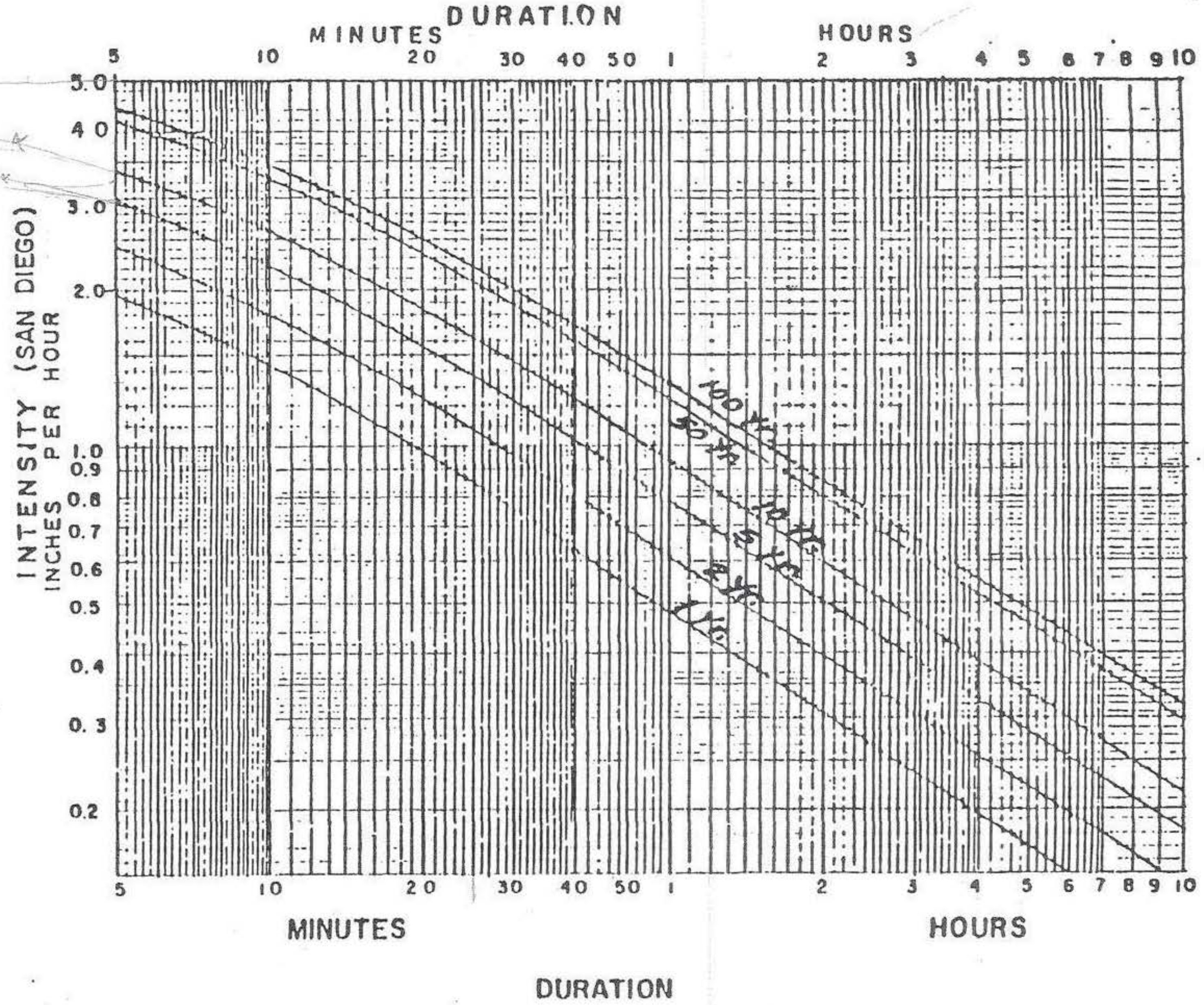
CHAPTER 2

METHODOLOGY

2.1 – City of San Diego Intensity Duration Frequency Curve & Runoff Coefficients

ELEV.	FACTOR
0–1500	1.00
1500–3000	1.25
3000–4000	1.42
4000–5000	1.60
5000–6000	1.70
DESERT	1.25

To obtain correct intensity, multiply intensity on chart by factor for design elevation.



RAINFALL
INTENSITY - DURATION - FREQUENC
CURVES
for
COUNTY OF SAN DIEGO

APPENDIX I

TABLE 2

RUNOFF COEFFICIENTS (RATIONAL METHOD)

DEVELOPED AREAS (URBAN)

Land Use	Coefficient, C Soil Type (1)
Residential:	D
Single Family	.55
Multi-Units	.70
Mobile Homes	.65
Rural (lots greater than 1/2 acre)	.45
Commercial (2) 80% Impervious	.85
Industrial (2) 90% Impervious	.95

NOTES:

(1) Type D soil to be used for all areas.

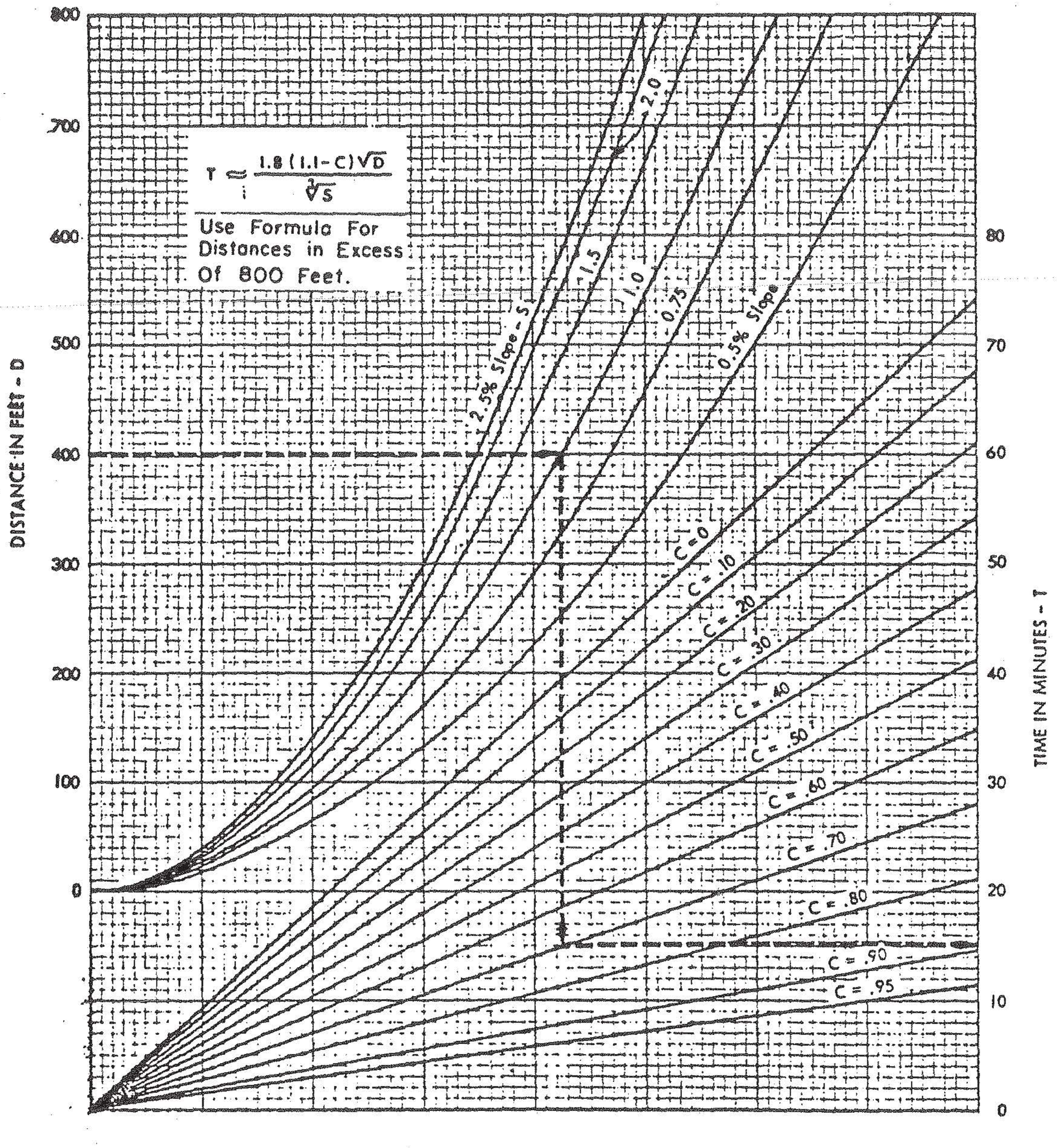
(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in no case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%

Tabulated imperviousness = 80%

$$\text{Revised C} = \frac{50}{80} \times 0.85 = 0.53$$

URBAN AREAS OVERLAND TIME OF FLOW CURVES



$$T \approx \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{S}}$$

Use Formula For Distances in Excess Of 800 Feet.

Surface Flow Time Curves

EXAMPLE:

GIVEN: LENGTH OF FLOW = 400 FT.
SLOPE = 1.0 %
COEFFICIENT OF RUNOFF C = .70

READ: OVERLAND FLOWTIME = 15 MINUTES

CHAPTER 2

METHODOLOGY

2.2 – Hydrograph Development Summary (from San Diego County Hydrology Manual)

SECTION 6
RATIONAL METHOD HYDROGRAPH PROCEDURE

6.1 INTRODUCTION

The procedures in this section are for the development of hydrographs from RM study results for study areas up to approximately 1 square mile in size. The RM, discussed in Section 3, is a mathematical formula used to determine the maximum runoff rate from a given rainfall. It has particular application in urban storm drainage, where it is used to estimate peak runoff rates from small urban and rural watersheds for the design of storm drains and small drainage structures. However, in some instances such as for design of detention basins, the peak runoff rate is insufficient information for the design, and a hydrograph is needed. Unlike the NRCS hydrologic method (discussed in Section 4), the RM itself does not create hydrographs. The procedures for detention basin design based on RM study results were first developed as part of the East Otay Mesa Drainage Study. Rick Engineering Company performed this study under the direction of County Flood Control. The procedures in this section may be used for the development of hydrographs from RM study results for study areas up to approximately 1 square mile in size.

6.2 HYDROGRAPH DEVELOPMENT

The concept of this hydrograph procedure is based on the RM formula:

$$Q = C\,I\,A$$

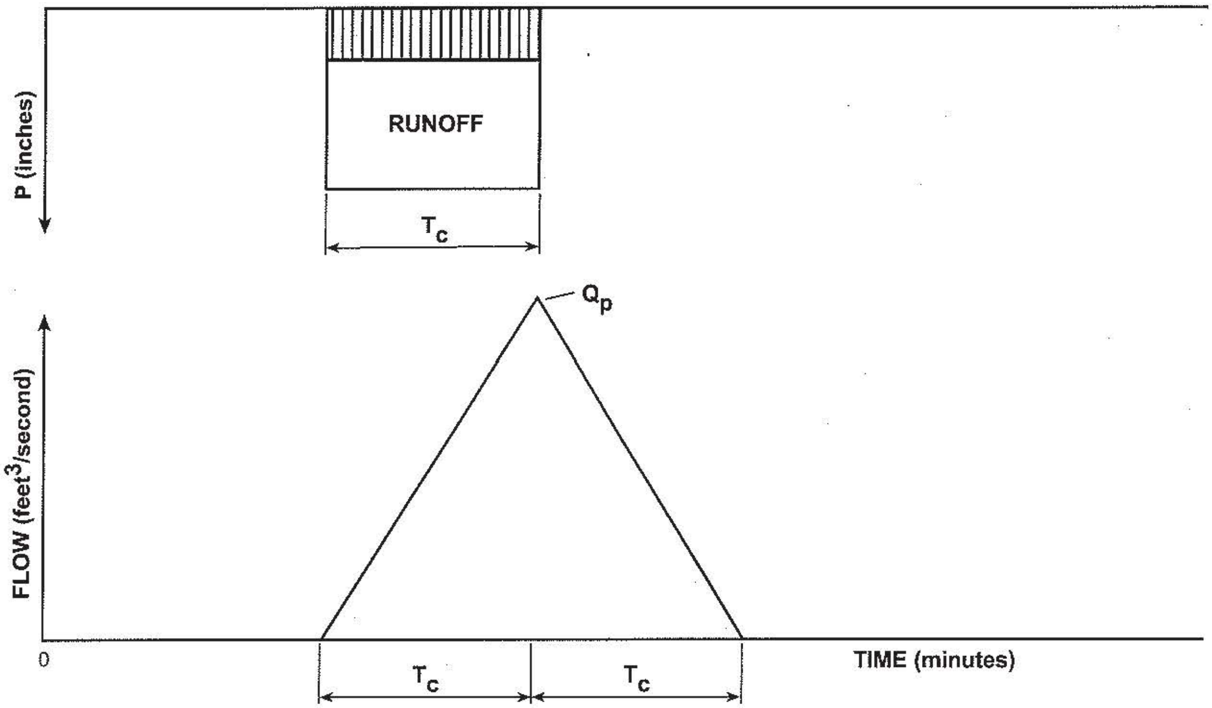
Where: Q = peak discharge, in cubic feet per second (cfs)
C = runoff coefficient, proportion of the rainfall that runs off the surface (no units)
I = average rainfall intensity for a duration equal to the T_c for the area, in inches per hour
A = drainage area contributing to the design location, in acres

The RM formula is discussed in more detail in Section 3.

An assumption of the RM is that discharge increases linearly over the T_c for the drainage area until reaching the peak discharge as defined by the RM formula, and then decreases linearly. A linear hydrograph can be developed for the peak flow occurring over the T_c as shown in Figure 6-1. However, for designs that are dependent on the total storm volume, it is not sufficient to consider a single hydrograph for peak flow occurring over the T_c at the beginning of a 6-hour storm event because the hydrograph does not account for the entire volume of runoff from the storm event. The volume under the hydrograph shown in Figure 6-1 is equal to the rainfall intensity multiplied by the duration for which that intensity occurs (T_c), the drainage area (A) contributing to the design location, and the runoff coefficient (C) for the drainage area. For designs that are dependent on the total storm volume, a hydrograph must be generated to account for the entire volume of runoff from the 6-hour storm event. The hydrograph for the entire 6-hour storm event is generated by creating a rainfall distribution consisting of blocks of rain, creating an incremental hydrograph for each block of rain, and adding the hydrographs from each block of rain. This process creates a hydrograph that contains runoff from all the blocks of rain and accounts for the entire volume of runoff from the 6-hour storm event. The total volume under the resulting hydrograph is equal to the following equation:

$$\mathrm{VOL} = CP_6A \qquad \text{(Eq. 6-1)}$$

Where: VOL = volume of runoff (acre-inches)
P_6 = 6-hour rainfall (inches)
C = runoff coefficient
A = area of the watershed (acres)



Triangular Hydrograph

FIGURE

6-1

6.2.1 Rainfall Distribution

Figure 6-2 shows a 6-hour rainfall distribution consisting of blocks of rain over increments of time equal to T_c. The number of blocks is determined by rounding T_c to the nearest whole number of minutes, dividing 360 minutes (6 hours) by T_c, and rounding again to the nearest whole number. The blocks are distributed using a (2/3, 1/3) distribution in which the peak rainfall block is placed at the 4-hour time within the 6-hour rainfall duration. The additional blocks are distributed in a sequence alternating two blocks to the left and one block to the right of the 4-hour time (see Figure 6-2). The total amount of rainfall ($P_{T(N)}$) for any given block (N) is determined as follows:

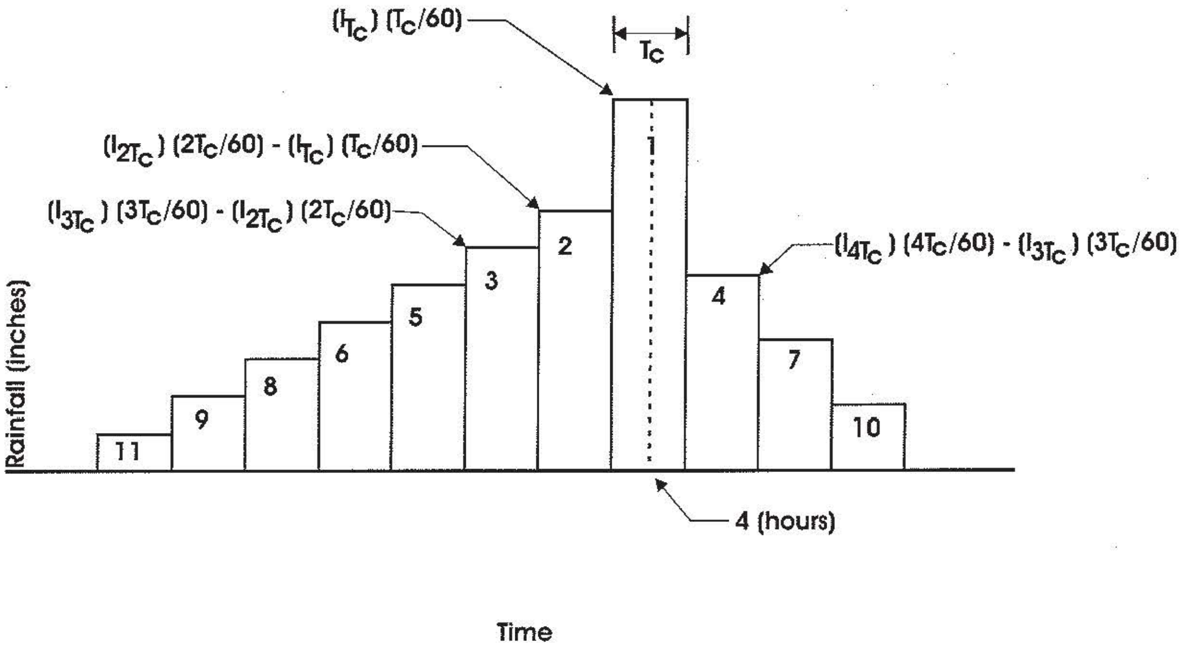
$$P_{T(N)} = (I_{T(N)}\ T_{T(N)}) / 60$$

Where: $P_{T(N)}$ = total amount of rainfall for any given block (N)
$I_{T(N)}$ = average rainfall intensity for a duration equal to $T_{T(N)}$ in inches per hour
$T_{T(N)}$ = NT_c in minutes (N is an integer representing the given block number of rainfall)

Intensity is calculated using the following equation (described in detail in Section 3):

$$I = 7.44\ P_6\ D^{-0.645}$$

Where: I = average rainfall intensity for a duration equal to D in inches per hour
P_6 = adjusted 6-hour storm rainfall
D = duration in minutes



Rainfall Distribution

FIGURE

6-2

Substituting the equation for I in the equation above for $P_{T(N)}$ and setting the duration (D) equal to $T_{T(N)}$ yields:

$$P_{T(N)} = [(7.44\ P_6/T_{T(N)}{}^{0.645})(T_{T(N)})] / 60$$
$$P_{T(N)} = 0.124\ P_6 T_{T(N)}{}^{0.355}$$

Substituting NT_c for T_T (where N equals the block number of rainfall) in the equation above yields:

$$P_{T(N)} = 0.124\ P_6\ (NT_c)^{0.355} \qquad \text{(Eq. 6-2)}$$

Equation 6-2 represents the total rainfall amount for a rainfall block with a time base equal to $T_{T(N)}$ (NT_c). The actual time base of each rainfall block in the rainfall distribution is T_c, as shown in Figure 6-2. The actual rainfall amount (P_N) for each block of rain is equal to P_T at N ($P_{T(N)}$) minus the previous P_T at N–1 ($P_{T(N-1)}$) at any given multiple of T_c (any NT_c). For example, the rainfall for block 2 is equal to $P_{T(N)}$ at $T_{T(N)} = 2T_c$ minus the $P_{T(N)}$ at $T_{T(N)} = 1T_c$, and the rainfall for block 3 equals $P_{T(N)}$ at $T_{T(N)} = 3T_c$ minus the $P_{T(N)}$ at $T_{T(N)} = 2T_c$, or P_N can be represented by the following equation:

$$P_N = P_{T(N)} - P_{T(N-1)} \qquad \text{(Eq. 6-3)}$$

For the rainfall distribution, the rainfall at block N = 1, ($1T_c$), is centered at 4 hours, the rainfall at block N = 2, ($2T_c$), is centered at 4 hours – $1T_c$, the rainfall at block N = 3, ($3T_c$), is centered at 4 hours – $2T_c$, and the rainfall at at block N = 4, ($4T_c$), is centered at 4 hours + $1T_c$. The sequence continues alternating two blocks to the left and one block to the right (see Figure 6-2).

6.2.2 Construction of Incremental Hydrographs

Figure 6-1 shows the relationship of a single block of rain to a single hydrograph. Figure 6-3 shows the relationship of the rainfall distribution to the overall hydrograph for the storm event. The peak flow amount from each block of rain is determined by the RM formula, Q = CIA, where I equals I_N (the actual rainfall intensity for the rainfall block). I_N is determined by dividing P_N by the actual time base of the block, T_c. The following equation shows this relationship:

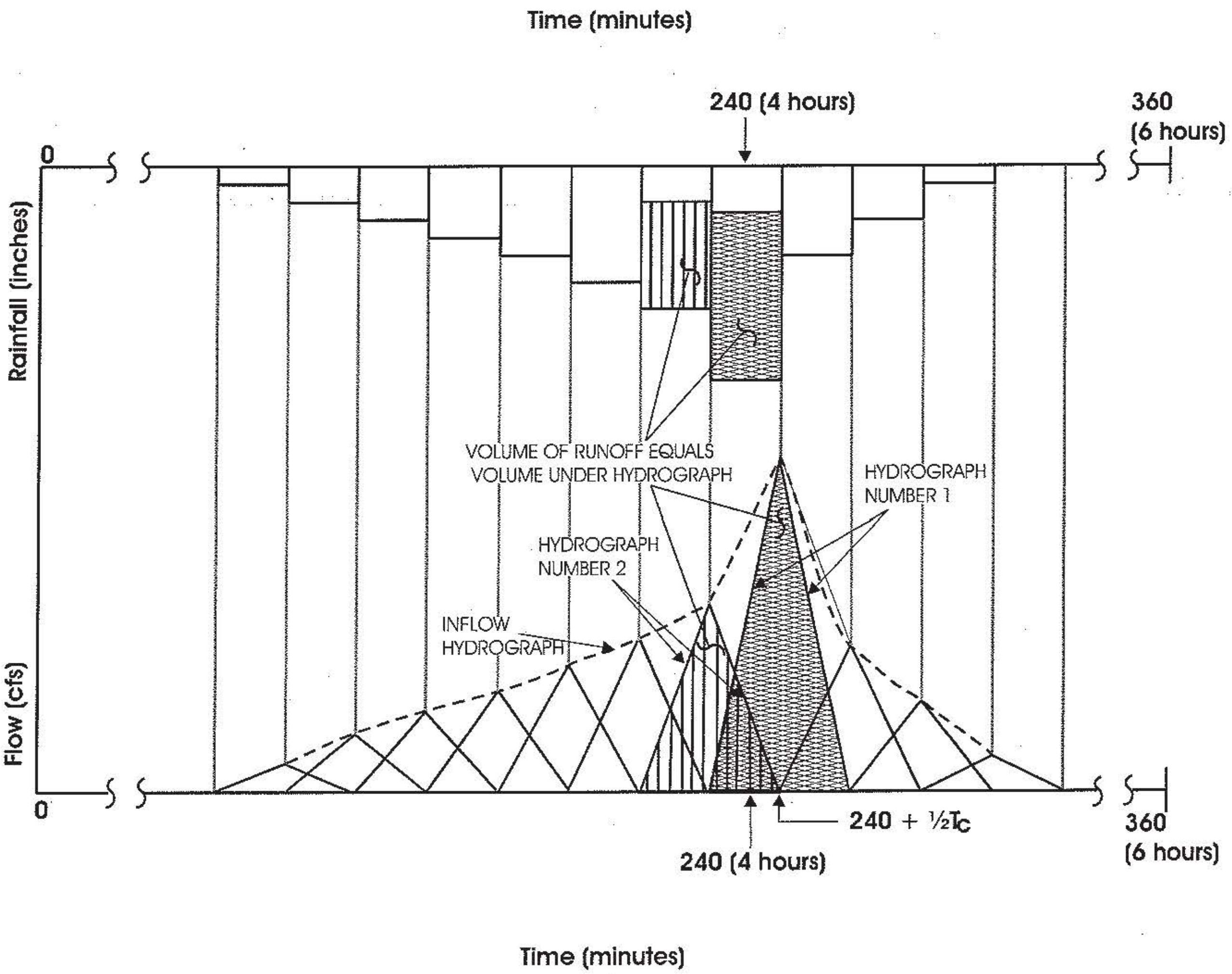
$$I_N = 60\ P_N/T_c \qquad \text{(Eq. 6-4)}$$

Where: I_N = average rainfall intensity for a duration equal to T_c in inches per hour
P_N = rainfall amount for the block in inches
T_c = time of concentration in minutes

By substituting equation 6-4 into the rational equation, the following relationship is obtained:

$$Q_N = 60\ CAP_N/T_c\ \text{(cfs)} \qquad \text{(Eq. 6-5)}$$

Finally, the overall hydrograph for the storm event is determined by adding all the hydrographs from each block of rain. Since the peak flow amount for each incremental hydrograph corresponds to a zero flow amount from the previous and proceeding hydrographs, as shown in Figure 6-3, the inflow hydrograph can be plotted by connecting the peak flow amounts (see the dashed line in Figure 6-3).



6-Hour Rational Method Hydrograph

FIGURE

6-3

6.3 GENERATING A HYDROGRAPH USING RATHYDRO

The rainfall distribution and related hydrographs can be developed using the RATHYDRO computer program provided to the County by Rick Engineering Company. A copy of this program is available at no cost from the County. The output from this computer program may be used with HEC-1 or other software for routing purposes.

The design storm pattern used by the RATHYDRO program is based on the (2/3, 1/3) distribution described in Sections 4.1.1 and 6.2.1. The ordinates on the hydrograph are calculated based on the County of San Diego Intensity-Duration Design Chart (Figure 3-1), which uses the intensity equation described in Sections 3.1.3 and 6.2.1 to relate the intensity (I) of the storm to T_c, $I = 7.44\ P_6 D^{-0.645}$. The computer program uses equations 6-2 and 6-3 described above and calculates I_N directly. The intensity at any given multiple of T_c is calculated by the following equation:

$$I_N = [(I_{T(N)})\ (T_{T(N)}) - (I_{T(N-1)})\ (T_{T(N-1)})]\ /\ T_c \qquad \text{(Eq. 6-6)}$$

Where: N = number of rainfall blocks

$T_{T(N)}$ = time of concentration at rainfall block N in minutes (equal to NT_c)

I_N = actual rainfall intensity at rainfall block N in inches per hour

$I_{T(N)}$ = rainfall intensity at time of concentration $T_{T(N)}$ in inches per hour

Figure 6-2 shows the rainfall distribution used in the RM hydrograph, computed at multiples of T_c. The rainfall at block $N = 1$, $(1T_c)$, is centered at 4 hours, the rainfall at block $N = 2$, $(2T_c)$, is centered at 4 hours – $1T_c$, the rainfall at block $N = 3$, $(3T_c)$, is centered at 4 hours – $2T_c$, and the rainfall at at block $N = 4$, $(4T_c)$, is centered at 4 hours + $1T_c$. The sequence continues alternating two blocks to the left and one block to the right (see Figure 6-2).

As described in Section 6.2.2, the peak discharge (Q_N) of the hydrograph for any given rainfall block (N) is determined by the RM formula $Q = CIA$, where $I = I_N$ = the actual rainfall intensity for the rainfall block. The RATHYDRO program substitutes equation 6-6 into the RM formula to determine Q_N yielding the following equation:

$$Q_N = [(I_{T(N)})\ (T_{T(N)}) - (I_{T(N-1)})\ (T_{T(N-1)})]\ CA\ /\ T_c \qquad \text{(Eq. 6-7)}$$

Where: Q_N = peak discharge for rainfall block N in cubic feet per second (cfs)
N = number of rainfall blocks
$T_{T(N)}$ = time of concentration at rainfall block N in minutes (equal to NT_c)
$I_{T(N)}$ = rainfall intensity at time of concentration $T_{T(N)}$ in inches per hour
C = RM runoff coefficient
A = area of the watershed (acres)

To develop the hydrograph for the 6-hour design storm, a series of triangular hydrographs with ordinates at multiples of the given T_c are created and added to create the hydrograph. This hydrograph has its peak at 4 hours plus ½ of the T_c. The total volume under the hydrograph is equal to the following equation (equation 6-1):

$$VOL = CP_6A$$

Where: VOL = volume of runoff (acre-inches)
P_6 = 6-hour rainfall (inches)
C = runoff coefficient
A = area of the watershed (acres)

CHAPTER 3

MODIFIED-PULS DETENTION ROUTING

3.1 – Rational Method Calculations & Hydrographs

Weighted Runoff Coefficient Calculations

Pre-Developed Conditions

Note: Impervious Area C = 0.9, Pervious Area C = 0.35)

Impervious Area = 8.82 Ac
Pervious Area = 5.9 Ac
Total 14.72 Ac

Weighted C = 0.68

Post-Developed Conditions

Basin Bypass Area

Impervious Area = 8.72 Ac
Pervious Area = 4.52 Ac
Total 13.24 Ac

Weighted C = 0.71

Basin Tributary Area

Impervious Area = 0.9 Ac
Pervious Area = 0.42 Ac
Total 1.32 Ac

Weighted C = 0.73

Time of Concentration Calculation

$$T = \frac{1.8\,(1.1-C)\,\sqrt{D}}{\sqrt[3]{s}}$$

Where:
C = 0.71
D = 900 ft
s = 2 %

T = 17 minutes

Rational Method Calculations

Pre-Developed Conditions

Area	14.72	Ac	
C	0.68		
Tc	17	min	
Intensity	2.6	in/hr	(per 1984 City of San Diego IDF)

Q	26.02	cfs

Post-Developed Conditions

Basin Bypass Area

Area	13.24	Ac	
C	0.71		
Tc	17	min	
Intensity	2.60	in/hr	(per 1984 City of San Diego IDF)

Q	24.44	cfs

Basin Tributary Area

Area	1.32	Ac	
C	0.73		
Tc	5	min	
Intensity	4.3	in/hr	(per 1984 City of San Diego IDF)

Q	4.14	cfs

DETERMINATION OF 100 YR - 6 HR RUNOFF HYDROGRAPH - ONSITE
KROC CENTER - POST-DEV CONDITIONS

I: 4.300 in/hr
Δt: 5 min

A: 1.32 acres
Tc: 5 min
C: 0.73
Q: 4.14 cfs

time	P (in)	I (in/hr)	Position
5	0.370	4.440	49
10	0.570	2.404	48
15	0.710	1.682	47
20	0.820	1.313	50
25	0.911	1.089	46
30	0.989	0.937	45
35	1.058	0.827	51
40	1.120	0.744	44
45	1.176	0.679	43
50	1.228	0.625	52
55	1.277	0.581	42
60	1.322	0.544	41
65	1.365	0.513	53
70	1.405	0.485	40
75	1.444	0.461	39
80	1.480	0.439	54
85	1.515	0.420	38
90	1.549	0.403	37
95	1.581	0.388	55
100	1.612	0.374	36
105	1.642	0.361	35
110	1.672	0.349	56
115	1.700	0.338	34
120	1.727	0.328	33
125	1.754	0.318	57
130	1.779	0.310	32
135	1.804	0.302	31
140	1.829	0.294	58
145	1.853	0.287	30
150	1.876	0.280	29
155	1.899	0.274	59
160	1.921	0.268	28
165	1.943	0.262	27
170	1.965	0.257	60
175	1.986	0.252	26
180	2.006	0.247	25
185	2.026	0.242	61
190	2.046	0.238	24
195	2.065	0.233	23
200	2.085	0.229	62
205	2.103	0.225	22
210	2.122	0.222	21
215	2.140	0.218	63
220	2.158	0.215	20
225	2.176	0.211	19
230	2.193	0.208	64
235	2.210	0.205	18
240	2.227	0.202	17
245	2.244	0.199	65
250	2.260	0.197	16
255	2.276	0.194	15
260	2.292	0.192	66

time	I (in/hr)	Position	Q (cfs)	
0	0	0	0.000	
5	0.154	1	0.149	
10	0.155	2	0.151	
15	0.158	3	0.154	
20	0.160	4	0.155	
25	0.163	5	0.158	
30	0.165	6	0.160	
35	0.168	7	0.163	
40	0.170	8	0.165	
45	0.174	9	0.169	
50	0.176	10	0.171	
55	0.180	11	0.175	
60	0.182	12	0.177	
65	0.187	13	0.181	
70	0.189	14	0.184	
75	0.194	15	0.189	
80	0.197	16	0.191	
85	0.202	17	0.197	
90	0.205	18	0.199	
95	0.211	19	0.205	
100	0.215	20	0.209	
105	0.222	21	0.215	
110	0.225	22	0.219	
115	0.233	23	0.227	
120	0.238	24	0.231	
125	0.247	25	0.240	
130	0.252	26	0.244	
135	0.262	27	0.255	
140	0.268	28	0.260	
145	0.280	29	0.272	
150	0.287	30	0.279	
155	0.302	31	0.293	
160	0.310	32	0.301	
165	0.328	33	0.319	
170	0.338	34	0.328	
175	0.361	35	0.350	
180	0.374	36	0.363	
185	0.403	37	0.392	
190	0.420	38	0.408	
195	0.461	39	0.448	
200	0.485	40	0.471	
205	0.544	41	0.529	
210	0.581	42	0.565	
215	0.679	43	0.659	
220	0.744	44	0.723	
225	0.937	45	0.911	
230	1.089	46	1.058	
235	1.682	47	1.634	
240	2.404	48	2.335	
245	4.440	49	**4.140**	**Max Q**
250	1.313	50	1.276	
255	0.827	51	0.804	
260	0.625	52	0.608	

265	2.308	0.189	14
270	2.323	0.187	13
275	2.339	0.184	67
280	2.354	0.182	12
285	2.369	0.180	11
290	2.384	0.178	68
295	2.398	0.176	10
300	2.413	0.174	9
305	2.427	0.172	69
310	2.441	0.170	8
315	2.455	0.168	7
320	2.469	0.166	70
325	2.483	0.165	6
330	2.497	0.163	5
335	2.510	0.161	71
340	2.523	0.160	4
345	2.536	0.158	3
350	2.549	0.157	72
355	2.562	0.155	2
360	2.575	0.154	1

265	0.513	53	0.498
270	0.439	54	0.427
275	0.388	55	0.377
280	0.349	56	0.339
285	0.318	57	0.309
290	0.294	58	0.286
295	0.274	59	0.266
300	0.257	60	0.249
305	0.242	61	0.235
310	0.229	62	0.223
315	0.218	63	0.212
320	0.208	64	0.202
325	0.199	65	0.194
330	0.192	66	0.186
335	0.184	67	0.179
340	0.178	68	0.173
345	0.172	69	0.167
350	0.166	70	0.162
355	0.161	71	0.157
360	0.157	72	0.152

DETERMINATION OF 100 YR - 6 HR RUNOFF HYDROGRAPH - OFFSITE BASIN BYPASS
KROC CENTER - POST-DEV CONDITIONS

I: 2.6 in/hr
Δt: 17 min

A: 13.24 acres
Tc: 17 min
C: 0.71
Q: 24.09 cfs

time	P (in)	I (in/hr)	Position
17	0.760	2.661	15.00
34	1.048	1.008	14.00
51	1.243	0.680	13.00
69	1.394	0.530	16.00
86	1.520	0.442	12.00
103	1.630	0.383	11.00
120	1.727	0.341	17.00
137	1.815	0.308	10.00
154	1.896	0.283	9.00
171	1.971	0.262	18.00
189	2.040	0.244	8.00
206	2.106	0.230	7.00
223	2.168	0.217	19.00
240	2.227	0.206	6.00
257	2.283	0.196	5.00
274	2.337	0.188	20.00
291	2.388	0.180	4.00
309	2.437	0.173	3.00
326	2.485	0.167	21.00
343	2.531	0.161	2.00
360	2.575	0.155	1.00

time	I (in/hr)	Position	Q (cfs)
0	0	0	0.000
17	0.155	1	1.473
34	0.161	2	1.524
51	0.173	3	1.638
69	0.180	4	1.705
86	0.196	5	1.860
103	0.206	6	1.952
120	0.230	7	2.177
137	0.244	8	2.317
154	0.283	9	2.679
171	0.308	10	2.922
189	0.383	11	3.631
206	0.442	12	4.189
223	0.680	13	6.445
240	1.008	14	9.557
257	2.600	15	24.090
274	0.530	16	5.024
291	0.341	17	3.228
309	0.262	18	2.481
326	0.217	19	2.057
343	0.188	20	1.778
360	0.167	21	1.578

SUMMATION OF 100 YR - 6 HR RUNOFF HYDROGRAPHS - DEVELOPED CONDITION

OFFSITE BASIN BYPASS
HYDROGRAH

t	Q (cfs)
0:00	0.000
0:01	0.087
0:02	0.173
0:03	0.260
0:04	0.347
0:05	0.433
0:06	0.520
0:07	0.607
0:08	0.693
0:09	0.780
0:10	0.867
0:11	0.953
0:12	1.040
0:13	1.127
0:14	1.213
0:15	1.300
0:16	1.387
0:17	1.473
0:18	1.476
0:19	1.479
0:20	1.482
0:21	1.485
0:22	1.488
0:23	1.491
0:24	1.494
0:25	1.497
0:26	1.500
0:27	1.503
0:28	1.506
0:29	1.509
0:30	1.512
0:31	1.515
0:32	1.518
0:33	1.521
0:34	1.524
0:35	1.530
0:36	1.537
0:37	1.544
0:38	1.551
0:39	1.557
0:40	1.564
0:41	1.571
0:42	1.578
0:43	1.584
0:44	1.591
0:45	1.598
0:46	1.605
0:47	1.611
0:48	1.618
0:49	1.625

ONSITE BASIN BYPASS
HYDROGRAPH

t	Q (cfs)
0:00	0.000
0:01	0.003
0:02	0.007
0:03	0.010
0:04	0.014
0:05	0.017
0:06	0.021
0:07	0.024
0:08	0.028
0:09	0.031
0:10	0.035
0:11	0.038
0:12	0.042
0:13	0.045
0:14	0.048
0:15	0.052
0:16	0.055
0:17	0.017
0:18	0.017
0:19	0.018
0:20	0.018
0:21	0.018
0:22	0.018
0:23	0.018
0:24	0.018
0:25	0.018
0:26	0.018
0:27	0.018
0:28	0.019
0:29	0.019
0:30	0.019
0:31	0.019
0:32	0.019
0:33	0.019
0:34	0.018
0:35	0.018
0:36	0.018
0:37	0.019
0:38	0.019
0:39	0.019
0:40	0.020
0:41	0.020
0:42	0.020
0:43	0.020
0:44	0.021
0:45	0.021
0:46	0.021
0:47	0.021
0:48	0.022
0:49	0.022

BASIN ROUTED
HYDROGRAPH

t	Q (cfs)
0:00	0.0
0:01	0.0
0:02	0.0
0:03	0.0
0:04	0.0
0:05	0.0
0:06	0.0
0:07	0.0
0:08	0.0
0:09	0.0
0:10	0.0
0:11	0.0
0:12	0.0
0:13	0.0
0:14	0.0
0:15	0.0
0:16	0.0
0:17	0.0
0:18	0.0
0:19	0.0
0:20	0.0
0:21	0.0
0:22	0.0
0:23	0.0
0:24	0.0
0:25	0.0
0:26	0.0
0:27	0.0
0:28	0.0
0:29	0.0
0:30	0.0
0:31	0.0
0:32	0.0
0:33	0.0
0:34	0.0
0:35	0.0
0:36	0.0
0:37	0.0
0:38	0.0
0:39	0.0
0:40	0.0
0:41	0.0
0:42	0.0
0:43	0.0
0:44	0.0
0:45	0.0
0:46	0.0
0:47	0.0
0:48	0.0
0:49	0.0

TOTAL DEVELOPED
HYDROGRAPH

t	Q (cfs)
0:00	0.000
0:01	0.090
0:02	0.180
0:03	0.270
0:04	0.360
0:05	0.451
0:06	0.541
0:07	0.631
0:08	0.721
0:09	0.821
0:10	0.911
0:11	1.001
0:12	1.091
0:13	1.182
0:14	1.272
0:15	1.362
0:16	1.452
0:17	1.501
0:18	1.504
0:19	1.507
0:20	1.510
0:21	1.513
0:22	1.516
0:23	1.519
0:24	1.522
0:25	1.525
0:26	1.528
0:27	1.531
0:28	1.534
0:29	1.537
0:30	1.541
0:31	1.544
0:32	1.547
0:33	1.550
0:34	1.551
0:35	1.558
0:36	1.565
0:37	1.572
0:38	1.580
0:39	1.597
0:40	1.604
0:41	1.611
0:42	1.618
0:43	1.625
0:44	1.632
0:45	1.639
0:46	1.646
0:47	1.653
0:48	1.660
0:49	1.667

0:50	1.632
0:51	1.638
0:52	1.642
0:53	1.646
0:54	1.650
0:55	1.654
0:56	1.658
0:57	1.662
0:58	1.666
0:59	1.670
1:00	1.673
1:01	1.677
1:02	1.681
1:03	1.685
1:04	1.689
1:05	1.693
1:06	1.697
1:07	1.701
1:08	1.705
1:09	1.714
1:10	1.723
1:11	1.732
1:12	1.741
1:13	1.750
1:14	1.759
1:15	1.769
1:16	1.778
1:17	1.787
1:18	1.796
1:19	1.805
1:20	1.814
1:21	1.823
1:22	1.833
1:23	1.842
1:24	1.851
1:25	1.860
1:26	1.865
1:27	1.871
1:28	1.876
1:29	1.882
1:30	1.887
1:31	1.893
1:32	1.898
1:33	1.903
1:34	1.909
1:35	1.914
1:36	1.920
1:37	1.925
1:38	1.930
1:39	1.936
1:40	1.941
1:41	1.947
1:42	1.952
1:43	1.965
1:44	1.977
1:45	1.990
1:46	2.002

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0:52	0.019
0:53	0.020
0:54	0.020
0:55	0.020
0:56	0.020
0:57	0.020
0:58	0.020
0:59	0.020
1:00	0.021
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1:16	0.023
1:17	0.023
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1:19	0.024
1:20	0.024
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1:23	0.025
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1:26	0.022
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1:28	0.022
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1:30	0.023
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1:32	0.023
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1:35	0.024
1:36	0.024
1:37	0.024
1:38	0.025
1:39	0.025
1:40	0.025
1:41	0.025
1:42	0.023
1:43	0.023
1:44	0.023
1:45	0.023
1:46	0.024

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0:52	1.682
0:53	1.686
0:54	1.690
0:55	1.694
0:56	1.698
0:57	1.702
0:58	1.706
0:59	1.710
1:00	1.714
1:01	1.718
1:02	1.722
1:03	1.726
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1:06	1.738
1:07	1.742
1:08	1.745
1:09	1.754
1:10	1.764
1:11	1.773
1:12	1.783
1:13	1.792
1:14	1.802
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1:18	1.840
1:19	1.849
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1:21	1.868
1:22	1.878
1:23	1.887
1:24	1.897
1:25	1.902
1:26	1.907
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1:36	1.964
1:37	1.980
1:38	1.985
1:39	1.991
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2:13	2.284
2:14	2.292
2:15	2.300
2:16	2.308
2:17	2.317
2:18	2.338
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2:20	2.381
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2:22	2.423
2:23	2.444
2:24	2.466
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2:27	2.530
2:28	2.551
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2:32	2.636
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2:36	2.707
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2:38	2.736
2:39	2.750
2:40	2.765
2:41	2.779
2:42	2.793
2:43	2.807

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1:50	2.106
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1:55	2.169
1:56	2.182
1:57	2.195
1:58	2.207
1:59	2.220
2:00	2.233
2:01	2.241
2:02	2.250
2:03	2.258
2:04	2.267
2:05	2.275
2:06	2.284
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2:08	2.301
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2:13	2.344
2:14	2.352
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2:17	2.374
2:18	2.396
2:19	2.418
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2:21	2.462
2:22	2.485
2:23	2.507
2:24	2.529
2:25	2.551
2:26	2.573
2:27	2.595
2:28	2.618
2:29	2.640
2:30	2.662
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2:35	2.755
2:36	2.770
2:37	2.785
2:38	2.800
2:39	2.825
2:40	2.839
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2:42	2.869
2:43	2.884

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2:46	2.850
2:47	2.864
2:48	2.879
2:49	2.893
2:50	2.907
2:51	2.922
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2:54	3.047
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2:56	3.130
2:57	3.172
2:58	3.214
2:59	3.255
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3:01	3.339
3:02	3.381
3:03	3.422
3:04	3.464
3:05	3.506
3:06	3.548
3:07	3.589
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3:09	3.664
3:10	3.697
3:11	3.729
3:12	3.762
3:13	3.795
3:14	3.828
3:15	3.861
3:16	3.893
3:17	3.926
3:18	3.959
3:19	3.992
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3:22	4.090
3:23	4.123
3:24	4.156
3:25	4.189
3:26	4.321
3:27	4.454
3:28	4.587
3:29	4.719
3:30	4.852
3:31	4.985
3:32	5.118
3:33	5.250
3:34	5.383
3:35	5.516
3:36	5.649
3:37	5.781
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3:40	6.179

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2:57	0.044
2:58	0.046
2:59	0.048
3:00	0.049
3:01	0.051
3:02	0.053
3:03	0.054
3:04	0.056
3:05	0.058
3:06	0.059
3:07	0.061
3:08	0.043
3:09	0.044
3:10	0.045
3:11	0.047
3:12	0.048
3:13	0.049
3:14	0.051
3:15	0.052
3:16	0.053
3:17	0.054
3:18	0.056
3:19	0.057
3:20	0.058
3:21	0.060
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3:23	0.062
3:24	0.064
3:25	0.049
3:26	0.054
3:27	0.060
3:28	0.065
3:29	0.070
3:30	0.076
3:31	0.081
3:32	0.086
3:33	0.092
3:34	0.097
3:35	0.102
3:36	0.107
3:37	0.113
3:38	0.118
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3:40	0.129

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2:45	2.924
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2:47	2.963
2:48	2.978
2:49	3.013
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2:54	3.226
2:55	3.269
2:56	3.323
2:57	3.376
2:58	3.420
2:59	3.473
3:00	3.516
3:01	3.570
3:02	3.613
3:03	3.667
3:04	3.710
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3:07	3.860
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3:13	4.074
3:14	4.108
3:15	4.152
3:16	4.197
3:17	4.251
3:18	4.295
3:19	4.339
3:20	4.383
3:21	4.427
3:22	4.481
3:23	4.535
3:24	4.589
3:25	4.628
3:26	4.786
3:27	4.944
3:28	5.092
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3:30	5.398
3:31	5.546
3:32	5.704
3:33	5.852
3:34	6.000
3:35	6.148
3:36	6.296
3:37	6.444
3:38	6.592
3:39	6.740
3:40	6.888

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3:43	6.618
3:44	6.771
3:45	6.909
3:46	7.033
3:47	7.146
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3:49	7.343
3:50	7.429
3:51	7.509
3:52	7.583
3:53	7.651
3:54	7.715
3:55	7.775
3:56	7.831
3:57	7.883
3:58	7.933
3:59	7.979
4:00	9.557
4:01	10.412
4:02	11.267
4:03	12.122
4:04	12.976
4:05	13.831
4:06	14.686
4:07	15.541
4:08	16.396
4:09	17.251
4:10	18.106
4:11	18.961
4:12	19.816
4:13	20.670
4:14	21.525
4:15	22.380
4:16	23.235
4:17	24.090
4:18	22.968
4:19	21.847
4:20	20.725
4:21	19.604
4:22	18.482
4:23	17.361
4:24	16.239
4:25	15.118
4:26	13.996
4:27	12.874
4:28	11.753
4:29	10.631
4:30	9.510
4:31	8.388
4:32	7.267
4:33	6.145
4:34	5.024
4:35	4.918
4:36	4.812
4:37	4.707

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3:49	0.086
3:50	0.087
3:51	0.088
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3:53	0.090
3:54	0.091
3:55	0.091
3:56	0.092
3:57	0.093
3:58	0.093
3:59	0.094
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4:02	0.255
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4:04	0.398
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4:06	0.542
4:07	0.613
4:08	0.685
4:09	0.756
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4:11	0.899
4:12	0.971
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4:16	1.257
4:17	0.470
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4:19	0.306
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4:21	0.141
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3:57	1.0	
3:58	1.2	
3:59	1.4	
4:00	1.7	
4:01	2.0	
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4:03	2.8	
4:04	3.2	
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4:06	3.7	Max Q
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4:08	3.1	
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4:20	21.869	
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5:34	0.2

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4:57	3.312
4:58	3.256
4:59	3.211
5:00	3.165
5:01	3.109
5:02	3.064
5:03	3.018
5:04	2.962
5:05	2.916
5:06	2.871
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5:08	2.790
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6:14	0.1
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6:17	0.1

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5:38	2.079
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5:47	1.953
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5:52	1.897
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5:59	1.808
6:00	1.797
6:01	1.700
6:02	1.604
6:03	1.497
6:04	1.401
6:05	1.304
6:06	1.201
6:07	1.108
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6:10	0.810
6:11	0.717
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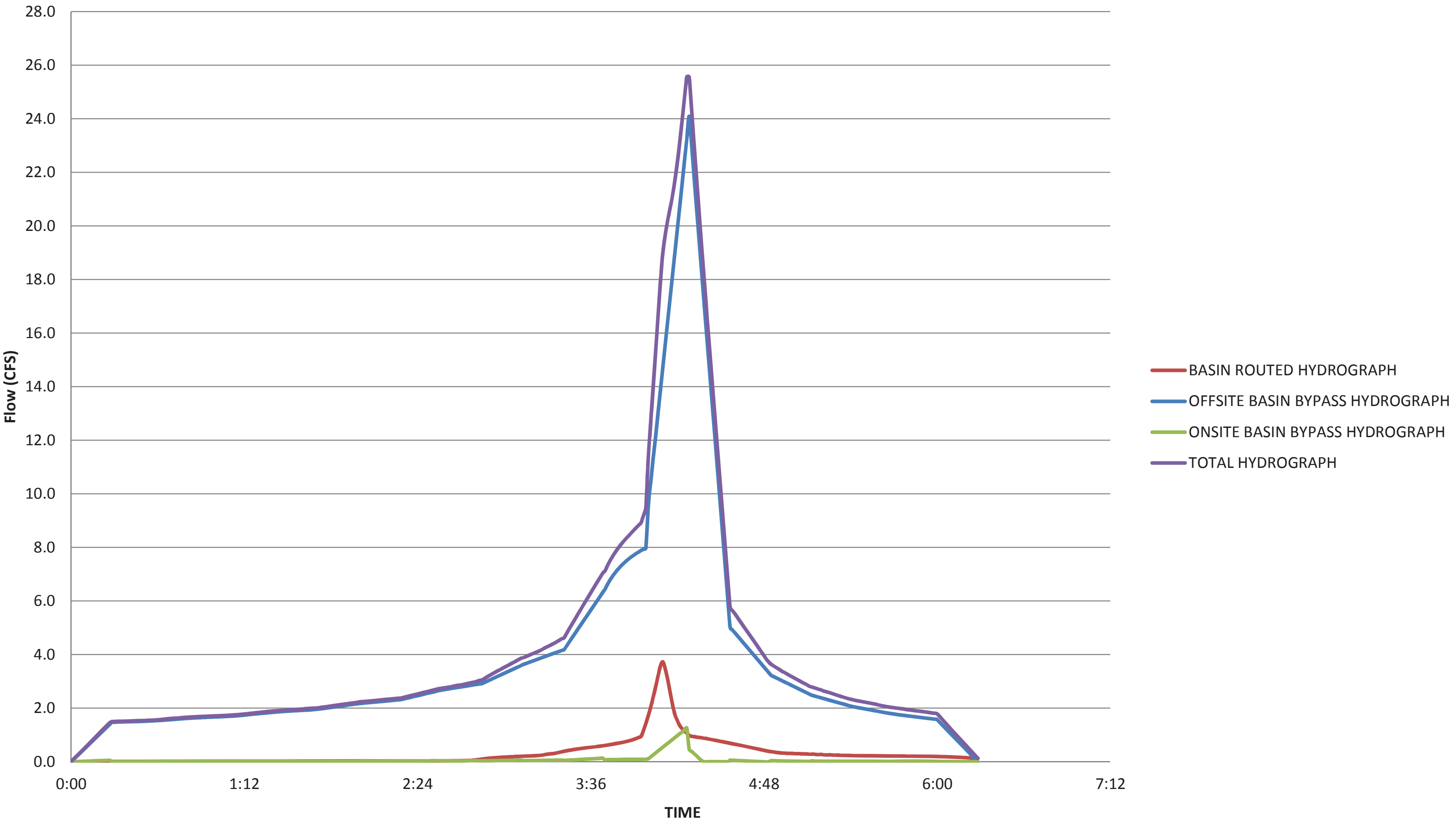
6:17	0.130

Developed Conditon Hydrograph



CHAPTER 3

MODIFIED-PULS DETENTION ROUTING

3.2 – Stage-Storage & Stage-Discharge Relationships

Stage-Storage Calculations

Elev (ft)	Area (ft^2)	Area (Ac)	Volume (Ac-ft)
0	800	0.0183655	0.0000
1	800	0.0183655	0.0184
2	800	0.0183655	0.0367
3	800	0.0183655	0.0551
4	800	0.0183655	0.0735

Outlet structure for Underground Detention System

Discharge vs Elevation Table

Low orifice:	0.675	"	Lower slot			Emergency Weir		
Number:	2		Invert:	2.250	ft	Invert:	3.500	ft
Cg-low:	0.61		B	0.75	ft	B:	3	ft
Middle orifice:	1	"	h	0.083	ft			
number of orif:	0		Upper slot					
Cg-middle:	0.61		Invert:	2.750	ft			
invert elev:	0.25	ft	B:	1.667	ft			
			h	0.083	ft			

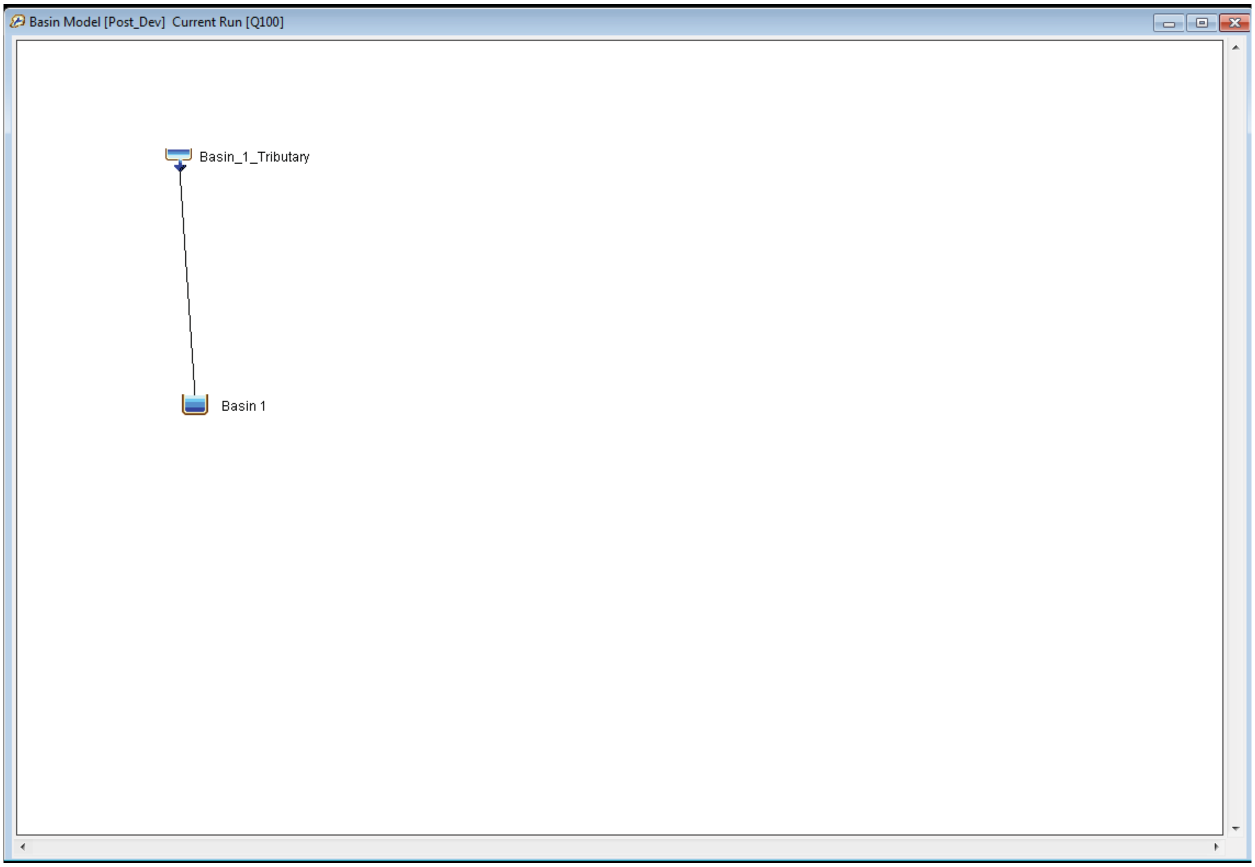
h (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qemer (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.100	1.778	0.000	0.007	0.008	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.200	3.556	0.000	0.010	0.012	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.010
0.300	5.333	0.600	0.013	0.113	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.400	7.111	1.800	0.015	0.148	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.015
0.500	8.889	3.000	0.017	0.167	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.017
0.600	10.667	4.200	0.018	0.184	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.018
0.700	12.444	5.400	0.020	0.199	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.020
0.800	14.222	6.600	0.021	0.214	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.900	16.000	7.800	0.023	0.227	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.023
1.000	17.778	9.000	0.024	0.240	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.024
1.100	19.556	10.200	0.025	0.252	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.025
1.200	21.333	11.400	0.026	0.263	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.026
1.300	23.111	12.600	0.027	0.274	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.027
1.400	24.889	13.800	0.028	0.285	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.028
1.500	26.667	15.000	0.030	0.295	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.030
1.600	28.444	16.200	0.031	0.305	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.031
1.700	30.222	17.400	0.031	0.315	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.031
1.800	32.000	18.600	0.032	0.324	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.032
1.900	33.778	19.800	0.033	0.333	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.033
2.000	35.556	21.000	0.034	0.342	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.034
2.100	37.333	22.200	0.035	0.350	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.035
2.200	39.111	23.400	0.036	0.359	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.036
2.300	40.889	24.600	0.037	0.367	0.037	0.000	0.000	0.000	0.026	0.000	0.000	0.063
2.400	42.667	25.800	0.037	0.375	0.037	0.000	0.000	0.000	0.101	0.000	0.000	0.138
2.500	44.444	27.000	0.038	0.383	0.038	0.000	0.000	0.000	0.140	0.000	0.000	0.178
2.600	46.222	28.200	0.039	0.390	0.039	0.000	0.000	0.000	0.170	0.000	0.000	0.209
2.700	48.000	29.400	0.040	0.398	0.040	0.000	0.000	0.000	0.196	0.000	0.000	0.235
2.800	49.778	30.600	0.041	0.405	0.041	0.000	0.000	0.000	0.218	0.058	0.000	0.316
2.900	51.556	31.800	0.041	0.412	0.041	0.000	0.000	0.000	0.239	0.224	0.000	0.504
3.000	53.333	33.000	0.042	0.419	0.042	0.000	0.000	0.000	0.257	0.310	0.000	0.610
3.100	55.111	34.200	0.043	0.426	0.043	0.000	0.000	0.000	0.275	0.378	0.000	0.695
3.200	56.889	35.400	0.043	0.433	0.043	0.000	0.000	0.000	0.292	0.434	0.000	0.769
3.300	58.667	36.600	0.044	0.440	0.044	0.000	0.000	0.000	0.307	0.485	0.000	0.836
3.400	60.444	37.800	0.045	0.447	0.045	0.000	0.000	0.000	0.322	0.530	0.000	0.897
3.500	62.222	39.000	0.045	0.453	0.045	0.000	0.000	0.000	0.336	0.572	0.000	0.954
3.600	64.000	40.200	0.046	0.460	0.046	0.000	0.000	0.000	0.350	0.611	0.294	1.301
3.700	65.778	41.400	0.047	0.466	0.047	0.000	0.000	0.000	0.363	0.648	0.832	1.890
3.800	67.556	42.600	0.047	0.473	0.047	0.000	0.000	0.000	0.376	0.683	1.528	2.634
3.900	69.333	43.800	0.048	0.479	0.048	0.000	0.000	0.000	0.388	0.716	2.353	3.504
4.000	71.111	45.000	0.048	0.485	0.048	0.000	0.000	0.000	0.400	0.747	3.288	4.484

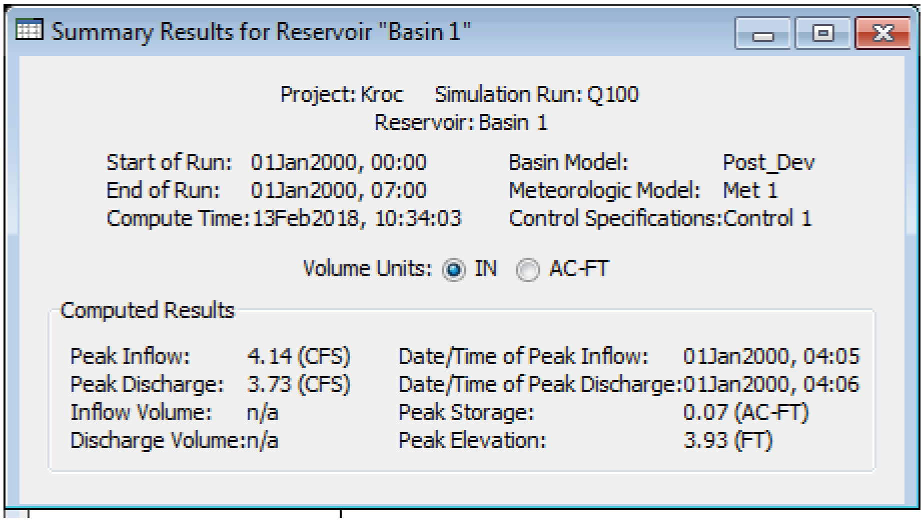
CHAPTER 3

MODIFIED-PULS DETENTION ROUTING

3.3 – HEC-HMS Modified-Puls Routing Results

HEC-HMS MODEL POC-1





Project: Kroc Simulation Run: Q100
Reservoir: Basin 1

Start of Run: 01Jan2000, 00:00
End of Run: 01Jan2000, 07:00
Compute Time: 13Feb2018, 10:34:03

Basin Model: Post_Dev
Meteorologic Model: Met 1
Control Specifications: Control 1

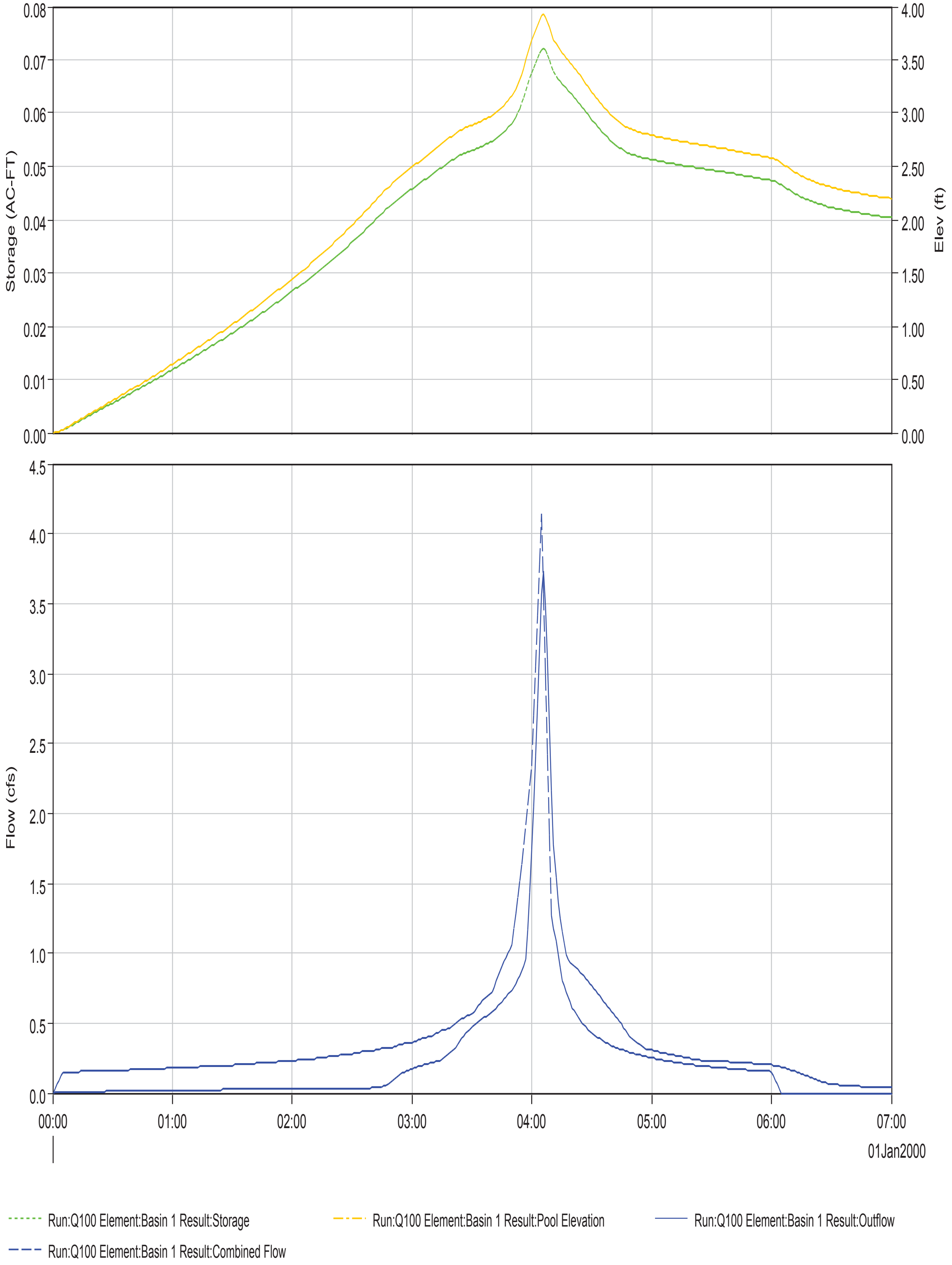
Volume Units: ● IN ○ AC-FT

Computed Results

Peak Inflow: 4.14 (CFS)
Peak Discharge: 3.73 (CFS)
Inflow Volume: n/a
Discharge Volume: n/a

Date/Time of Peak Inflow: 01Jan2000, 04:05
Date/Time of Peak Discharge: 01Jan2000, 04:06
Peak Storage: 0.07 (AC-FT)
Peak Elevation: 3.93 (FT)

Reservoir "Basin 1" Results for Run "Q100"



Project: Kroc Simulation Run: Q100
Reservoir: Basin 1

Start of Run: 01Jan2000, 00:00 Basin Model: Post_Dev
End of Run: 01Jan2000, 07:00 Meteorologic Model: Met 1
Compute Time: 13Feb2018, 10:34:03 Control Specifications:Control 1

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	00:00	0.00	0.00	0.00	0.00
01Jan2000	00:01	0.03	0.00	0.00	0.00
01Jan2000	00:02	0.06	0.00	0.00	0.00
01Jan2000	00:03	0.09	0.00	0.01	0.00
01Jan2000	00:04	0.12	0.00	0.02	0.00
01Jan2000	00:05	0.15	0.00	0.03	0.00
01Jan2000	00:06	0.15	0.00	0.04	0.00
01Jan2000	00:07	0.15	0.00	0.05	0.00
01Jan2000	00:08	0.15	0.00	0.06	0.00
01Jan2000	00:09	0.15	0.00	0.07	0.01
01Jan2000	00:10	0.15	0.00	0.08	0.01
01Jan2000	00:11	0.15	0.00	0.09	0.01
01Jan2000	00:12	0.15	0.00	0.10	0.01
01Jan2000	00:13	0.15	0.00	0.11	0.01
01Jan2000	00:14	0.15	0.00	0.13	0.01
01Jan2000	00:15	0.15	0.00	0.14	0.01
01Jan2000	00:16	0.15	0.00	0.15	0.01
01Jan2000	00:17	0.15	0.00	0.16	0.01
01Jan2000	00:18	0.16	0.00	0.17	0.01
01Jan2000	00:19	0.16	0.00	0.18	0.01
01Jan2000	00:20	0.16	0.00	0.19	0.01
01Jan2000	00:21	0.16	0.00	0.20	0.01
01Jan2000	00:22	0.16	0.00	0.21	0.01
01Jan2000	00:23	0.16	0.00	0.22	0.01
01Jan2000	00:24	0.16	0.00	0.23	0.01
01Jan2000	00:25	0.16	0.00	0.25	0.01

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	00:26	0.16	0.00	0.26	0.01
01Jan2000	00:27	0.16	0.00	0.27	0.01
01Jan2000	00:28	0.16	0.01	0.28	0.01
01Jan2000	00:29	0.16	0.01	0.29	0.01
01Jan2000	00:30	0.16	0.01	0.30	0.01
01Jan2000	00:31	0.16	0.01	0.31	0.01
01Jan2000	00:32	0.16	0.01	0.32	0.01
01Jan2000	00:33	0.16	0.01	0.33	0.01
01Jan2000	00:34	0.16	0.01	0.35	0.01
01Jan2000	00:35	0.16	0.01	0.36	0.01
01Jan2000	00:36	0.16	0.01	0.37	0.01
01Jan2000	00:37	0.16	0.01	0.38	0.01
01Jan2000	00:38	0.16	0.01	0.39	0.01
01Jan2000	00:39	0.16	0.01	0.40	0.02
01Jan2000	00:40	0.16	0.01	0.41	0.02
01Jan2000	00:41	0.17	0.01	0.42	0.02
01Jan2000	00:42	0.17	0.01	0.43	0.02
01Jan2000	00:43	0.17	0.01	0.45	0.02
01Jan2000	00:44	0.17	0.01	0.46	0.02
01Jan2000	00:45	0.17	0.01	0.47	0.02
01Jan2000	00:46	0.17	0.01	0.48	0.02
01Jan2000	00:47	0.17	0.01	0.49	0.02
01Jan2000	00:48	0.17	0.01	0.50	0.02
01Jan2000	00:49	0.17	0.01	0.51	0.02
01Jan2000	00:50	0.17	0.01	0.53	0.02
01Jan2000	00:51	0.17	0.01	0.54	0.02
01Jan2000	00:52	0.17	0.01	0.55	0.02
01Jan2000	00:53	0.17	0.01	0.56	0.02
01Jan2000	00:54	0.17	0.01	0.57	0.02
01Jan2000	00:55	0.18	0.01	0.58	0.02
01Jan2000	00:56	0.18	0.01	0.60	0.02

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	00:57	0.18	0.01	0.61	0.02
01Jan2000	00:58	0.18	0.01	0.62	0.02
01Jan2000	00:59	0.18	0.01	0.63	0.02
01Jan2000	01:00	0.18	0.01	0.64	0.02
01Jan2000	01:01	0.18	0.01	0.66	0.02
01Jan2000	01:02	0.18	0.01	0.67	0.02
01Jan2000	01:03	0.18	0.01	0.68	0.02
01Jan2000	01:04	0.18	0.01	0.69	0.02
01Jan2000	01:05	0.18	0.01	0.70	0.02
01Jan2000	01:06	0.18	0.01	0.72	0.02
01Jan2000	01:07	0.18	0.01	0.73	0.02
01Jan2000	01:08	0.18	0.01	0.74	0.02
01Jan2000	01:09	0.18	0.01	0.75	0.02
01Jan2000	01:10	0.18	0.01	0.76	0.02
01Jan2000	01:11	0.18	0.01	0.78	0.02
01Jan2000	01:12	0.19	0.01	0.79	0.02
01Jan2000	01:13	0.19	0.01	0.80	0.02
01Jan2000	01:14	0.19	0.01	0.81	0.02
01Jan2000	01:15	0.19	0.02	0.83	0.02
01Jan2000	01:16	0.19	0.02	0.84	0.02
01Jan2000	01:17	0.19	0.02	0.85	0.02
01Jan2000	01:18	0.19	0.02	0.86	0.02
01Jan2000	01:19	0.19	0.02	0.88	0.02
01Jan2000	01:20	0.19	0.02	0.89	0.02
01Jan2000	01:21	0.19	0.02	0.90	0.02
01Jan2000	01:22	0.19	0.02	0.91	0.02
01Jan2000	01:23	0.19	0.02	0.93	0.02
01Jan2000	01:24	0.20	0.02	0.94	0.02
01Jan2000	01:25	0.20	0.02	0.95	0.02
01Jan2000	01:26	0.20	0.02	0.97	0.02
01Jan2000	01:27	0.20	0.02	0.98	0.02

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	01:28	0.20	0.02	0.99	0.02
01Jan2000	01:29	0.20	0.02	1.00	0.02
01Jan2000	01:30	0.20	0.02	1.02	0.02
01Jan2000	01:31	0.20	0.02	1.03	0.02
01Jan2000	01:32	0.20	0.02	1.04	0.02
01Jan2000	01:33	0.20	0.02	1.06	0.02
01Jan2000	01:34	0.20	0.02	1.07	0.02
01Jan2000	01:35	0.21	0.02	1.08	0.02
01Jan2000	01:36	0.21	0.02	1.10	0.02
01Jan2000	01:37	0.21	0.02	1.11	0.03
01Jan2000	01:38	0.21	0.02	1.13	0.03
01Jan2000	01:39	0.21	0.02	1.14	0.03
01Jan2000	01:40	0.21	0.02	1.15	0.03
01Jan2000	01:41	0.21	0.02	1.17	0.03
01Jan2000	01:42	0.21	0.02	1.18	0.03
01Jan2000	01:43	0.21	0.02	1.19	0.03
01Jan2000	01:44	0.21	0.02	1.21	0.03
01Jan2000	01:45	0.22	0.02	1.22	0.03
01Jan2000	01:46	0.22	0.02	1.24	0.03
01Jan2000	01:47	0.22	0.02	1.25	0.03
01Jan2000	01:48	0.22	0.02	1.27	0.03
01Jan2000	01:49	0.22	0.02	1.28	0.03
01Jan2000	01:50	0.22	0.02	1.29	0.03
01Jan2000	01:51	0.22	0.02	1.31	0.03
01Jan2000	01:52	0.22	0.02	1.32	0.03
01Jan2000	01:53	0.22	0.02	1.34	0.03
01Jan2000	01:54	0.22	0.02	1.35	0.03
01Jan2000	01:55	0.23	0.03	1.37	0.03
01Jan2000	01:56	0.23	0.03	1.38	0.03
01Jan2000	01:57	0.23	0.03	1.40	0.03
01Jan2000	01:58	0.23	0.03	1.41	0.03

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	01:59	0.23	0.03	1.43	0.03
01Jan2000	02:00	0.23	0.03	1.44	0.03
01Jan2000	02:01	0.23	0.03	1.46	0.03
01Jan2000	02:02	0.23	0.03	1.47	0.03
01Jan2000	02:03	0.24	0.03	1.49	0.03
01Jan2000	02:04	0.24	0.03	1.51	0.03
01Jan2000	02:05	0.24	0.03	1.52	0.03
01Jan2000	02:06	0.24	0.03	1.54	0.03
01Jan2000	02:07	0.24	0.03	1.55	0.03
01Jan2000	02:08	0.24	0.03	1.57	0.03
01Jan2000	02:09	0.24	0.03	1.59	0.03
01Jan2000	02:10	0.24	0.03	1.60	0.03
01Jan2000	02:11	0.25	0.03	1.62	0.03
01Jan2000	02:12	0.25	0.03	1.63	0.03
01Jan2000	02:13	0.25	0.03	1.65	0.03
01Jan2000	02:14	0.25	0.03	1.67	0.03
01Jan2000	02:15	0.26	0.03	1.68	0.03
01Jan2000	02:16	0.26	0.03	1.70	0.03
01Jan2000	02:17	0.26	0.03	1.72	0.03
01Jan2000	02:18	0.26	0.03	1.73	0.03
01Jan2000	02:19	0.26	0.03	1.75	0.03
01Jan2000	02:20	0.26	0.03	1.77	0.03
01Jan2000	02:21	0.26	0.03	1.79	0.03
01Jan2000	02:22	0.26	0.03	1.80	0.03
01Jan2000	02:23	0.27	0.03	1.82	0.03
01Jan2000	02:24	0.27	0.03	1.84	0.03
01Jan2000	02:25	0.27	0.03	1.86	0.03
01Jan2000	02:26	0.27	0.03	1.87	0.03
01Jan2000	02:27	0.28	0.03	1.89	0.03
01Jan2000	02:28	0.28	0.04	1.91	0.03
01Jan2000	02:29	0.28	0.04	1.93	0.03

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	02:30	0.28	0.04	1.95	0.03
01Jan2000	02:31	0.28	0.04	1.97	0.03
01Jan2000	02:32	0.28	0.04	1.99	0.03
01Jan2000	02:33	0.29	0.04	2.00	0.03
01Jan2000	02:34	0.29	0.04	2.02	0.03
01Jan2000	02:35	0.29	0.04	2.04	0.03
01Jan2000	02:36	0.30	0.04	2.06	0.03
01Jan2000	02:37	0.30	0.04	2.08	0.03
01Jan2000	02:38	0.30	0.04	2.10	0.03
01Jan2000	02:39	0.30	0.04	2.12	0.04
01Jan2000	02:40	0.30	0.04	2.14	0.04
01Jan2000	02:41	0.30	0.04	2.16	0.04
01Jan2000	02:42	0.31	0.04	2.18	0.04
01Jan2000	02:43	0.31	0.04	2.20	0.04
01Jan2000	02:44	0.32	0.04	2.22	0.04
01Jan2000	02:45	0.32	0.04	2.24	0.05
01Jan2000	02:46	0.32	0.04	2.26	0.05
01Jan2000	02:47	0.32	0.04	2.28	0.06
01Jan2000	02:48	0.32	0.04	2.30	0.06
01Jan2000	02:49	0.33	0.04	2.32	0.08
01Jan2000	02:50	0.33	0.04	2.34	0.09
01Jan2000	02:51	0.33	0.04	2.36	0.10
01Jan2000	02:52	0.34	0.04	2.37	0.11
01Jan2000	02:53	0.34	0.04	2.39	0.13
01Jan2000	02:54	0.35	0.04	2.41	0.14
01Jan2000	02:55	0.35	0.04	2.42	0.14
01Jan2000	02:56	0.35	0.04	2.44	0.15
01Jan2000	02:57	0.36	0.05	2.45	0.16
01Jan2000	02:58	0.36	0.05	2.47	0.16
01Jan2000	02:59	0.36	0.05	2.48	0.17
01Jan2000	03:00	0.36	0.05	2.50	0.17

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	03:01	0.37	0.05	2.51	0.18
01Jan2000	03:02	0.37	0.05	2.52	0.18
01Jan2000	03:03	0.38	0.05	2.54	0.19
01Jan2000	03:04	0.39	0.05	2.55	0.19
01Jan2000	03:05	0.39	0.05	2.57	0.20
01Jan2000	03:06	0.40	0.05	2.58	0.20
01Jan2000	03:07	0.40	0.05	2.60	0.21
01Jan2000	03:08	0.40	0.05	2.61	0.21
01Jan2000	03:09	0.40	0.05	2.62	0.21
01Jan2000	03:10	0.41	0.05	2.64	0.22
01Jan2000	03:11	0.42	0.05	2.65	0.22
01Jan2000	03:12	0.42	0.05	2.67	0.23
01Jan2000	03:13	0.43	0.05	2.68	0.23
01Jan2000	03:14	0.44	0.05	2.70	0.23
01Jan2000	03:15	0.45	0.05	2.71	0.24
01Jan2000	03:16	0.45	0.05	2.73	0.25
01Jan2000	03:17	0.46	0.05	2.74	0.27
01Jan2000	03:18	0.46	0.05	2.76	0.28
01Jan2000	03:19	0.47	0.05	2.77	0.29
01Jan2000	03:20	0.47	0.05	2.78	0.30
01Jan2000	03:21	0.48	0.05	2.80	0.31
01Jan2000	03:22	0.49	0.05	2.81	0.33
01Jan2000	03:23	0.51	0.05	2.82	0.35
01Jan2000	03:24	0.52	0.05	2.83	0.37
01Jan2000	03:25	0.53	0.05	2.84	0.39
01Jan2000	03:26	0.54	0.05	2.85	0.41
01Jan2000	03:27	0.54	0.05	2.86	0.43
01Jan2000	03:28	0.55	0.05	2.87	0.44
01Jan2000	03:29	0.56	0.05	2.88	0.46
01Jan2000	03:30	0.56	0.05	2.89	0.47
01Jan2000	03:31	0.58	0.05	2.89	0.48

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	03:32	0.60	0.05	2.90	0.50
01Jan2000	03:33	0.62	0.05	2.91	0.51
01Jan2000	03:34	0.64	0.05	2.92	0.52
01Jan2000	03:35	0.66	0.05	2.93	0.53
01Jan2000	03:36	0.67	0.05	2.94	0.54
01Jan2000	03:37	0.68	0.05	2.95	0.55
01Jan2000	03:38	0.70	0.05	2.96	0.56
01Jan2000	03:39	0.71	0.05	2.97	0.57
01Jan2000	03:40	0.72	0.05	2.98	0.58
01Jan2000	03:41	0.76	0.05	2.99	0.59
01Jan2000	03:42	0.80	0.06	3.00	0.61
01Jan2000	03:43	0.84	0.06	3.02	0.62
01Jan2000	03:44	0.87	0.06	3.04	0.64
01Jan2000	03:45	0.91	0.06	3.05	0.65
01Jan2000	03:46	0.94	0.06	3.07	0.67
01Jan2000	03:47	0.97	0.06	3.10	0.69
01Jan2000	03:48	1.00	0.06	3.12	0.70
01Jan2000	03:49	1.03	0.06	3.14	0.72
01Jan2000	03:50	1.06	0.06	3.16	0.74
01Jan2000	03:51	1.17	0.06	3.19	0.76
01Jan2000	03:52	1.29	0.06	3.23	0.78
01Jan2000	03:53	1.40	0.06	3.27	0.81
01Jan2000	03:54	1.52	0.06	3.31	0.84
01Jan2000	03:55	1.63	0.06	3.37	0.87
01Jan2000	03:56	1.78	0.06	3.43	0.91
01Jan2000	03:57	1.92	0.06	3.50	0.95
01Jan2000	03:58	2.06	0.07	3.57	1.17
01Jan2000	03:59	2.20	0.07	3.63	1.44
01Jan2000	04:00	2.34	0.07	3.68	1.73
01Jan2000	04:01	2.70	0.07	3.73	2.04
01Jan2000	04:02	3.06	0.07	3.77	2.41

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	04:03	3.42	0.07	3.82	2.79
01Jan2000	04:04	3.78	0.07	3.87	3.18
01Jan2000	04:05	4.14	0.07	3.91	3.57
01Jan2000	04:06	3.57	0.07	3.93	3.73
01Jan2000	04:07	2.99	0.07	3.90	3.48
01Jan2000	04:08	2.42	0.07	3.86	3.10
01Jan2000	04:09	1.85	0.07	3.80	2.63
01Jan2000	04:10	1.28	0.07	3.74	2.16
01Jan2000	04:11	1.18	0.07	3.69	1.78
01Jan2000	04:12	1.09	0.07	3.65	1.55
01Jan2000	04:13	0.99	0.07	3.62	1.36
01Jan2000	04:14	0.90	0.07	3.59	1.24
01Jan2000	04:15	0.80	0.07	3.56	1.15
01Jan2000	04:16	0.76	0.07	3.54	1.07
01Jan2000	04:17	0.72	0.06	3.52	0.99
01Jan2000	04:18	0.69	0.06	3.50	0.95
01Jan2000	04:19	0.65	0.06	3.48	0.94
01Jan2000	04:20	0.61	0.06	3.45	0.92
01Jan2000	04:21	0.59	0.06	3.43	0.91
01Jan2000	04:22	0.56	0.06	3.41	0.90
01Jan2000	04:23	0.54	0.06	3.38	0.88
01Jan2000	04:24	0.52	0.06	3.35	0.87
01Jan2000	04:25	0.50	0.06	3.33	0.85
01Jan2000	04:26	0.48	0.06	3.30	0.83
01Jan2000	04:27	0.47	0.06	3.28	0.82
01Jan2000	04:28	0.46	0.06	3.25	0.80
01Jan2000	04:29	0.44	0.06	3.22	0.78
01Jan2000	04:30	0.43	0.06	3.20	0.76
01Jan2000	04:31	0.42	0.06	3.17	0.75
01Jan2000	04:32	0.41	0.06	3.15	0.73
01Jan2000	04:33	0.40	0.06	3.13	0.71

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	04:34	0.39	0.06	3.10	0.69
01Jan2000	04:35	0.38	0.06	3.08	0.67
01Jan2000	04:36	0.37	0.06	3.06	0.66
01Jan2000	04:37	0.36	0.06	3.04	0.64
01Jan2000	04:38	0.35	0.06	3.02	0.62
01Jan2000	04:39	0.35	0.06	3.00	0.60
01Jan2000	04:40	0.34	0.05	2.98	0.58
01Jan2000	04:41	0.33	0.05	2.96	0.56
01Jan2000	04:42	0.33	0.05	2.94	0.55
01Jan2000	04:43	0.32	0.05	2.93	0.53
01Jan2000	04:44	0.32	0.05	2.91	0.51
01Jan2000	04:45	0.31	0.05	2.90	0.49
01Jan2000	04:46	0.30	0.05	2.89	0.47
01Jan2000	04:47	0.30	0.05	2.87	0.45
01Jan2000	04:48	0.30	0.05	2.86	0.43
01Jan2000	04:49	0.29	0.05	2.85	0.41
01Jan2000	04:50	0.29	0.05	2.85	0.39
01Jan2000	04:51	0.28	0.05	2.84	0.38
01Jan2000	04:52	0.28	0.05	2.83	0.37
01Jan2000	04:53	0.27	0.05	2.83	0.35
01Jan2000	04:54	0.27	0.05	2.82	0.34
01Jan2000	04:55	0.27	0.05	2.81	0.33
01Jan2000	04:56	0.26	0.05	2.81	0.32
01Jan2000	04:57	0.26	0.05	2.81	0.32
01Jan2000	04:58	0.26	0.05	2.80	0.31
01Jan2000	04:59	0.25	0.05	2.80	0.31
01Jan2000	05:00	0.25	0.05	2.79	0.31
01Jan2000	05:01	0.25	0.05	2.79	0.30
01Jan2000	05:02	0.24	0.05	2.78	0.30
01Jan2000	05:03	0.24	0.05	2.78	0.30
01Jan2000	05:04	0.24	0.05	2.78	0.29

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	05:05	0.24	0.05	2.77	0.29
01Jan2000	05:06	0.23	0.05	2.77	0.29
01Jan2000	05:07	0.23	0.05	2.76	0.28
01Jan2000	05:08	0.23	0.05	2.76	0.28
01Jan2000	05:09	0.22	0.05	2.76	0.28
01Jan2000	05:10	0.22	0.05	2.75	0.27
01Jan2000	05:11	0.22	0.05	2.75	0.27
01Jan2000	05:12	0.22	0.05	2.75	0.27
01Jan2000	05:13	0.22	0.05	2.74	0.26
01Jan2000	05:14	0.21	0.05	2.74	0.26
01Jan2000	05:15	0.21	0.05	2.73	0.26
01Jan2000	05:16	0.21	0.05	2.73	0.26
01Jan2000	05:17	0.21	0.05	2.73	0.25
01Jan2000	05:18	0.21	0.05	2.72	0.25
01Jan2000	05:19	0.20	0.05	2.72	0.25
01Jan2000	05:20	0.20	0.05	2.72	0.24
01Jan2000	05:21	0.20	0.05	2.71	0.24
01Jan2000	05:22	0.20	0.05	2.71	0.24
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01Jan2000	05:24	0.20	0.05	2.71	0.24
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01Jan2000	05:26	0.19	0.05	2.70	0.23
01Jan2000	05:27	0.19	0.05	2.70	0.23
01Jan2000	05:28	0.19	0.05	2.69	0.23
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01Jan2000	05:31	0.18	0.05	2.68	0.23
01Jan2000	05:32	0.18	0.05	2.68	0.23
01Jan2000	05:33	0.18	0.05	2.68	0.23
01Jan2000	05:34	0.18	0.05	2.67	0.23
01Jan2000	05:35	0.18	0.05	2.67	0.23

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	05:36	0.18	0.05	2.67	0.22
01Jan2000	05:37	0.18	0.05	2.66	0.22
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01Jan2000	05:46	0.17	0.05	2.63	0.22
01Jan2000	05:47	0.16	0.05	2.63	0.21
01Jan2000	05:48	0.16	0.05	2.62	0.21
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01Jan2000	05:51	0.16	0.05	2.61	0.21
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01Jan2000	05:53	0.16	0.05	2.60	0.21
01Jan2000	05:54	0.16	0.05	2.60	0.21
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01Jan2000	05:56	0.16	0.05	2.59	0.21
01Jan2000	05:57	0.16	0.05	2.59	0.20
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01Jan2000	06:00	0.15	0.05	2.58	0.20
01Jan2000	06:01	0.12	0.05	2.57	0.20
01Jan2000	06:02	0.09	0.05	2.57	0.20
01Jan2000	06:03	0.06	0.05	2.56	0.19
01Jan2000	06:04	0.03	0.05	2.55	0.19
01Jan2000	06:05	0.00	0.05	2.53	0.19
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Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
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01Jan2000	06:10	0.00	0.05	2.47	0.16
01Jan2000	06:11	0.00	0.05	2.46	0.16
01Jan2000	06:12	0.00	0.04	2.44	0.15
01Jan2000	06:13	0.00	0.04	2.43	0.15
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01Jan2000	06:17	0.00	0.04	2.39	0.13
01Jan2000	06:18	0.00	0.04	2.38	0.12
01Jan2000	06:19	0.00	0.04	2.37	0.11
01Jan2000	06:20	0.00	0.04	2.37	0.11
01Jan2000	06:21	0.00	0.04	2.36	0.10
01Jan2000	06:22	0.00	0.04	2.35	0.10
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01Jan2000	06:32	0.00	0.04	2.29	0.06
01Jan2000	06:33	0.00	0.04	2.29	0.06
01Jan2000	06:34	0.00	0.04	2.29	0.06
01Jan2000	06:35	0.00	0.04	2.28	0.06
01Jan2000	06:36	0.00	0.04	2.28	0.06
01Jan2000	06:37	0.00	0.04	2.27	0.05

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	06:38	0.00	0.04	2.27	0.05
01Jan2000	06:39	0.00	0.04	2.26	0.05
01Jan2000	06:40	0.00	0.04	2.26	0.05
01Jan2000	06:41	0.00	0.04	2.26	0.05
01Jan2000	06:42	0.00	0.04	2.25	0.05
01Jan2000	06:43	0.00	0.04	2.25	0.05
01Jan2000	06:44	0.00	0.04	2.25	0.05
01Jan2000	06:45	0.00	0.04	2.24	0.05
01Jan2000	06:46	0.00	0.04	2.24	0.05
01Jan2000	06:47	0.00	0.04	2.24	0.04
01Jan2000	06:48	0.00	0.04	2.23	0.04
01Jan2000	06:49	0.00	0.04	2.23	0.04
01Jan2000	06:50	0.00	0.04	2.23	0.04
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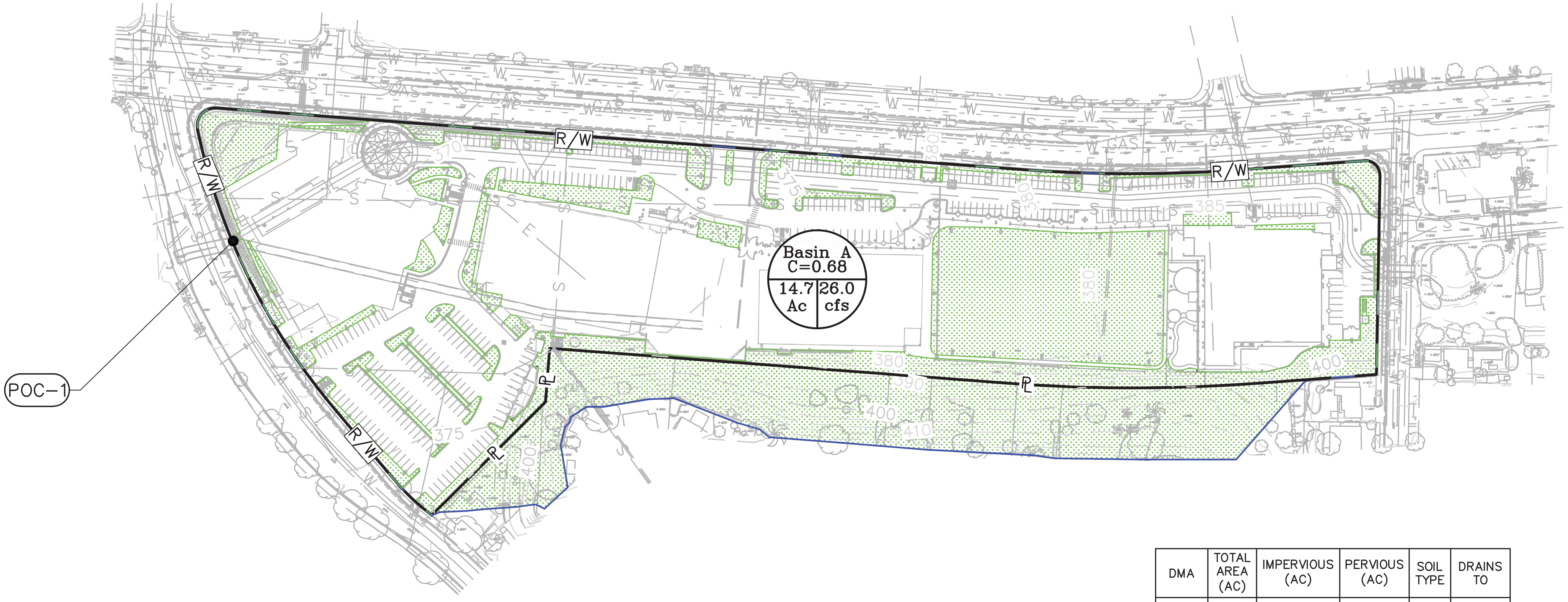
01Jan2000	06:52	0.00	0.04	2.22	0.04
01Jan2000	06:53	0.00	0.04	2.22	0.04
01Jan2000	06:54	0.00	0.04	2.21	0.04
01Jan2000	06:55	0.00	0.04	2.21	0.04
01Jan2000	06:56	0.00	0.04	2.21	0.04
01Jan2000	06:57	0.00	0.04	2.21	0.04
01Jan2000	06:58	0.00	0.04	2.20	0.04
01Jan2000	06:59	0.00	0.04	2.20	0.04
01Jan2000	07:00	0.00	0.04	2.20	0.04

APPENDIX 1

Developed Conditions Exhibit

SAVE DATE: 4/7/2017 ~ PLOT DATE: 4/18/2017 ~ FILE NAME: P:\Acad\1290 Kroc Center\Reports\Drainage Study\PRE-Condition Map.dwg



DMA	TOTAL AREA (AC)	IMPERVIOUS (AC)	PERVIOUS (AC)	SOIL TYPE	DRAINS TO
1	14.72	8.82	5.90		

SCALE: 1" = 100'

LEGEND

PERVIOUS AREA 🟩

SOILS BOUNDARY ▬ ▬ ▬ ▬

BASIN LIMITS ──────

SUB-BASIN BOUNDARY ▬ ▬ ▬ ▬

PROPERTY BOUNDARY ──PL── ── ── ────

NODE NUMBER ●─(1)

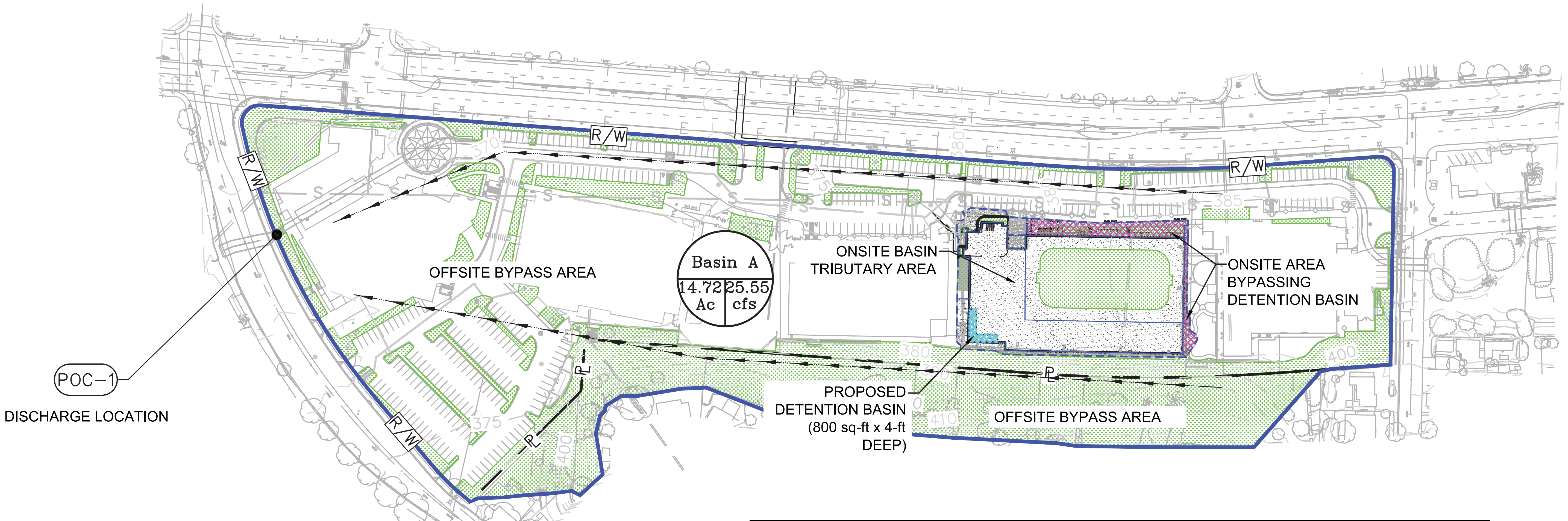
FLOW-LINE ←←←

R·E·C
Consultants, Inc.

Civil Engineering · Environmental
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

PRE CONDITIONS

KROC CENTER
SAN DIEGO CALIFORNIA



AREAS	TOTAL AREA (AC)	IMPERVIOUS AREA (AC)	PERVIOUS AREA (AC)	FLOWS TO	DISCHARGE LOCATION
OFFSITE BYPASS AREA	13.24	8.72	4.52	BYPASS	POC-1
BASIN TRIBUTARY AREA	1.32	0.9	0.42	DETENTION BASIN	
ONSITE BYPASS AREA	0.16	0.1	0.06	BYPASS	
TOTAL	14.72	9.72	5.00	-	

LEGEND

PERVIOUS AREA	🟩	NEW IMPERVIOUS AREA	▒
BASIN LIMITS	━━━	ONSITE BYPASS AREAS	▨
PROPOSED DEVELOPMENT LIMITS (ONSITE AREAS)	━ ━ ━	PROPERTY BOUNDARY	—℄—
		FLOW–LINE	←—·—←

SCALE: 1" = 100'

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San Diego, CA 92101
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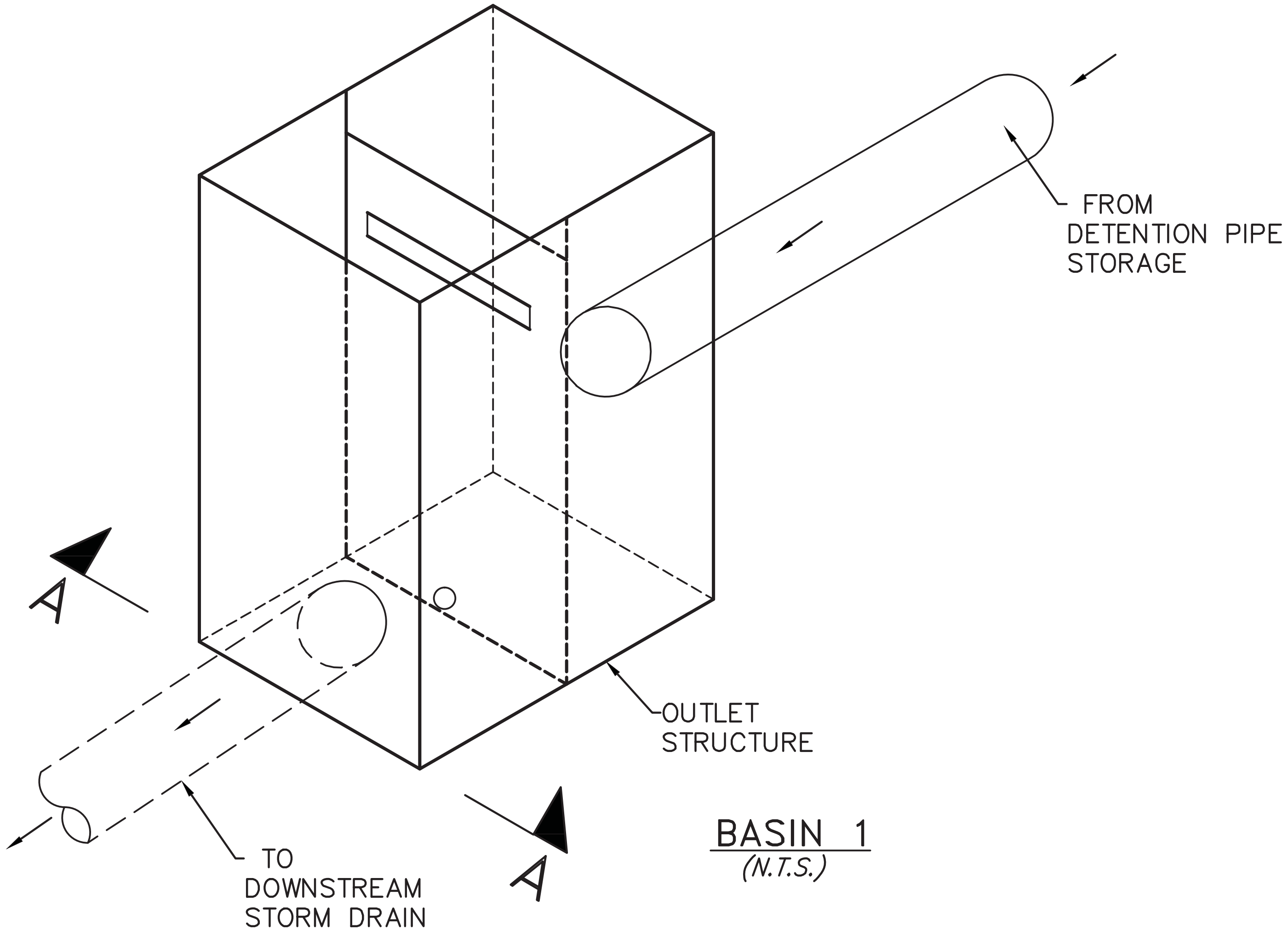
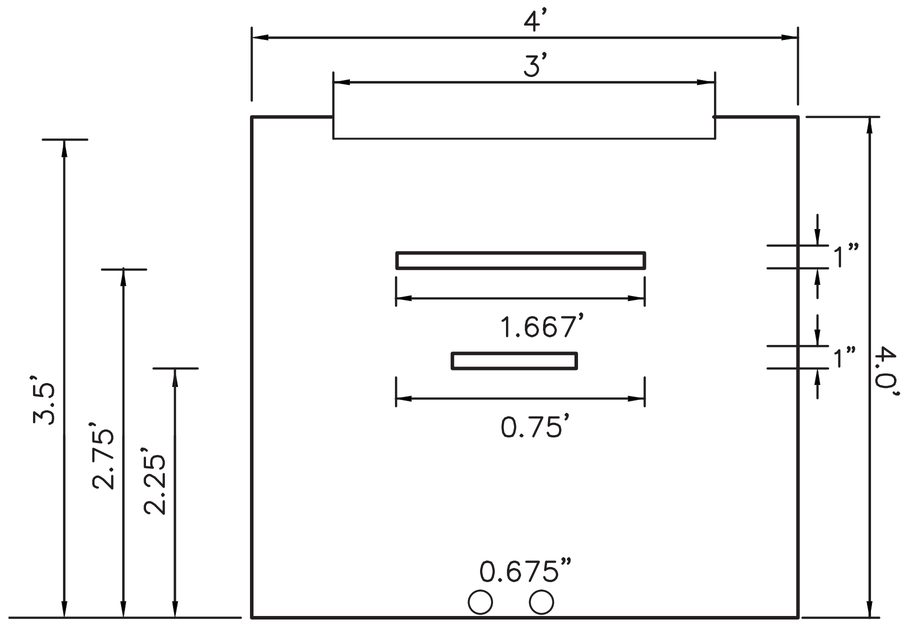
PROPOSED CONDITIONS

KROC CENTER
SAN DIEGO CALIFORNIA



BASIN 1
(N.T.S.)



SECTION A–A
(N.T.S.)

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BASIN 1 DETAIL

NTS

Attachment 6
Geotechnical and Groundwater Investigation Report

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

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GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

GEOTECHNICAL INVESTIGATION

KROC II – WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

PREPARED FOR

THE SALVATION ARMY
SAN DIEGO, CALIFORNIA

MAY 5, 2017
PROJECT NO. 06151-42-05

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. 06151-42-05
May 5, 2017

The Salvation Army
Ray and Joan Kroc Community Center
6845 University Avenue
San Diego, California 92115

Attention: Mr. Kevin Forrey

Subject: GEOTECHNICAL INVESTIGATION
KROC II – WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

Dear Mr. Forrey

In accordance with your request and authorization of our proposal (LG-16043, revised date August 29, 2016), we herein submit the results of our geotechnical investigation for the subject project. We performed our investigation to evaluate the underlying soil and geologic conditions and potential geologic hazards and to assist in the design of the proposed building and associated improvements.

The accompanying report presents the results of our study and conclusions and recommendations pertaining to the geotechnical aspects of the proposed project. The site is suitable for the proposed building and improvements provided the recommendations of this report are incorporated into the design and construction of the planned project.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Noel G. Borja
Senior Staff Engineer

Rodney C. Mikesell
GE 2533

Garry W. Cannon
CEG 2201
RCE 56468

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REGISTERED PROFESSIONAL ENGINEER
GARRY WELLS CANNON
No. C 056468
CIVIL
STATE OF CALIFORNIA

NGB:RCM:GWC:ejc

(1) Addressee
(3/del) REC Consultants, Inc.
Attention: Mr. Jason Evans

TABLE OF CONTENTS

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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the proposed new wellness center/gymnasium within The Salvation Army Ray and Joan Kroc Community Center located at 6845 University Avenue in San Diego, California (see Vicinity Map, Figure 1). The purpose of this geotechnical investigation is to evaluate the surface and subsurface soil conditions; general site geology; and to identify geotechnical constraints that may impact the planned improvements to the property. This report also provides grading and foundation recommendations, retaining wall design criteria, and storm water management recommendations.

To aid in preparing this report, we reviewed the as-graded report prepared by Geocon Incorporated titled *Final Report of Testing and Observation Services During Site Grading, The Salvation Army Ray and Joan Kroc Community Center*, *San Diego, California*, dated July 31, 2001 (Project No. 06151-42-04).

The field investigation consisted of drilling two, small-diameter borings to evaluate the underlying geologic conditions within the area of planned improvements and performing 5 infiltration tests for storm water management recommendations.

The locations of the small-diameter borings and infiltration tests are shown the *Geologic Map*, Figure 2, and on the *Geologic Cross-Sections*, Figure 3. The base map used for Figure 2 is an AutoCAD file provided by REC Consultants, Inc.. Logs of the exploratory borings and a detailed discussion of the field investigation are presented in Appendix A.

We performed laboratory tests on selected soil samples obtained during the field investigation to evaluate pertinent physical properties for engineering analyses and to assist in providing recommendations for site grading and foundation design criteria. Details of the laboratory testing and a summary of test results are presented in Appendix B.

The conclusions and recommendations presented herein are based on analyses of the data obtained from the field investigation, laboratory tests, and our experience with similar soil and geologic conditions.

2. SITE AND PROJECT DESCRIPTION

The proposed new wellness center/gymnasium is planned within the existing recreation/soccer field that is situated between the family enhancement/administration center building and the gymnasium. The site is bordered to the north by a parking lot, to the west by the gymnasium building, the east by the family enhancement/administration center building, and to the south by a natural hillside slope and residential properties. Existing grade slopes from east to west with elevations varying from approximately 385 feet Mean Sea Level (MSL) at the east end to approximately 375 feet MSL at the west end.

Based on our understanding of the project, proposed development will consist of constructing a new two-story, 19,000-square-foot wellness center/gymnasium. The center will include an on-grade parking level with a new sports field above the parking level. Cuts up to approximately 8 feet are planned at the east end and fills of approximately 3 feet at the west end to achieve finish pad grade. We expect the eastern building wall will also function as a retaining wall.

The above locations, site descriptions, and proposed development are based on our site reconnaissance, review of published geologic literature, field investigations, and discussions with the project civil engineer. If development plans differ from those described herein, Geocon Incorporated should be contacted for review of the plans and possible revisions to this report.

3. PREVIOUS GRADING

The overall community center was previously graded between June 2000 and July 2001. While previous grading resulted in complete removal of undocumented fill and replacement with compacted fill within building pads, the soccer field only received cuts within the undocumented fill to create a gently sloped sheet graded pad. A summary of previous grading for the community center is contained in the referenced Geocon July 2001 report.

4. SOIL AND GEOLOGIC CONDITIONS

Based on previous geotechnical studies performed for the overall community center, observations during previous grading, and exploratory borings performed for our recent field investigation, the property is underlain by undocumented fill overlying alluvium and bedrock soils consisting of the Stadium Conglomerate. Compacted fill placed during original grading of the overall community center is surrounds the site. A description of the surficial soils and bedrock unit are discussed below. The approximate occurrence and thickness of the units are shown on the Geologic Map (Figure 2) and Geologic Cross-Sections (Figure 3). We prepared the geologic cross-sections using information from previous grading and interpolation between exploratory borings; therefore, actual geologic conditions between the borings may vary from those illustrated.

4.1 Undocumented Fill (Qudf)

We encountered approximately 6 to 7 feet of undocumented fill in borings performed for this study. The fill generally consists of silty to clayey sand with gravel and cobble. Laboratory tests indicate the fill has a low expansion potential. The undocumented fill is not suitable for support of additional fill or settlement sensitive structures and should be completely removed and replaced as compacted fill.

4.2 Compacted Fill (Qcf)

Compacted fill placed during previous grading is present along the perimeter of the site. Geocon Incorporated performed observation and compaction testing during previous grading. A summary of grading and compaction test results are presented in Geocon's referenced July 2001 report.

4.3 Alluvium (Qal)

Alluvial soil was observed below the undocumented fill in the exploratory borings performed for this study. Additionally, based on elevations taken during previous grading at the bottom of removals for the adjacent family enhancement/administrative center building to the west, we expect alluvium extends to depths between 6 to 16 feet below current site elevations. The alluvium generally consists of stiff, moist, sandy clay with varying gravel and cobble content. The alluvium is not suitable for support of additional fill or settlement sensitive structures and will require complete removed and replacement as compacted fill.

4.4 Stadium Conglomerate (Tst)

We observed Stadium Conglomerate underlying the surficial deposits in both borings at a depth of approximately 9 feet. The Stadium Conglomerate consists of very dense, silty sand conglomerate. The Stadium Conglomerate can be cemented and may require heavy ripping/excavation effort. We encountered refusal to the drill auger at a depth of approximately 11 feet at both boring locations. The Stadium Conglomerate is suitable for support of structural fill soil and foundation loads.

5. GROUNDWATER

We did not encounter groundwater during drilling for this site investigation; however, groundwater was encountered perched on the underlying bedrock contact during previous grading. Additionally, borings performed recently for new improvements within the community center west of the site encountered groundwater at depths between 7 and 10 feet. Groundwater or seepage will likely be encountered near the bedrock contact during remedial grading. Groundwater management/dewatering will likely be required at the base of removals, especially if grading occurs during the rainy season or shortly after periods of rain.

It is not uncommon for seepage conditions to exist within the near surface elevations or develop where none previously existed. Seepage is dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

The City of San Diego (2008), Sheet 22 defines the site as Hazard Category 53: *Level or sloping terrain, unfavorable geologic structure, low to moderate risk*. Along the northern perimeter of the community center, Hazard Category 32 is mapped. Hazard Category 32 is defined under liquefaction as *Low Potential – fluctuating groundwater minor drainages*. It is our opinion the site has favorable geologic structure with respect to geologic hazards.

6.2 Faulting and Ground Rupture

The site is not located within a State of California Earthquake Fault Zone. Our review of USGS (2016), Kennedy & Tan (2008), and City of San Diego (2008) shows that there are no active, presumed-active, or inactive faults trending toward or transecting the site. The nearest active fault is the Newport-Inglewood/Rose Canyon Fault Zone, which is located approximately 4 miles west of the site. The risk associated with ground rupture hazard is low due to the absence of active faults on the property.

6.3 Seismicity

We performed a deterministic seismic hazard analysis using Risk Engineering (2015). Six known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. The nearest known active faults are the Newport-Inglewood/Rose Canyon Fault system, located approximately 7 miles west of the site and is the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood/Rose Canyon Fault Zone or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood Fault are 7.5 and 0.32g, respectively. Table 6.3.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for these and other faults in relationship to the site location. We used acceleration attenuation relationships developed by Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2007) NGA USGS 2008 acceleration-attenuation relationships in our analysis.

TABLE 6.3.1
DETERMINISTIC SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2007 (g)
Newport-Inglewood	7	7.5	0.28	0.26	0.32
Rose Canyon	7	6.9	0.23	0.24	0.25
Coronado Bank	19	7.4	0.16	0.12	0.14
Palos Verdes Connected	19	7.7	0.18	0.13	0.17
Elsinore	35	7.85	0.12	0.09	0.11
Earthquake Valley	40	6.8	0.07	0.05	0.04

It is our opinion the site could be subjected to moderate to severe ground shaking in the event of an earthquake along any of the faults listed on Table 6.3.1 or other faults in the southern California/ northern Baja California region. We do not consider the site to possess a greater risk than that of the surrounding developments.

We performed a probabilistic seismic hazard analysis for the site using Risk Engineering (2015). The computer program operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program accounts for earthquake magnitude as a function of fault rupture length, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 in the analysis. Table 6.3.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.3.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2007 (g)
2% in a 50 Year Period	0.37	0.37	0.42
5% in a 50 Year Period	0.26	0.26	0.28
10% in a 50 Year Period	0.19	0.19	0.20

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the 2016 California Building Code (CBC) guidelines or guidelines currently adopted by the City of San Diego.

6.4 Liquefaction

Based on observations during previous grading, and considering that the undocumented fill and alluvium within the building pad will be removed and replaced as compacted fill, the risk associated with liquefaction is low.

6.5 Landslides

We did not observe indications of landsliding or landslide deposits during this investigation. It is our opinion landslides are not present within the subject property or in an area that could affect the project. The risk associated with landslide hazard is low.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 From a geotechnical engineering standpoint, it is our opinion that the site is suitable for development of the proposed project provided the recommendations presented herein are implemented in design and construction of the project.

7.1.2 The site is underlain by undocumented fill and alluvium overlying the Stadium Conglomerate. Compacted fill exists along the perimeter of the site. The undocumented fill and alluvium is unsuitable for support of additional fill or proposed improvements and will require remedial grading consisting of complete removal and recompaction. The Stadium Conglomerate is suitable for support of the planned improvements.

7.1.3 The site is located approximately 7 miles from the nearest active fault, the Newport-Inglewood/Rose Canyon Fault Zone. It is our opinion that active or potentially active faults do not cross the site.

7.1.4 The risk associated with geologic hazards due to ground rupture, liquefaction, and landslides are low.

7.1.5 We did not encounter groundwater during our field investigation; however, seepage was observed during grading for the community center. Groundwater management/dewatering will likely be required at the base of removals, especially if grading occurs during the rainy season or shortly after periods of rain.

7.1.6 Subsurface conditions observed may be extrapolated to reflect general soil and geologic conditions; however, variations in subsurface conditions between exploratory borings should be expected.

7.1.7 With the exception of retaining wall drains, we do not expect other subdrains are required for this project.

7.2 Excavation and Soil Characteristics

7.2.1 Excavation of the undocumented fill and alluvium should be possible with moderate to heavy effort using conventional, heavy-duty equipment during grading and trenching operations. Excavations into the Stadium Conglomerate will likely require very heavy effort to excavate.

7.2.2 The soil encountered in our field investigation is considered to be both “non-expansive” (Expansion Index [EI] of 20 or less) and “expansive” (EI greater than 20) as defined by 2016 California Building Code (CBC) Section 1803.5.3. Table 7.2 presents soil classifications based on the expansion index.

TABLE 7.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	Expansion Classification	2016 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

7.2.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Appendix B presents the results from the laboratory water-soluble sulfate content tests. The test results indicate that on-site materials at the locations tested possess “Not Applicable” and “S0” sulfate exposure to concrete structures, as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19. The presence of water-soluble sulfates is not a visually discernible characteristic. Therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e. addition of fertilizers and other soil nutrients) may affect the concentration.

7.2.4 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, if improvements that could be susceptible to corrosion are planned, further evaluation by a corrosion engineer may be needed.

7.3 Temporary Excavations

7.3.1 It is the responsibility of the contractor to provide a safe excavation during the construction of the proposed project. Geocon Incorporated cannot be responsible for site safety and the stability of the proposed excavations.

7.3.2 Temporary slopes should be made in conformance with OSHA requirements. The undocumented and compacted fill can be considered Type B Soil (Type C where groundwater or seepage is encountered) in accordance with OSHA requirements. In general, no special shoring requirement will be necessary if temporary excavations will be less than 4 feet high. Temporary excavations greater than 4 feet high should be laid back at an appropriate inclination. Surcharge loads should not be permitted within a distance equal to the height of the excavation from the top of the excavation.

7.3.3 The top of the excavation should be at least 15 feet from the edge of the existing building foundations. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

7.4 Grading

7.4.1 All grading should be performed in accordance with the *Recommended Grading Specifications* contained in Appendix D. Where the recommendations of Appendix D conflict with this section of the report, the recommendations of this section take precedence.

7.4.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner or developer, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

7.4.3 Grading should be performed in conjunction with the observation and compaction testing services of Geocon Incorporated. Fill soil should be observed on a full-time basis during placement and tested to check in-place dry density and moisture content.

7.4.4 Site preparation should begin with removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soil to be used for fill is relatively free of organic matter. Deleterious material generated during stripping and/or site demolition should be exported from the site.

7.4.5 Abandoned utilities should be removed and the subsequent depressions and/or trenches backfilled with properly compacted fill as part of the remedial grading.

7.4.6 Undocumented fill and alluvium should be completely removed and replaced as compacted fill. The base of remedial excavations should extend to a horizontal distance beyond the building footprint of at least 5 feet, or a distance equal to the depth of the excavation, whichever is deeper. The actual extent of remedial grading should be evaluated in the field during grading by the geotechnical engineer and/or engineering geologist.

7.4.7 To enable removal of undocumented fill as recommended above, we expect portions of the existing surface improvements along the perimeter of the site will need to be removed.

Along the eastern side, removals will extend into the playground area. To protect the existing building, we recommend removals extend no closer 15 feet from the existing building foundation. Slot cut excavations or temporary shoring may be required along the eastern edge to limit impacts to existing improvements.

7.4.8 We expect groundwater will be encountered near the bottom of the remedial removals. Groundwater management will likely be required. Dewatering via a sump and pump and/or cutoff trenches to divert water will likely be required.

7.4.9 Prior to placing fill, the upper 12 inches at the base of removals should be scarified, moisture conditioned as necessary and recompacted. Soils derived from onsite excavations are suitable for reuse as fill if free from vegetation, debris and other deleterious material. Fill lifts should be no thicker than will allow for adequate bonding and compaction. Fill, backfill, and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of maximum dry density at or slightly above optimum moisture content, as determined in accordance with ASTM D 1557. Grading should be performed so that the upper 3 feet of soil below finish pad subgrade consist of soil with a *very low* to *low* expansive potential (EI of 50 or less).

7.4.10. Oversize rock greater than 12 inches should be placed at least 5 feet below finish pad grade or 3 feet below the deepest utility, whichever is greater. Rock greater than 6 inches should not be placed in the upper 3 feet below building pad grade. Oversize rock that cannot be placed as recommended should be exported off site.

7.4.11 Imported fill should consist of granular soil with a *very low* to *low* expansion potential (EI of 50 or less) that is free of deleterious material or stones larger than 3 inches and should be compacted as recommended above. Geocon Incorporated should be notified of the import soil source and should perform laboratory testing prior to its arrival at the site to evaluate its suitability as fill material.

7.5 Seismic Design Criteria

7.5.1 We used USGS (2017) to determine seismic design criteria. Table 7.4.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The building structure and improvements should be designed using a Site Class C. We evaluated the Site Class in accordance with Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10 based on our experience with the site subsurface soils and exploratory boring information. The values presented in Table 7.4.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 7.4.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	C	Table 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.907g	Figure 1613..3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.347g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.037	Table 1613.3.3(1)
Site Coefficient, F_V	1.453	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	0.940g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.504g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.627g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.336g	Section 1613.3.4 (Eqn 16-40)

7.5.2 Table 7.4.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 7.4.2
2016 CBC SITE ACCELERATION DESIGN PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.359g	Figure 22-7
Site Coefficient, F_{PGA}	1.041	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.374g	Section 11.8.3 (Eqn 11.8-1)

7.5.3 Conformance to the criteria in Tables 7.4.1 and 7.4.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

7.6 Foundation and Concrete Slabs-On-Grade Recommendations

7.6.1 The following foundation recommendations assume the proposed structure will be bear entirely on properly compacted fill and that the prevailing soil within 3 feet of pad grade will have an Expansion Index (EI) 50 or less. If soil with an Expansion Index greater than 50 is encountered or present within the upper 3 feet, foundation modifications may be necessary.

7.6.2 Foundations for the new structure should consist of continuous strip footings and/or isolated spread footings. Continuous footings should be at least 12 inches wide and extend at least 18 inches below lowest adjacent pad grade. Isolated spread footings should have a minimum width of 24 inches and should extend at least 18 inches below lowest adjacent pad grade. Steel reinforcement for continuous footings should consist of at least four, No. 5 steel, reinforcing bars placed horizontally in the footings, two near the top and two near the bottom. The project structural engineer should design the concrete reinforcement for the spread footings. A typical footing dimension detail depicting lowest adjacent grade is provided on Figure 4.

7.6.3 Foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load) for footings founded in properly compacted fill. The bearing pressure may be increased by 300 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable bearing pressure of 4,000 psf. The allowable bearing pressure may also be increased by up to one-third for transient loads such as those due to wind or seismic forces. We expect settlement due to footing loads conforming to the above recommended allowable soil bearing pressures are expected to be less than 1-inch total and ¾-inch differential over a span of 40 feet.

7.6.4 The minimum foundation dimensions and concrete reinforcement recommendations presented above are based on soil characteristics only and are not intended to replace reinforcement required for structural considerations.

7.6.5 The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is anticipated. As a minimum, wall footings should be deepened such that the bottom outside edge of the footing is at least seven feet from the face of slope when located adjacent and/or at the top of descending slopes.

7.6.6 Interior concrete slabs-on-grade should be at least 5 inches thick and reinforced with No. 3 bars placed 24 inches on center in both directions placed at the slab midpoint. The concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting planned loading. Thicker concrete slabs may be required for heavier loads.

7.6.7 The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams.

7.6.8 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute’s (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.6.9 The project foundation engineer, architect, and/or developer should determine the thickness of bedding sand below the slab. Sand bedding thicknesses of 3 to 4 inches are typical in the Southern California area. Geocon should be contacted to provide recommendations if the bedding sand is thicker than 6 inches.

7.6.10 The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

7.6.11 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

7.6.12 Exterior slabs not subject to vehicle loads should be at least 4 inches thick and reinforced with 6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh where the slabs are underlain by low expansive soils. The mesh should be placed within the upper one-third of the slab. Proper mesh positioning is critical to future performance of the slabs. The contractor should take extra measures to provide proper mesh placement.

7.6.13 Prior to construction of slabs, the subgrade should be moisture conditioned to at least optimum moisture content and compacted to a dry density of at least 90 percent of the laboratory maximum dry density.

7.6.14 The recommendations of this report are intended to reduce the potential for cracking of slabs and foundations due to expansive soil (if present), differential settlement of fill soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.6.15 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute (ACI) when establishing crack-control spacing. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.

7.6.16 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.7 Retaining Walls

7.7.1 Retaining walls that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pcf. Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. These active pressures assume low expansive soil (Expansion Index less than 50) will be used as retaining wall backfill.

7.7.2 Where walls are restrained from movement at the top, an additional uniform pressure of 8H psf should be added to the active soil pressure where the wall possesses a height of 8 feet or less and 13H where the wall is greater than 8 feet.

7.7.3 Soil contemplated for use as retaining wall backfill, including import materials, should identified prior to backfill. At that time Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

7.7.4 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The wall designer should provide appropriate lateral deflection quantities for planned retaining walls structures, if applicable. These lateral values should be considered when planning types of improvements above retaining wall structures.

7.7.5 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI of less than 50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. Figure 5 presents a typical retaining wall drainage detail. If conditions different than those described are expected, Geocon Incorporated should be contacted for additional recommendations.

7.7.6 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the 2016 CBC. If the project possesses a seismic design category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 18.3.5.12 of the 2016 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 19H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.374g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

7.7.7 Foundation excavations should be observed by the geotechnical engineer (a representative of Geocon Incorporated) prior to the placement of reinforcing steel and concrete to observe that the exposed soil conditions are consistent with those anticipated and that they have been extended to the appropriate bearing strata. If unanticipated soil conditions are encountered, foundation modifications may be required.

7.8 Lateral Loading

7.8.1 To resist lateral loads, a passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot (pcf) should be used for design of footings or shear keys poured neat against compacted fill. The allowable passive pressure assumes a horizontal surface extending at least 5 feet or three times the height of the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance. Where walls are planned adjacent to and/or on descending slopes, a passive pressure of 150 pcf should be used in design.

7.8.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.35 should be used for design for footings founded in compacted fill or formational materials. The recommended passive pressure may be used concurrently with frictional resistance and may be increased by one-third for transient wind or seismic loading.

7.9 Storm Water Management

7.9.1 If storm water management devices are not properly designed and constructed, there is a risk for distress to improvements and property located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water being detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff into the subsurface occurs, downstream improvements may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

7.9.2 We performed an infiltration study on the property. A summary of our study and storm water management recommendations are provided in Appendix C. Based on the results of our study, infiltration is considered infeasible due to low infiltration rates, the presence of undocumented and compacted fill, and groundwater.

7.10 Site Drainage and Moisture Protection

7.10.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

7.10.2 In the case of basement walls or building walls retaining landscaping areas, a waterproofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

7.10.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.10.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.

7.11 Grading and Foundation Plan Review

7.11.1 Geocon Incorporated should review the grading and foundation plans for the project prior to final design submittal to determine if additional analysis and/or recommendations are required.

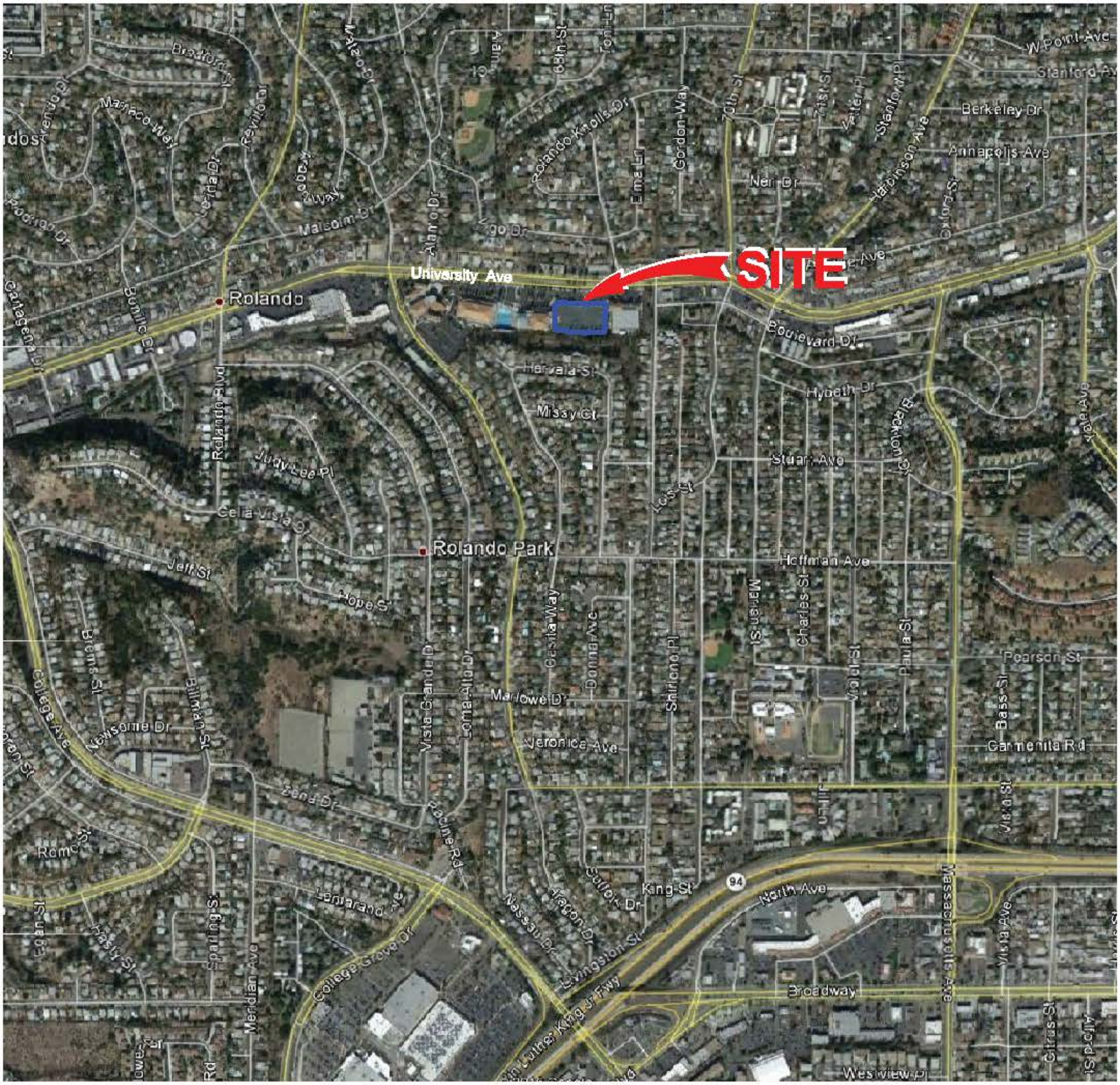
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



N

NO SCALE

VICINITY MAP

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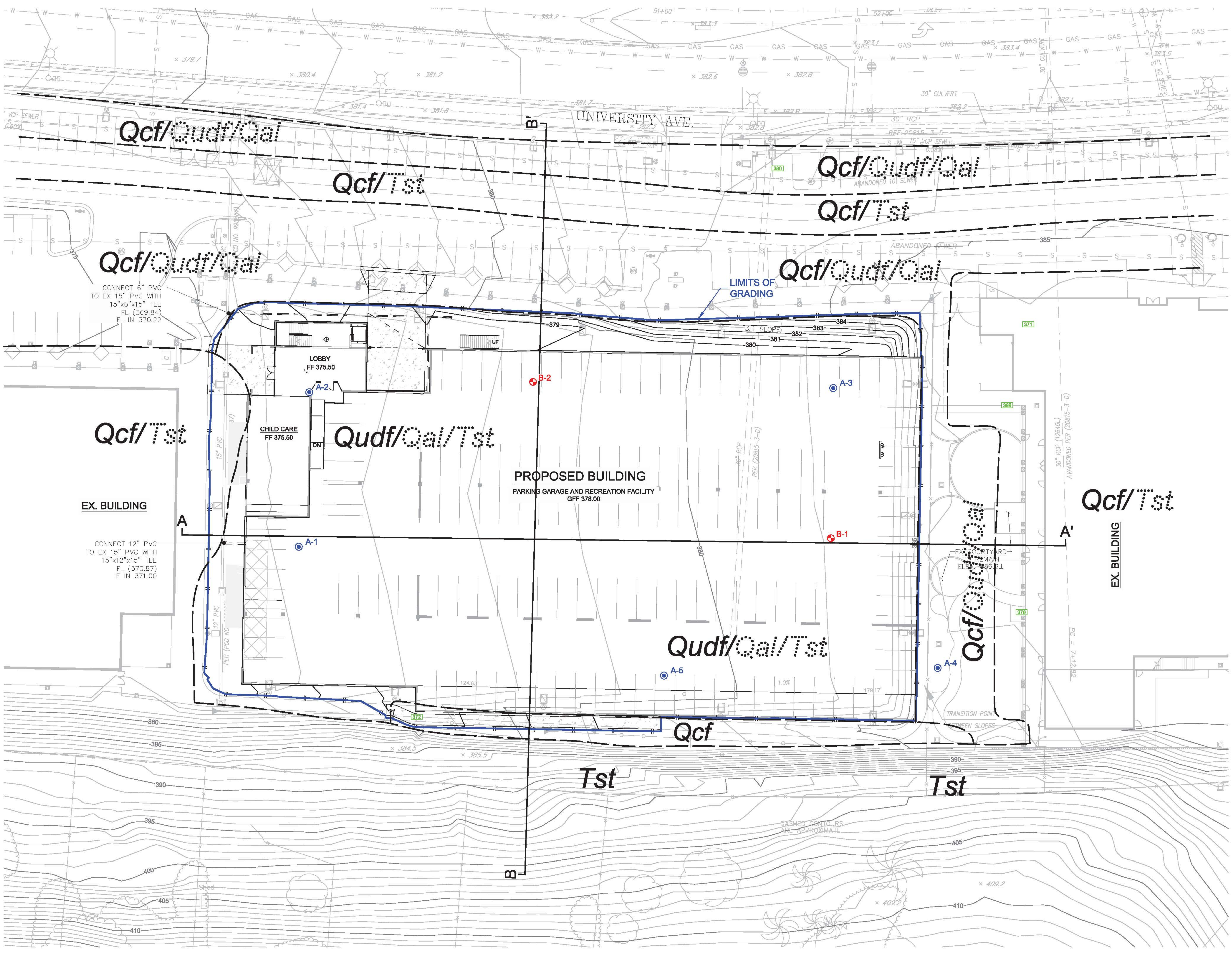
KROC II - WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 05 - 05 - 2017	PROJECT NO. 06151 - 42 - 05	FIG. 1



GEOCON LEGEND

- Qcf ....COMPACTED FILL
- Qudf ........UNDOCUMENTED FILL (Dotted Where Buried)
- Qal ....ALLUVIUM (Dotted Where Buried)
- Tst ....STADIUM CONGLOMERATE (Dotted Where Buried)
- ....APPROX. LOCATION OF GEOLOGIC CONTACT
- B-2 ....APPROX. LOCATION OF EXPLORATORY BORING
- A-5 ....APPROX. LOCATION OF INFILTRATION TEST
- B B' ....APPROX. LOCATION GEOLOGIC CROSS SECTION
- 369 ....APPROX. ELEVATION AT BASE OF FILL

GEOLOGIC MAP

KROC II WELLNESS CENTER/GYMNASIUM
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SCALE 1" = 20'
DATE 05 - 05 - 2017
PROJECT NO. 06151 - 42 - 05
FIGURE 2
SHEET 1 OF 1

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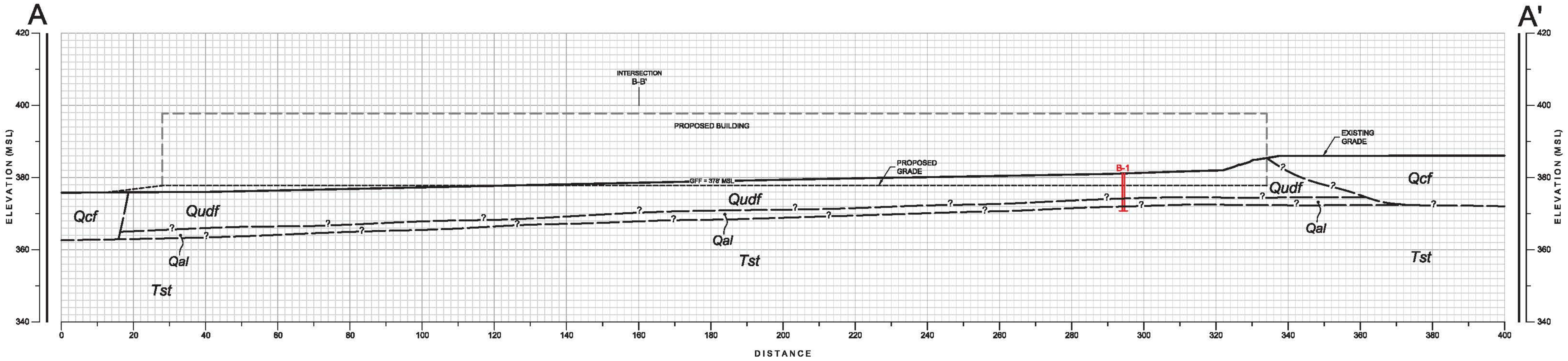
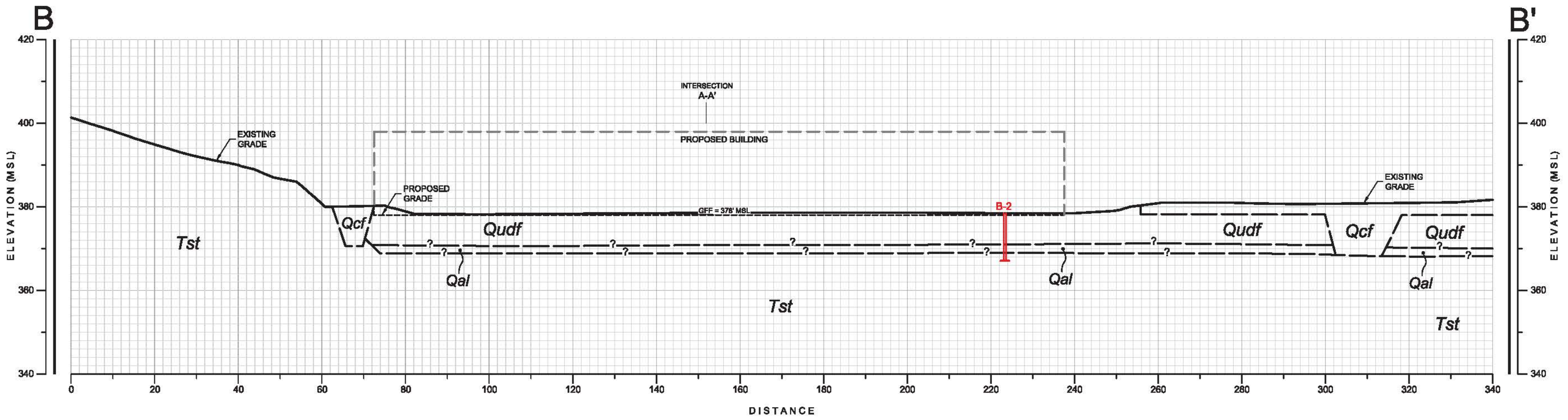


GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 20' (Vert. = Horiz.)

GEOCON LEGEND

Qcf	........COMPACTED FILL
Qudf	........UNDOCUMENTED FILL
Qal	........ALLUVIUM
Tst	........STADIUM CONGLOMERATE
~	........APPROX. LOCATION OF GEOLOGIC CONTACT
B-2	........APPROX. LOCATION OF EXPLORATORY BORING

GEOLOGIC CROSS SECTION

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SCALE 1" = 20'
DATE 05 - 05 - 2017
PROJECT NO. 06151 - 42 - 05
FIGURE 3
SHEET 1 OF 1

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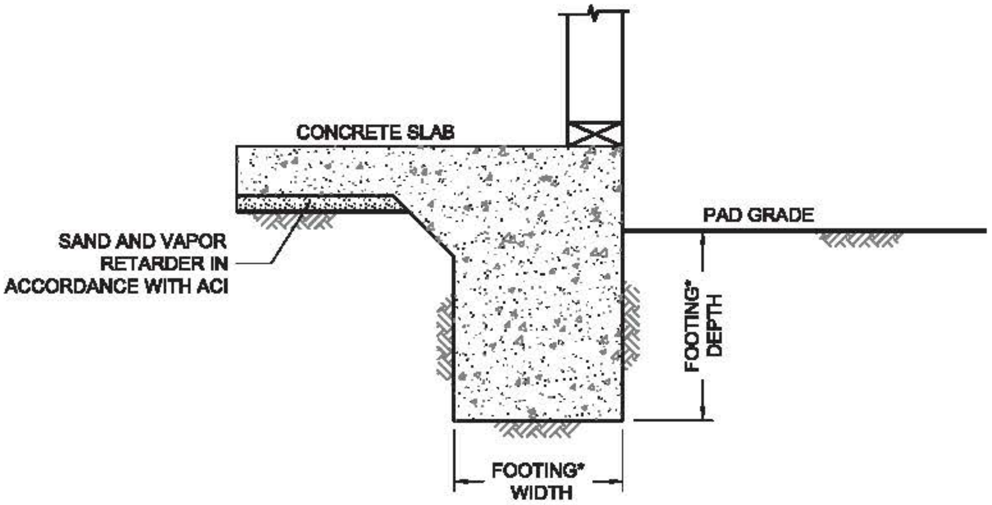

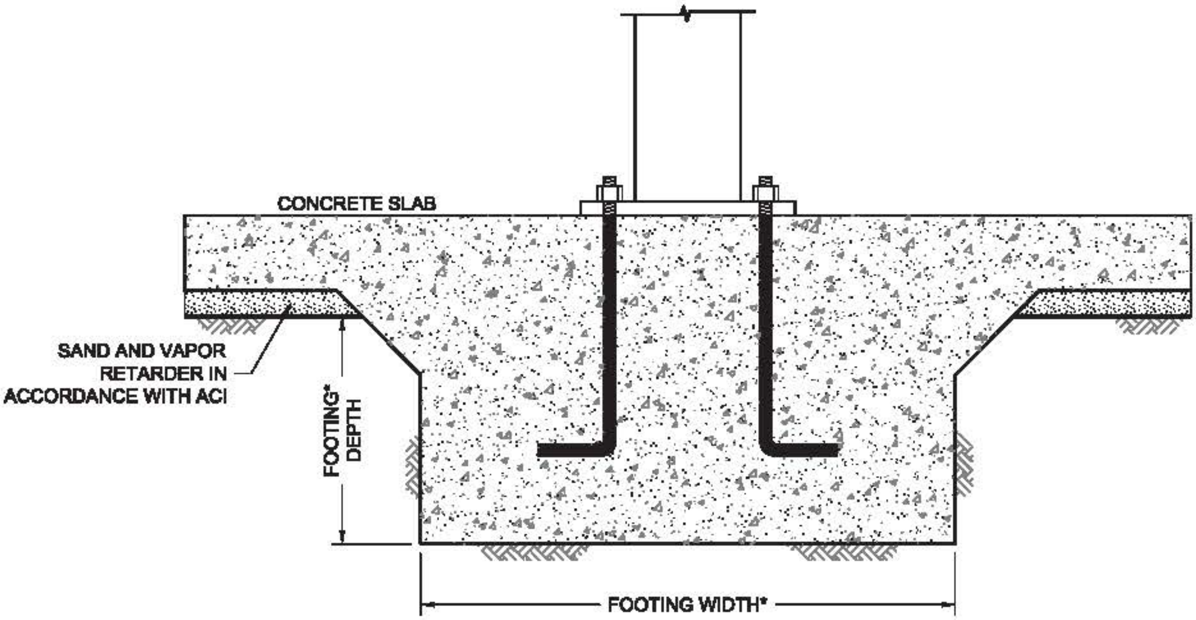

*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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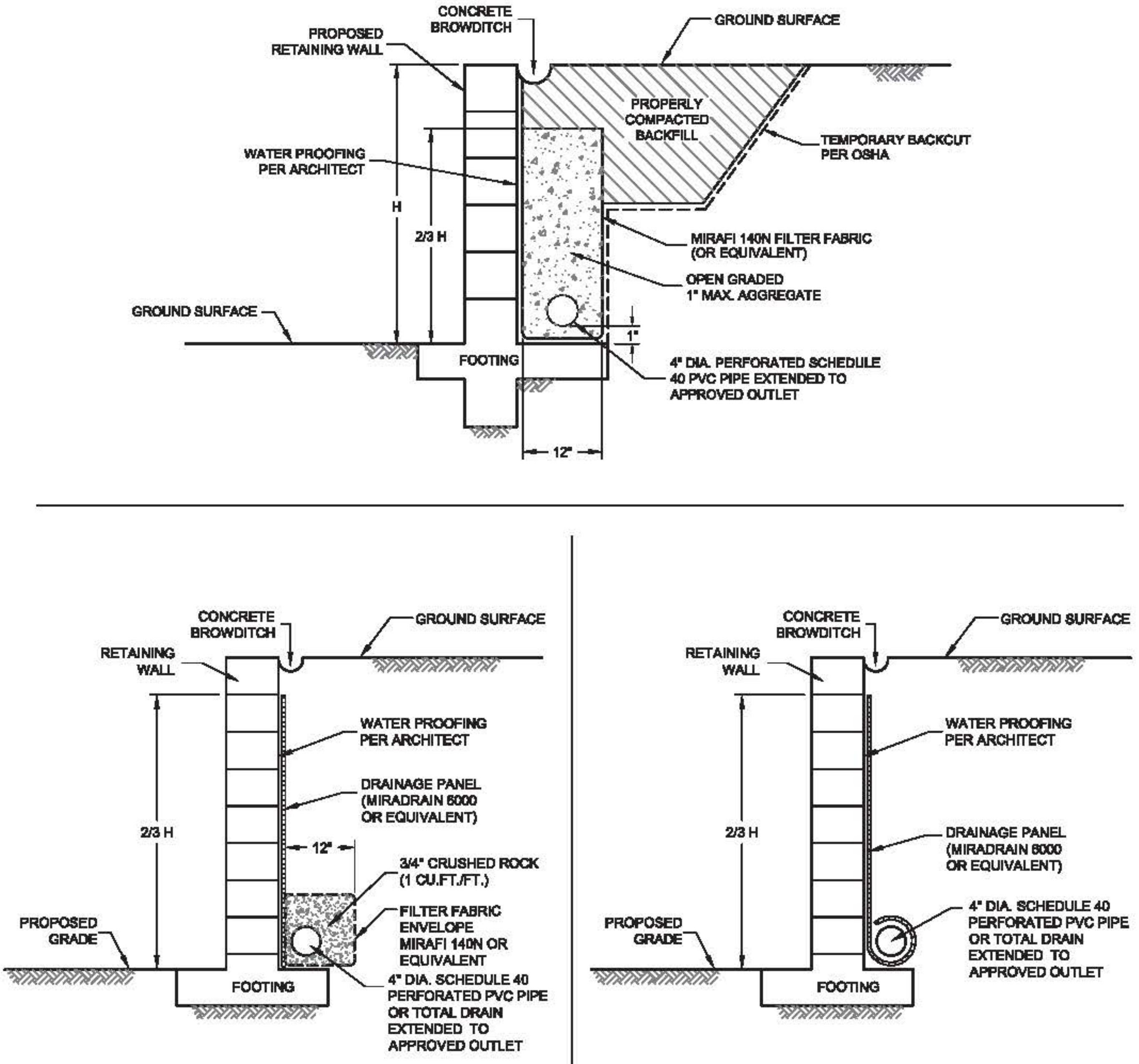
RM / AML		DSK/GTYPD	DATE 05 - 05 - 2017	PROJECT NO. 06151 - 42 - 05	FIG. 4

Plotted:05/05/2017 10:53AM \| By:ALVIN LADRILLONO \| File Location:Y:\PROJECTS\06151-42-05 (Kroc II - Wellness Ctr)\DETAILS\Wall-Column Footing Dimension Detail (COLFOOT2).dwg



NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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DATE 05 - 05 - 2017 | PROJECT NO. 06151 - 42 - 05 | FIG. 5

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APPENDIX A

APPENDIX A

FIELD INVESTIGATION

We performed the field investigation on January 29, 2017. The investigation consisted of drilling two, small-diameter borings and five, 8-inch diameter infiltration test holes. The approximate locations of the exploratory borings and infiltration tests are shown on Figure 2.

The borings were drilled to depths ranging from approximately 11 to 11.5 feet below existing grade using a CME 75 drill rig equipped with 8-inch diameter hollow-stem augers. We obtained relatively undisturbed samples from the borings by driving a 3-inch-diameter sampler 12 inches into the undisturbed soil mass with blows from a 140 pound hammer weighing falling 30 inches. The sampler was lined with 1-inch by 2.5-inch-diameter brass rings to facilitate sampling. Bulk samples were also collected.

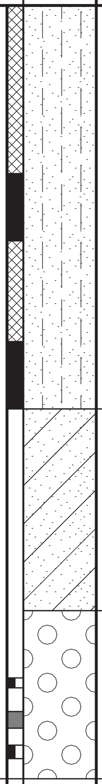
The soil conditions encountered in the borings were visually examined, classified, and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). Logs of the exploratory borings are presented on Figures A-1 and A-2. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained.

PROJECT NO. 06151-42-05

BORING B 1

ELEV. (MSL.) 380 DATE COMPLETED 01-29-2017

EQUIPMENT IR A-300 BY: N. BORJA



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B1-1			SM	**UNDOCUMENTED FILL** Medium dense, moist to wet, dark grayish brown to dark, Silty, fine to medium SAND; little gravel and cobble			
2								
	B1-2					50/5.5"		
4								
	B1-3					54		
6				CL	**ALLUVIUM** Stiff to hard, moist, dark gray to black, Sandy CLAY; little gravel			
8								
					STADIUM CONGLOMERATE Very dense, damp, yellowish brown, Silty Sand CONGLOMERATE; no recovery at 10.9 feet samples; resampled with SPT sampler; very difficult drilling below 10 feet			
10	B1-4					50/1"		
	B1-5					50/3"		
	B1-6					50/2"		

REFUSAL AT 11.5 FEET
Groundwater not encountered
Backfilled on 01-29-2017

Figure A-1,
Log of Boring B 1, Page 1 of 1

06151-42-05.GPJ

SAMPLE SYMBOLS

- ■ ... SAMPLING UNSUCCESSFUL
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◣ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 06151-42-05

BORING B 2

ELEV. (MSL.) **378** DATE COMPLETED **01-29-2017**

EQUIPMENT **IR A-300** BY: **N. BORJA**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	⊠ B2-1			SP	**UNDOCUMENTED FILL** Loose to medium dense, moist, yellowish brown to brown, medium to coarse SAND; trace silt			
				SM	Loose, moist to wet, dark gray to black, Silty, tine to medium SAND; little gravel and cobble			
2								
	■ B2-2				-Disturbed sample at 2.5 feet	9		
4	⊠							
	▨ B2-3				-Becomes dense, blow count may not be accurate due to presence of rock	69		
6								
				CL	**ALLUVIUM** Stiff, moist to wet, gray to grayish brown, Sandy CLAY; little gravel and cobble			
8	■ B2-4					65/11"		
					STADIUM CONGLOMERATE Very dense, damp to moist, mottled yellowish brown and greenish gray, Silty Sand CONGLOMERATE; hard drilling below 9 feet			
10	■ B2-5					100/10"		

REFUSAL AT 11 FEET
Groundwater not encountered
Backfilled on 01-30-2017

Figure A-2,
Log of Boring B 2, Page 1 of 1

06151-42-05.GPJ

SAMPLE SYMBOLS			
	▨ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

APPENDIX B

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected samples for their in-place dry density and moisture content, maximum dry density and optimum moisture content, expansion, water-soluble sulfate characteristics, and gradation. The results of our laboratory tests are presented on the following tables and graph. The in-place dry density and moisture content test results are presented on the exploratory boring logs in Appendix A.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557

Proctor Curve No.	Source and Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B1-1	Grayish brown, Silty, fine to coarse SAND; some gravel	132.2	8.5

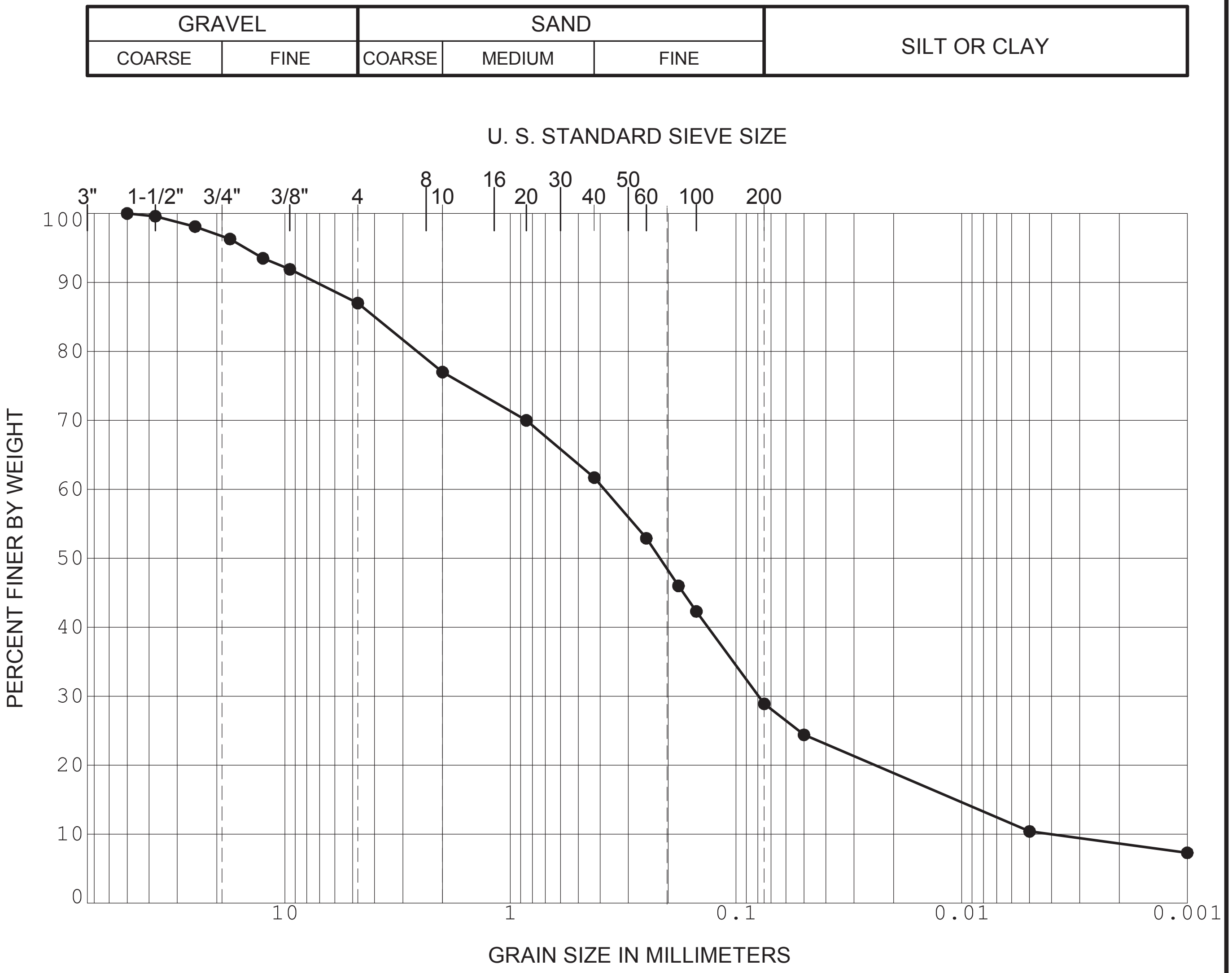
TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Expansion Classification
	Before Test	After Test			
B1-1	8.1	16.1	116.9	15	Very Low

TABLE B-III
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417

Sample No.	Water-Soluble Sulfate (%)	Classification
B1-1	0.063	Not Applicable (S0)

PROJECT NO. 06151-42-05



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B2-1	0.0	(SM) Silty SAND				
⧗							
▲							

GRADATION CURVE

KROC II - WELLNESS CENTER/GYMNASIUM

SAN DIEGO, CALIFORNIA

06151-42-05.GPJ

Figure B-1

GEOCON

APPENDIX C

APPENDIX C

STORM WATER MANAGEMENT

If storm water management devices are not properly designed and constructed, there is a risk for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water being detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff into the subsurface occurs, downstream improvements may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, provides general information regarding soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table C-1 presents the descriptions of the hydrologic soil groups.

TABLE C-1
HYDROLOGIC SOIL GROUP DEFINITIONS

Soil Group	Soil Group Definition
A	Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
B	Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
C	Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
D	Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The site is underlain by compacted fill, undocumented fill, alluvium, and the Stadium Conglomerate formation. The property falls within Hydraulic Soil Group D, which has a very slow infiltration rating. Table C-2 presents the information from the USDA website for the property.

TABLE C-2
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group
Olivenhain-Urban land complex, 2 to 9 percent slopes	OkC	100	D

In-Situ Testing

We performed 5 field-saturated, hydraulic conductivity tests at the site using a Soil Moisture Corp Aardvark Permeameter at the locations presented on the Geologic Map, Figure 2. All of the borings were drilled with a small-diameter drill rig using an 8-inch auger. Table C-3 presents the results of the saturated hydraulic conductivity testing.

We used the guidelines presented in the Riverside County Low Impact Development BMP Design Handbook which references the United States Bureau of Reclamation Well Permeameter Test Method (USBR 7300-89). Based on this widely accepted guideline, the saturated hydraulic conductivity (Ksat) is equal to the infiltration rate. Therefore, the Ksat value determined from the Aardvark Permeameter test is the unfactored infiltration rate. The Ksat (infiltration rate) equation provided in the Riverside County Handbook was used to compute the unfactored infiltration rate.

TABLE C-3
UNFACTORED, FIELD-SATURATED, INFILTRATION TEST RESULTS USING THE SOILMOISTURE CORP AARDVARK PERMEAMETER

Test No.	Depth (inches)	Geologic Unit	Field Infiltration Rate, I (inches/hour)
A-1	40	Qudf	0.0003
A-2	55	Qudf	0.030
A-3	48	Qudf	0.0007
A-4	37	Qcf	0.10
A-5	57	Qudf	0.0004

Soil permeability values from in-situ tests can vary significantly from one location to another due to the non-homogeneous characteristics inherent to most soil. However, if a sufficient amount of field and laboratory test data is obtained, a general trend of soil permeability can usually be evaluated. For this project and for storm water purposes, the test results presented herein should be considered approximate values.

STORM WATER MANAGEMENT CONCLUSIONS

Soil Types

Undocumented Fill and Compacted Fill – Undocumented fill and compacted fill underlies the property. The fills are predominately comprised of silty to clayey sand. The infiltration rates indicate the soils are not suitable for full or partial infiltration.

Existing Improvements

The proposed area of infiltration is planned adjacent to existing hardscape and structures. Due to variable soil conditions and the low infiltration rates, there is a potential for lateral water movement, which could impact nearby structures.

Infiltration Rates

The results of the testing show infiltration rates ranging from approximately 0.003 to 0.1 inches per hour. The rates are not high enough to support full or partial infiltration.

Groundwater

Groundwater or seepage was previously observed during grading in the alluvium along the bedrock contact. We expect groundwater is present at depths of approximately 10 to 15 feet below existing grades. Groundwater/seepage may impact infiltration.

Existing Utilities

Existing utilities exist along the perimeter of the property. Infiltrating near utilities is not recommended. Mitigation measures to prevent water from infiltrating into the utilities consist of setbacks, installing cutoff walls around the utilities and installing subdrains and/or installing liners.

Soil or Groundwater Contamination

We are unaware of contaminated soil or groundwater on the property. Therefore, infiltration associated with this risk is considered feasible.

Storm Water Management Devices

Liners and subdrains are recommended in the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride**,** PVC). The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. The attached Worksheet C.4-1 presents the completed information for the submittal process.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table C-4 describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE C-4
SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Assessment Methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., infiltrometer). Moderate spatial resolution	Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods.
Predominant Soil Texture	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site Soil Variability	Highly variable soils indicated from site assessment or unknown variability	Soil boring/test pits indicate moderately homogenous soils	Soil boring/test pits indicate relatively homogenous soils
Depth to Groundwater/ Impervious Layer	<5 feet below facility bottom	5-15 feet below facility bottom	>15 feet below facility bottom

Table C-5 presents the estimated factor values for the evaluation of the factor of safety. The factor of safety is determined using the information contained in Table C-4 and the results of our geotechnical investigation. Table C-5 only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B of Worksheet D.5-1) and use the combined safety factor for the design infiltration rate.

TABLE C-5
FACTOR OF SAFETY WORKSHEET D.5-1 DESIGN VALUES – PART A[1]

Suitability Assessment Factor Category	**Assigned Weight (w)**	**Factor Value (v)**	**Product (p = w x v)**
Assessment Methods	0.25	2	0.50
Predominant Soil Texture	0.25	2	0.50
Site Soil Variability	0.25	2	0.50
Depth to Groundwater/Impervious Layer	0.25	2	0.50
Suitability Assessment Safety Factor, $S_A = \Sigma p$			2.0

[1] The project civil engineer should complete Worksheet D.5-1 or Form I-9 to determine the overall factor of safety.

CONCLUSIONS

Our results indicate the site has soils that inhibit infiltration. Because of these site conditions, and the presence of groundwater, it is our opinion that there is a high probability for lateral water migration. It is our opinion that full and partial infiltration is infeasible on this site. Liners and subdrains should be installed within BMP areas.

Categorization of Infiltration Feasibility Condition

Worksheet C.4-1

Part 1 - Full Infiltration Feasibility Screening Criteria

Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

We performed 5 infiltration tests. Using a factor of safety of 2.0 for screening, the rates are not above 0.5 inches/hour.

A-1: 0.0003 in/hr
A-2: 0.030 in/hr
A-3: 0.0007 in/hr
A-4: 0.1 in/hr
A-5: 0.0004 in/hr

Criteria	Screening Question	Yes	No
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provided infiltration basins are founded in the underlying native formation bedrock and at least 15 feet away from existing buildings and utilities, infiltration should not increase the risk of geotechnical hazards.

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 2 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>3</td><td>**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
Groundwater is expected to be present within 10 feet of the bottom of proposed basins. Groundwater was encountered in the alluvium along the contact with the Stadium Conglomerate formation during previous grading for the community center.</td></tr>
<tr><td>4</td><td>**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
Infiltration is not anticipated to have a negative impact on nearby water balance or discharge of contaminated groundwater to surface waters.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>**Part 1 Result***</td><td colspan="2">If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration**
If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2</td><td>No</td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

Worksheet C.4-1 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

We performed 5 infiltration tests. The test results are as follows:

A-1: 0.0003 in/hr (factored rate of 0.00015 for F.S. = 2.0)
A-2: 0.030 in/hr (factored rate of 0.015 for F.S. = 2.0)
A-3: 0.0007 in/hr (factored rate of 0.00035 for F.S. = 2.0)
A-4: 0.1 in/hr (factored rate of 0.05 for F.S. = 2.0)
A-5: 0.0004 in/hr (factored rate of 0.0002 for F.S. = 2.0)

The rates indicate the majority of the soils do not allow for an appreciable rate.

Criteria	Screening Question	Yes	No
6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provided infiltration basins are founded in the underlying native formation bedrock and at least 15 feet away from existing buildings and utilities, infiltration should not increase the risk of geotechnical hazards.

Worksheet C.4-1 Page 4 of 4			
Criteria	Screening Question	Yes	No
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X
Provide basis: Groundwater is expected to be present within 10 feet of the bottom of proposed basins. Groundwater was encountered in the alluvium along the contact with the Stadium Conglomerate formation during previous grading for the community center.			
8	**Can infiltration be allowed without violating downstream water rights?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Infiltration is not anticipated to have a negative impact on nearby water balance or discharge of contaminated groundwater to surface waters.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**	No Infiltration	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

06451-42-05
Kroc Center
1/29/2017
JML

A-1

Dia_{hole}	8	inches
$Depth_{hole}$	40	inches
$Depth_{inst}$	32	inches
Ht_{res}	30.5	inches

Wt_0 20 lbs

Q (cipm): **1.38E-02**

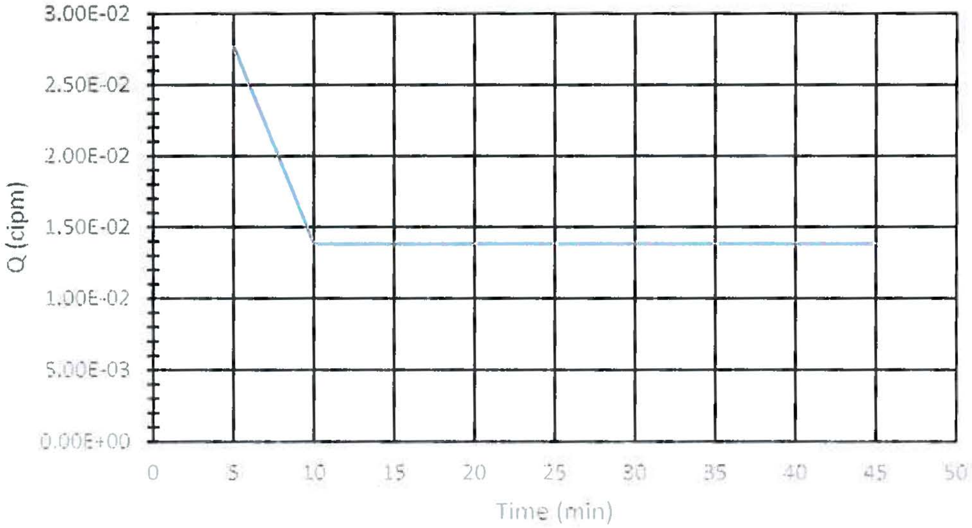
K_{fs} (iph) **0.0003**

D = 55.25 inches

h_{calc} = 11.68 inches

$h_{measured}$ = 9.25 inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (in^3/min)
5	5	14.010	5.990	9.60E-02	1.66E+02	3.32E+01
10	5	13.770	0.240	3.85E-03	6.65E+00	1.33E+00
15	5	13.765	0.005	8.01E-05	1.38E-01	2.77E-02
25	10	13.760	0.005	8.01E-05	1.38E-01	1.38E-02
45	20	13.750	0.010	1.60E-04	2.77E-01	1.38E-02
65	20	13.740	0.010	1.60E-04	2.77E-01	1.38E-02
85	20	13.730	0.010	1.60E-04	2.77E-01	1.38E-02



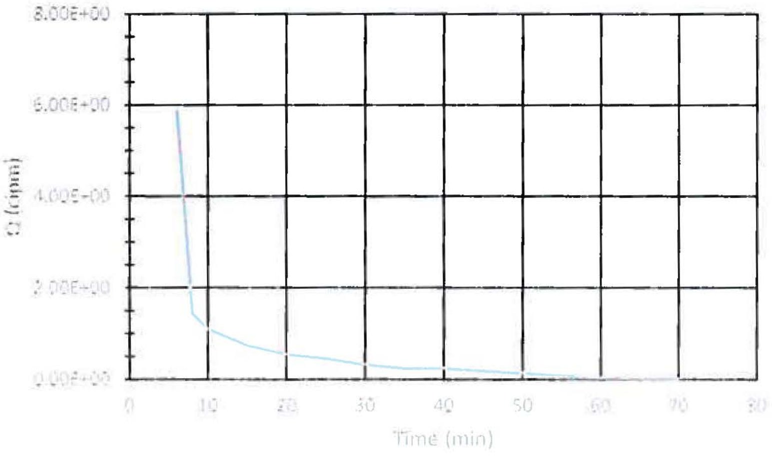
G1796-42-01
Parkview Terrace
1/29/2017
JML

A-2

Dia_{hole}	8	inches
$Depth_{hole}$	55	inches
$Depth_{inst}$	53	inches
Ht_{res}	30.5	inches
Wt_0	19.875	lbs
D =	76.25	inches
h_{calc} =	5.75	inches
$h_{measured}$ =	5.75	inches

Q (cipm):	**2.49E-01**
K_{fs} (iph)	**0.030**

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (in^3/min)
2	2	14.750	5.125	8.21E-02	1.42E+02	7.10E+01
4	2	12.560	2.190	3.51E-02	6.06E+01	3.03E+01
6	2	12.135	0.425	6.81E-03	1.18E+01	5.88E+00
8	2	12.030	0.105	1.68E-03	2.91E+00	1.45E+00
10	2	11.950	0.080	1.28E-03	2.22E+00	1.11E+00
15	5	11.815	0.135	2.16E-03	3.74E+00	7.48E-01
20	5	11.715	0.100	1.60E-03	2.77E+00	5.54E-01
25	5	11.630	0.085	1.36E-03	2.35E+00	4.71E-01
30	5	11.570	0.060	9.62E-04	1.66E+00	3.32E-01
35	5	11.525	0.045	7.21E-04	1.25E+00	2.49E-01
40	5	11.480	0.045	7.21E-04	1.25E+00	2.49E-01
45	5	11.445	0.035	5.61E-04	9.69E-01	1.94E-01
50	5	11.420	0.025	4.01E-04	6.92E-01	1.38E-01
60	10	11.405	0.015	2.40E-04	4.15E-01	4.15E-02
70	10	11.400	0.005	8.01E-05	1.38E-01	1.38E-02



06151-42-05
Kroc Center
1/29/2017
NB

A-3

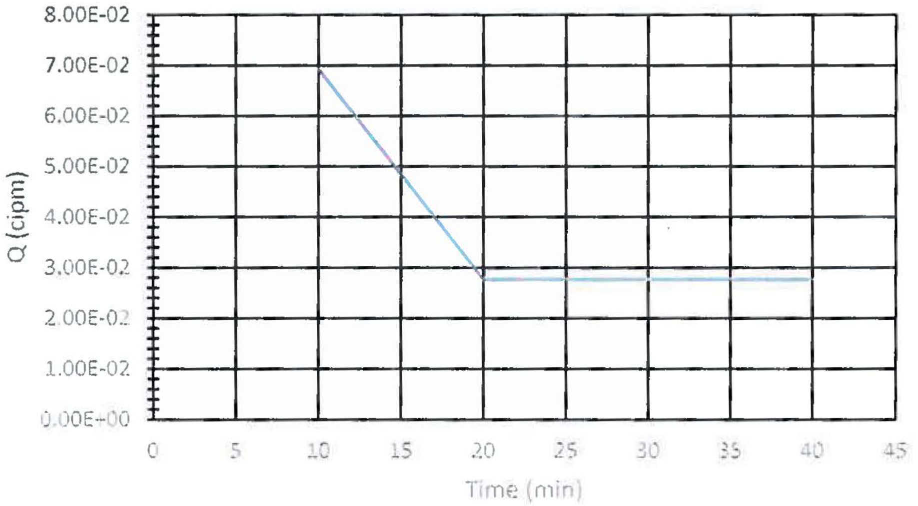
Dia_{hole}	8	inches
$Depth_{hole}$	48	inches
$Depth_{Inst}$	45	inches
Ht_{res}	30	inches

Q (cipm):	**2.77E-02**
K_{fs} (iph)	**0.0007**

Wt_0	24.98	lbs

D =	67.75	inches
h_{calc} =	6.73	inches
$h_{measured}$ =	7	inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (in^3/min)
10	10	24.955	0.025	4.01E-04	6.92E-01	6.92E-02
20	10	24.945	0.010	1.60E-04	2.77E-01	2.77E-02
30	10	24.935	0.010	1.60E-04	2.77E-01	2.77E-02
40	10	24.925	0.010	1.60E-04	2.77E-01	2.77E-02



06151-42-05
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NB

A-4

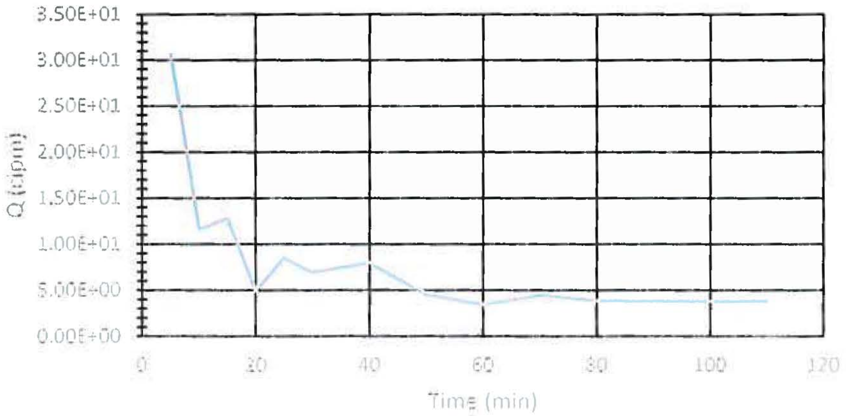
Dia_{hole}	8	inches
Depth_{hole}	37	inches
Depth_{inst}	35	inches
Ht_{res}	30.5	inches

Q (cipm):	**3.80E+00**
K_{fs} (iph)	**0.10**

Wt_0	24.378	lbs

D =	58.25	inches
h_{calc} =	5.69	inches
$h_{measured}$ =	5.5	inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (in^3/min)
5	5	18.835	5.543	8.88E-02	1.53E+02	3.07E+01
10	5	16.725	2.110	3.38E-02	5.84E+01	1.17E+01
15	5	14.405	2.320	3.72E-02	6.42E+01	1.28E+01
20	5	13.510	0.895	1.43E-02	2.48E+01	4.96E+00
25	5	11.965	1.545	2.48E-02	4.28E+01	8.56E+00
30	5	10.700	1.265	2.03E-02	3.50E+01	7.01E+00
40	10	7.805	2.895	4.64E-02	8.02E+01	8.02E+00
50	10	6.160	1.645	2.64E-02	4.56E+01	4.56E+00
60	10	4.910	1.250	2.00E-02	3.46E+01	3.46E+00
70	10	3.290	1.620	2.60E-02	4.49E+01	4.49E+00
80	10	1.890	1.400	2.24E-02	3.88E+01	3.88E+00
90	10	0.495	1.395	2.24E-02	3.86E+01	3.86E+00
100	10	-0.890	1.385	2.22E-02	3.84E+01	3.84E+00
110	10	-2.280	1.390	2.23E-02	3.85E+01	3.85E+00



06151-42-05
Kroc Center
1/29/2017
JML

A-5

Dia_{hole}	8	inches
$Depth_{hole}$	57	inches
$Depth_{inst}$	55	inches
Ht_{res}	29.5	inches

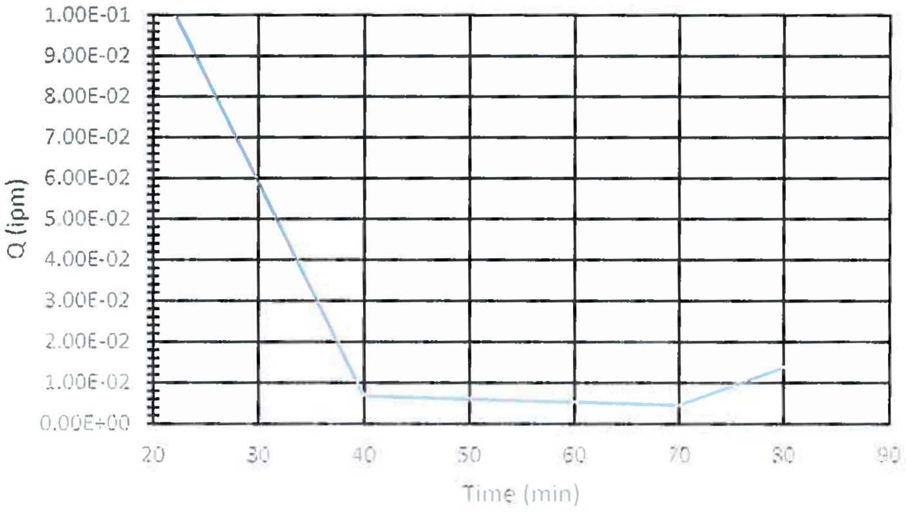
Q (cipm): 1.38E-02

Wt_0 13.42 lbs

K_{fs} (iph): 0.0004

D = 77.25 inches
h_{calc} = 5.76 inches
$h_{measured}$ = 5.5 inches

t (min)	Δt (min)	Wt (lbs)	ΔWt (lbs)	Δvol (ft^3)	Δvol (in^3)	Q (in^3/min)
5	5	13.160	0.260	4.17E-03	7.20E+00	1.44E+00
10	5	13.125	0.035	5.61E-04	9.69E-01	1.94E-01
15	5	13.115	0.010	1.60E-04	2.77E-01	5.54E-02
20	5	13.095	0.020	3.21E-04	5.54E-01	1.11E-01
40	20	13.090	0.005	8.01E-05	1.38E-01	6.92E-03
70	30	13.085	0.005	8.01E-05	1.38E-01	4.62E-03
80	10	13.080	0.005	8.01E-05	1.38E-01	1.38E-02



APPENDIX D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

KROC II – WELLNESS CENTER/GYMNASIUM
SAN DIEGO, CALIFORNIA

MAY 5,2017
PROJECT NO. 06151-42-01

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

4. CLEARING AND PREPARING AREAS TO BE FILLED

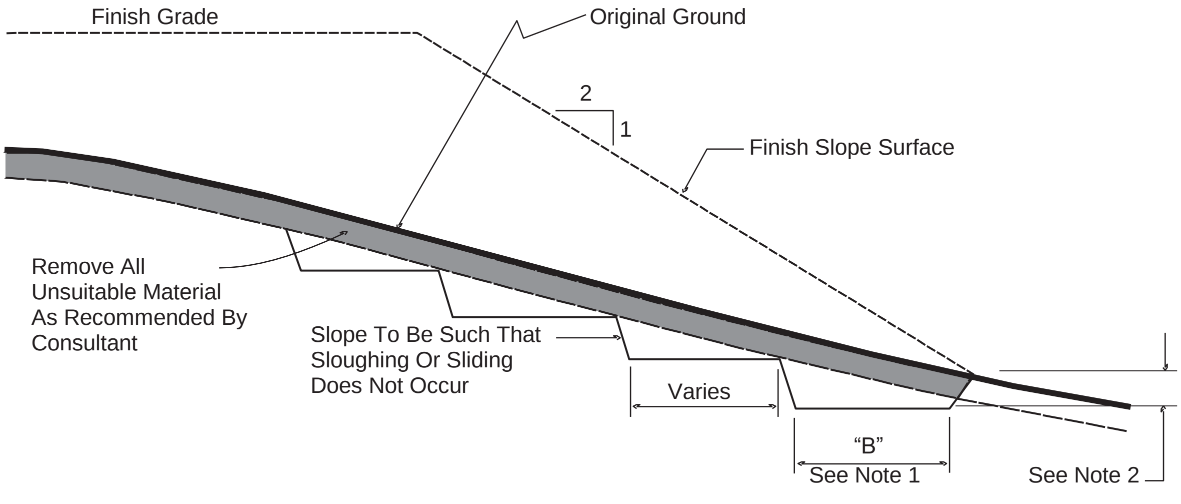
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

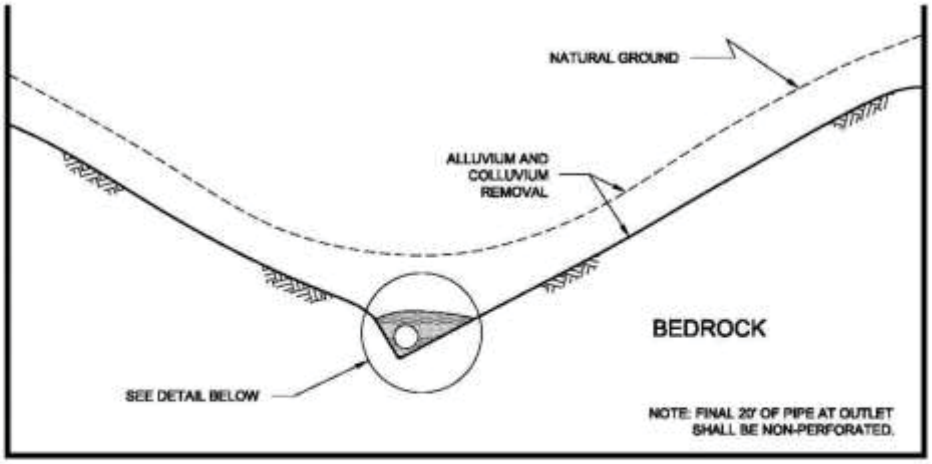
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

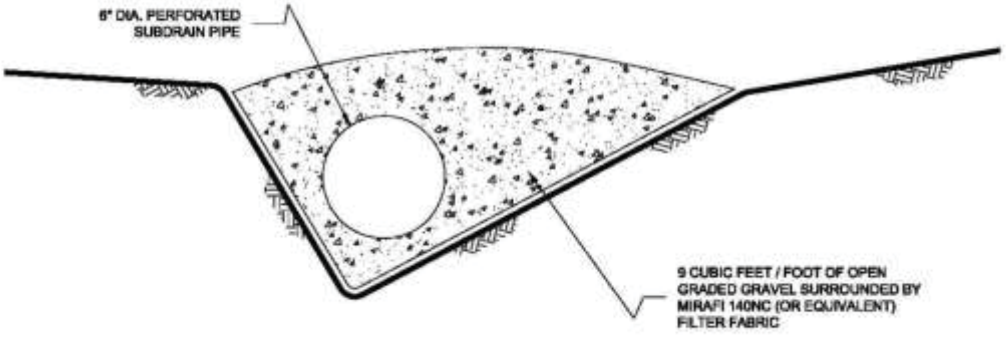
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

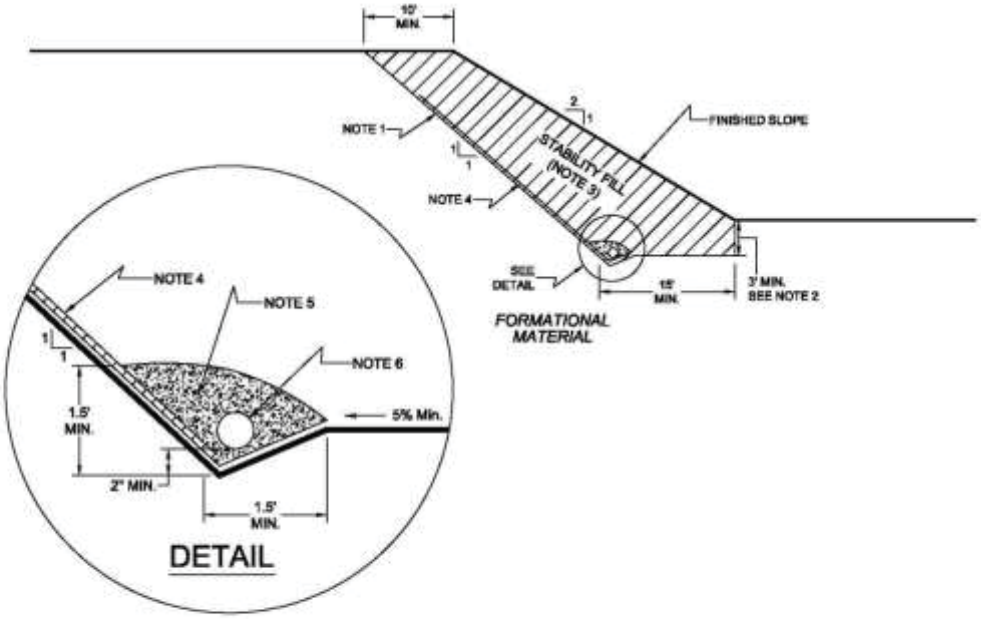
1......8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

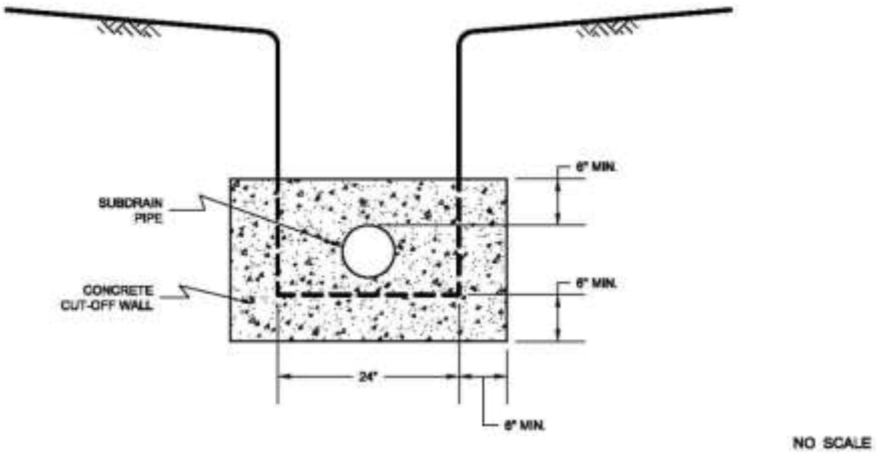
NO SCALE

7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

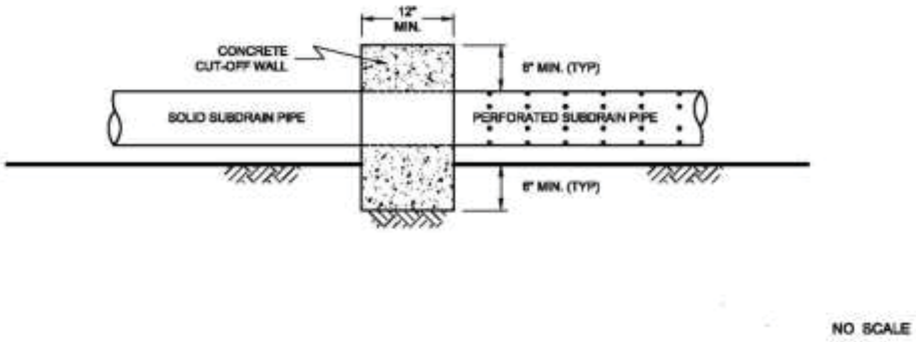
7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

TYPICAL CUT OFF WALL DETAIL



FRONT VIEW

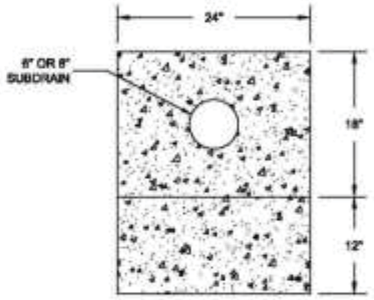


SIDE VIEW

7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

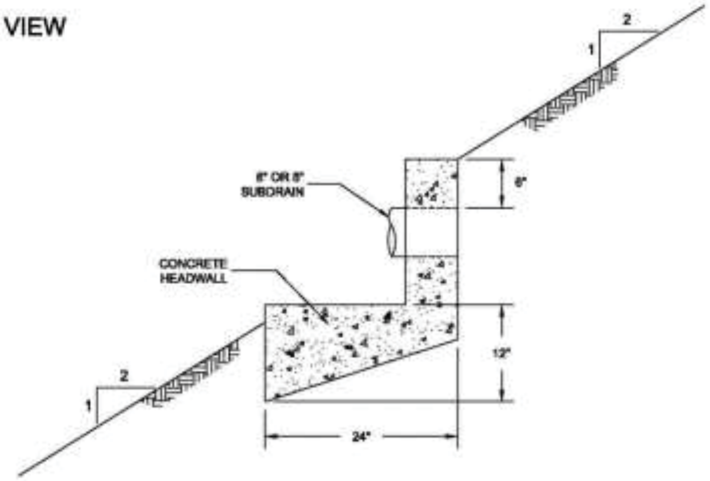
TYPICAL HEADWALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE
OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an “as-built” map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

City of San Diego (2008), *Seismic Safety Study, Geologic Hazards and Faults, Map Sheet 22*;

Kennedy, M. P., and Tan, S. S., (2008), *Geologic Map of the San Diego 30' x 60' Quadrangle, California*, USGS Regional Geologic Map Series, 1:100,000 Scale, Map No. 3;

Risk Engineering (2011), *EZ-FRISK (version 7.62)*, software package used to perform site-specific earthquake hazard analyses, accessed May 2, 2017;

USGS (2016), *Quaternary Fault and Fold Database of the United States*: U.S. Geological Survey website, http://earthquakes,usgs.gov/hazards/qfaults, accessed May 2, 2017;

USGS (2017), U.S. Seismic Design Maps; USGS Earthquake Hazards Program website, https://earthquake.usgs.gov/designmaps/us/application.php, accessed May 2, 2017

Salvation Army Kroc Center Sports & Wellness Center
City of San Diego (PTS 552436)
6605-6845 University Avenue
San Diego, California

January 2, 2018
Third Revision June 4, 2018

Transportation Impact Study

Prepared for:
The Salvation Army
180 E. Ocean Blvd
Long Beach, CA 90802

Prepared by Justin Rasas (TR 2135) a principal with:

LOS Engineering, Inc.
11622 El Camino Real, Suite 100, San Diego, CA 92130
Phone 619-890-1253

Job #1738

REGISTERED PROFESSIONAL ENGINEER
JUSTIN P. RASAS
NO. TR 2135
EXP. 3/31/2020
TRAFFIC
STATE OF CALIFORNIA

SEALED ON 10/8/2018

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Appendices

Executive Summary

The project is a two-story recreation building (Wellness Center) with an elevated sports deck structure with at grade parking (underneath the elevated sports deck) at 6605-6845 University Avenue San Diego, California. The project will replace an existing and active soccer field on the Salvation Army Ray and Joan Kroc Community Center grounds. The project is planned to open by the year 2020. Project access is possible from a total of five existing driveways with two driveways on University Avenue, two driveways on Aragon Drive, and one driveway on 69th Street. The project requires an amendment to Planned Commercial Development Permit 99-0887.

The project trip generation for the project was calculated using trip rates from the City of San Diego *Trip Generation Manual*, May 2003. The proposed wellness center project with a health club and day care is calculated to generate approximately 1,069 ADT with 65 AM peak hour trips (36 inbound and 29 outbound) and 111 PM peak hour trips (64 inbound and 47 outbound).

The minimum required parking for the site is 486 spaces (existing Salvation Army Kroc Center and proposed parking structure). The proposed parking is 503 spaces resulting in a surplus of 17 spaces.

The following scenarios were analyzed: Existing, Existing with Project, Near Term Year 2020, Near Term Year 2020 with Project, Horizon Year 2035, and Horizon Year 2035 with Project Conditions. For each scenario, the findings include:

1) Under existing conditions, all of the study intersections and segments were calculated to operate at LOS C or better.

2) Under existing with project conditions, all of the study intersections and segments were calculated to operate at LOS C or better with no significant direct impacts because the addition of project traffic does not cause unacceptable levels of service.

3) Under near term conditions, all of the study intersections and segments were calculated to operate at LOS C or better.

4) Under near term with project conditions, all of the study intersections and segments were calculated to operate at LOS C or better with no significant direct impacts because the addition of project traffic does not cause unacceptable levels of service.

5) Under horizon year 2035 conditions, all of the study intersections and segments were calculated to operate at LOS D or better.

6) Under horizon year 2035 with project conditions, all of the study intersections and segments were calculated to operate at LOS D or better with no significant cumulative impacts because the addition of project traffic does not cause unacceptable levels of service.

The project has no calculated traffic impacts based on the significance criteria; therefore, mitigation measures are not required.

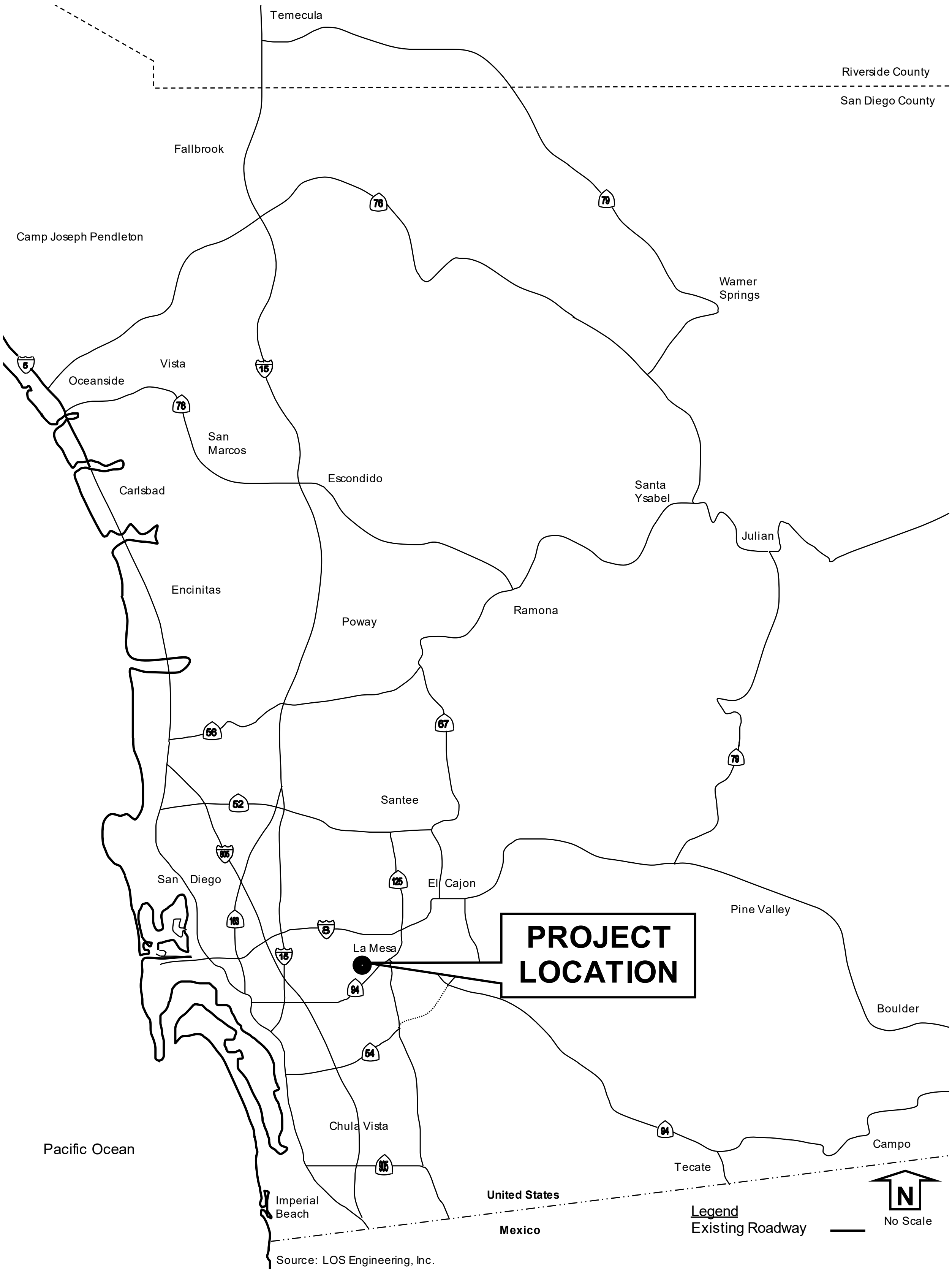
1.0 Introduction

The project is a two-story recreation building with an elevated sports deck structure with at grade parking (underneath the elevated sports deck) at 6605-6845 University Avenue San Diego, California. The project will replace an existing and active soccer field on the Salvation Army Ray and Joan Kroc Community Center grounds. The project is planned to open by the year 2020. The project requires an amendment to Planned Commercial Development Permit #99-0887. The location of the project is shown in **Figure 1**. **Figure 2** (Architect's reference DD-1) shows the location of the site within the Salvation Army Ray and Joan Kroc Community Center. The parking structure connection with the existing parking lot is shown in **Figure 3** (Architect's reference DD-2)**.** The first floor includes parking and the child care area (only for users of the center) as shown in **Figure 4** (Architect's reference DD-3). The replacement soccer field on the sports deck along with the new health club is shown in **Figure 5** (Architect's reference DD-4).

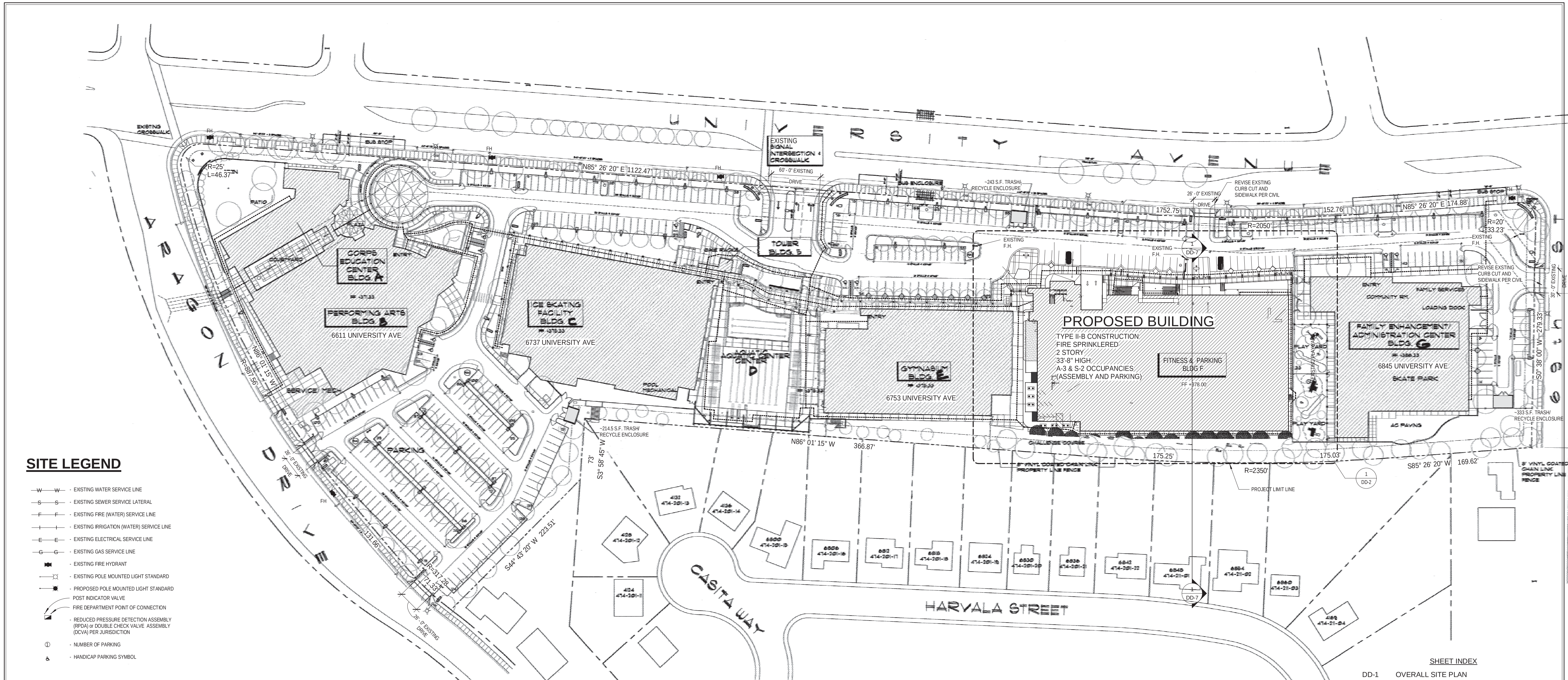
The purpose of this study is to analyze how the proposed project traffic will affect the study roadways and intersections during weekday daily, AM peak hour and PM peak hour conditions when the project is completed. This report includes the following chapters:

1.0 Introduction
2.0 Study Methodology
3.0 Existing Conditions
4.0 Project Description
5.0 Existing with Project Conditions
6.0 Near Term Year 2020 without Project Conditions
7.0 Near Term Year 2020 with Project Conditions
8.0 Horizon Year without Project Conditions
9.0 Horizon Year with Project Conditions
10.0 Summary of Potential Impacts
11.0 Transportation Demand Management
12.0 Conclusion
13.0 References and List of Preparers

Figure 1: Project Location



Source: LOS Engineering, Inc.



SITE LEGEND

- —W—W— - EXISTING WATER SERVICE LINE
- —S—S— - EXISTING SEWER SERVICE LATERAL
- —F—F— - EXISTING FIRE (WATER) SERVICE LINE
- —I—I— - EXISTING IRRIGATION (WATER) SERVICE LINE
- —E—E— - EXISTING ELECTRICAL SERVICE LINE
- —G—G— - EXISTING GAS SERVICE LINE
- - EXISTING FIRE HYDRANT
- - EXISTING POLE MOUNTED LIGHT STANDARD
- - PROPOSED POLE MOUNTED LIGHT STANDARD
- POST INDICATOR VALVE
- FIRE DEPARTMENT POINT OF CONNECTION
- - REDUCED PRESSURE DETECTION ASSEMBLY (RPDA) or DOUBLE CHECK VALVE ASSEMBLY (DCVA) PER JURISDICTION
- ① - NUMBER OF PARKING
- ♿ - HANDICAP PARKING SYMBOL

ACCESSIBLE PATH OF TRAVEL

•••••••••• NEW PATH OF TRAVEL (P.O.T.) AS INDICATED IS A BARRIER FREE ACCESS ROUTE WITHOUT ANY ABRUPT VERTICAL CHANGES EXCEEDING 1/2" BEVELED AT 1:2 MAXIMUM SLOPE, EXCEPT THAT LEVEL CHANGES DO NOT EXCEED 1/4" VERTICAL AND IS AT LEAST 48" WIDE. SURFACE IS SLIP RESISTANT, STABLE, FIRM, AND SMOOTH. CROSS-SLOPE DOES NOT EXCEED 2% AND SLOPE IN DIRECTION OF TRAVEL IS LESS THAT 5% UNLESS OTHERWISE INDICATED. P.O.T. SHALL BE MAINTAINED FREE OF OVERHANGING OBSTRUCTIONS TO 80" MINIMUM (1133B.8.2) AND PROTRUDING OBJECTS GREATER THAN 4" PROJECTION FROM A WALL AND ABOVE 27" AND LESS THAN 80" (1133B.8.6).

NOTES

1. A GRADING PERMIT IS REQUIRED FOR THIS PROJECT
2. FIRE HYDRANTS ARE TO COMPLY WITH THE CITY'S ENGINEERING DEPARTMENT STANDARDS AND SPECIFICATIONS FOR ON-SITE FIRE HYDRANTS.
3. ALL CURBING WHICH OUTLINES THE ACCESS ROADWAY SHALL BE PAINTED RED. WHITE, 4" HIGH LETTERING READING "NO PARKING - FIRE LANE" SHALL BE STENCILED EVERY 30'-0" ON THE RED CURB. IF NO CURB IS PRESENT, AN 8" WIDE RED STRIPE SHALL BE PAINTED ON THE PAVEMENT. THIS 8" STRIPE SHALL BE MARKED WITH 4" HIGH WHITE LETTERING EXACTLY AS IF IT WERE A CURB.
4. BACKFLOW PROTECTION OF WATER CONNECTION TO FIRE PROTECTION SYSTEMS SHALL BE PROVIDED PER UPC, SECT. 603.5.15.
5. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL ENTER INTO A MAINTENANCE AGREEMENT FOR THE ONGOING PERMANENT BMP MAINTENANCE, SATISFACTORY TO THE CITY ENGINEER.
6. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL INCORPORATE ARTICLE 2, DIVISION 1 (GRADING REGULATIONS) OF THE SAN DIEGO MUNICIPAL CODE, INTO THE CONSTRUCTION PLANS OR SPECIFICATIONS.

DIRECTORY

OWNER:

THE SALVATION ARMY
180 E. OCEAN BLVD - LEGAL DEPT
LONG BEACH, CA 90802
Tel: (562)491-8775
Fax: (562)491-8775
CONTACT:VICTOR DOUGHTY

ARCHITECT:

KENNETH D. SMITH ARCHITECT & ASSOCIATES, INC.
500 FESLER STREET, STE 102
EL CAJON, CA 92020
Tel: (619) 444-2182 x
CONTACT:CONTACT

CIVIL ENGINEER:

REC-CONSULTANTS.COM
2442 SECOND AVENUE
SAN DIEGO, CA 92101
(619) 232-9200

LANDSCAPE:

HOWARD ASSOCIATES
2422 SECOND AVE
SAN DIEGO, CA 92101
Tel: (619) 718-9660
CONTACT:JULIE HOWARD

SOILS ENGINEER:

GEOCON INCORPORATED
6960 FLANDERS DRIVE
SAN DIEGO, CA 92121-2974
TEL 858.558.6900

ACOUSTIC ENGINEER:

JEREMY LOUDEN, PRINCIPAL
LDN CONSULTING, INC.
PHONE 760-473-1253
2428 CHISOLM TRAIL
MURRIETA, CA 92562

TRAFFIC ENGINEER:

LOS ENGINEERING, INC.
11622 EL CAMINO REAL, SUITE 100
SAN DIEGO, CA 92130
619.890.1253 PHONE

SITE INFORMATION

SITE AREA:	536,659 SF	12.32 ACRES
PROPOSED BUILDING COVERAGE:	50,469 SF	9.4 %
EXISTING BUILDING COVERAGE	155,765 SF	29.02 %

TYPE OF DEVELOPMENT: RECREATION

DEVELOPMENT SUMMARY

- PLANNED DEVELOPMENT PERMIT
- CONSTRUCT A TYPE II-B BUILDING AND ALL SITE IMPROVEMENTS PER THESE PLANS AND SPECIFICATIONS. USES ARE AS FOLLOWS:
  1. LOBBY/PLAY CARE
  2. COVERED PARKING
  3. FITNESS CENTER
  4. SPORTS DECK.

PARKING TABULATION

ON-SITE PARKING SHOWN ON SCR-12-11-2000: 384 SPACES

NEW WELLNESS CENTER PARKING

FITNESS AREAS: 23007 S.F. AT 5 SPACE/1,000 S.F.:	115 SPACES	
PLAY CARE CENTER: 1854 S.F. AT 1 SPACE PER STAFF:	4	
TOTAL	119	
15% REDUCTION FOR TRANSIT OVERLAY:	<17 SPACES>	
TOTAL PARKING REQ'D FOR NEW BUILDING:	102 SPACES	102 SPACES
TOTAL PARKING REQUIRED		486 SPACES

TOTAL PARKING PROVIDED

ACTUAL ON-SITE PARKING:	378 SPACES
PROPOSED PARKING STRUCTURE:	129 SPACES
PARKING DELETED AT STRUCTURE ENTRANCE:	<4> SPACES
TOTAL PARKING PROVIDED:	503 SPACES
SURPLUS:	17 SPACES

EXISTING OFF-SITE (STREET) PARKING SHOWN ON SCR-12-11-2000: 50 SPACES

NOTE: ROOFTOP SOCCER FIELD IS SATISFIED BY EXISTING PARKING APPROVED IN P.C.D. PERMIT 99-0887
NOTE: THE ROOFTOP SOCCER FIELD SHALL NOT EXCEED THE SIZE OF THE EXISTING RECREATION FIELD

10 SHORT TERM BICYCLE RACKS PROPOSED
1 LONG TERM BICYCLE STORAGE PROPOSED
3 ACCESSIBLE SPACES, INCLUDING 1 VAN ACCESISBLE SPACE PROPOSED
3 MOTOCYCLE SPACES PROPOSED
11 CLEAN AIR/ VAN POOL/ EV SPACES PROPOSED

SQUARE FOOTAGE

Name	Area
01 FIRST FLOOR	
LOBBY / PLAY CARE	4,754 SF
PARKING	45,712 SF
01 FIRST FLOOR	50,467 SF
02 SECOND FLOOR	
FITNESS CENTER	23,007 SF
PHANTOM FLOOR	675 SF
SPORTS ROOF DECK	27,232 SF
02 SECOND FLOOR	50,913 SF
Grand total	101,380 SF

FLOOR AREA RATIO (FAR)

BUILDING	GFA
PROPOSED WELLNESS & SPORTS CTR	
FIRST FLOOR	50467
SECOND FLOOR & SPORTS DECK	50913
EXISTING BLDG #1 PERFORMING ARTS	
FIRST FLOOR	35268
SECOND FLOOR	15378
EXISTING BLDG #2 ICE RINK	
FIRST FLOOR	36130
SECOND FLOOR	0
EXISTING BLDG #3 GYMNASIUM	
FIRST FLOOR	26339
SECOND FLOOR	5547
EXISTING BLDG #4 FAMILY ENHANCE	
FIRST FLOOR	28527
SECOND FLOOR	7911
EXISTING BLDG #5 ENTRY TOWER	
FIRST FLOOR	256
SECOND FLOOR	0
TOTAL GFA	256736
LOT AREA	536659
FLOOR AREA RATIO (FAR) (.75 ALLOWED)	0.478

LEGAL DESCRIPTION

PARCEL 1 OF PARCEL MAP NO. 13069, IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA FILED IN THE OFFICE OF THE COUNTY RECORDER, DECEMBER 23, 1983.

SAID LAND WAS FORMERLY KNOWN AS:

LOTS 1 AND 3 OF ARAGON HEIGHTS UNIT NO. 1, IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA ACCORDING TO THE MAP THEREOF NO. 4227, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, JUNE 16, 1959.

APN:	474-130-1600
ADDRESS:	6845, 6753, 6737 & 6611 UNIVERSITY AVE.
USE:	RECREATION
ZONE:	CC-5-3
OVERLAY DISTRICTS:	COUNCIL DISTRICT 4 TRANSIT AREA OVERLAY (TAOZ) TRANIST PRIORITY AREA (TPA) GEOLGIC HAZARD CATEGORY 53 MONTGOMERY FIELD - AIRPORT LAND USE COMPATIBILITY OVERLAY (ALUCOZ) MONTGOMERY FIELD - AIRPORT INFLUENCE AREA (AIA)
SCHOOL DISTRICT:	SDUSD
COMMUNITY PLAN:	MID-CITY: EASTERN AREA
YEAR BUILT:	ALL BUILDINGS CONSTRUCTED 2001. NO STRUCTURES TO BE REMOVED.

PROPOSED DEVELOPMENT REGULATION DEVIATIONS

1. Minimum Exterior Refuse and Recyclable Material Storage Areas. (SDMC Table 142-08C), EXISTING APPROX. 790.5 S.F., REQUIRED 1,056 S.F.
2. Offsetting Planes requirement (SDMC 1519.0303(D)(1))
3. Hours of Operation (SDMC 141.0602c(2))

HOURS OF OPERATION	
FACILITY	PROPOSED HOURS OF OPERATION
AQUATICS	5:00 AM - 9:00 PM
CHALLENGE COURSE	7:00 AM - 7:00 PM
CLIMBING TOWER	7:00 AM - 7:00 PM
GYMNASIUM	5:00 AM - 9:00 PM
ICE ARENA	5:30 AM - 10:00 PM
NEW RECREATION SPORTS DECK	7:00 AM - 9:00 PM
NEW SPORTS & WELLNESS	5:00 AM - 9:00 PM
REMAINDER OF CENTER	7:00 AM - 9:00 PM

SHEET INDEX

NORTH

OVERALL SITE PLAN

1" = 50'-0"

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ARCHITECT
& ASSOCIATES, INC.
500 FESLER ST. SUITE 102
EL CAJON - CA - 92020
PH / 619 444 2182
Fax / 619 442 2699

LICENSED ARCHITECT
KENNETH DUANE SMITH
No. C25315
Ren. 2/28/19
STATE OF CALIFORNIA

DATE: 05.08.2017
JOB NO: 15024
DRAWN BY: ASM
CHECKED BY: ASM

Revision Schedule		
#	Date	Description

ORIGINAL PREPARATION DATE:
7/8/17

REVISION DATE(S):
2/15/18

project:
Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

DD-1
SHEET: 1 of 13

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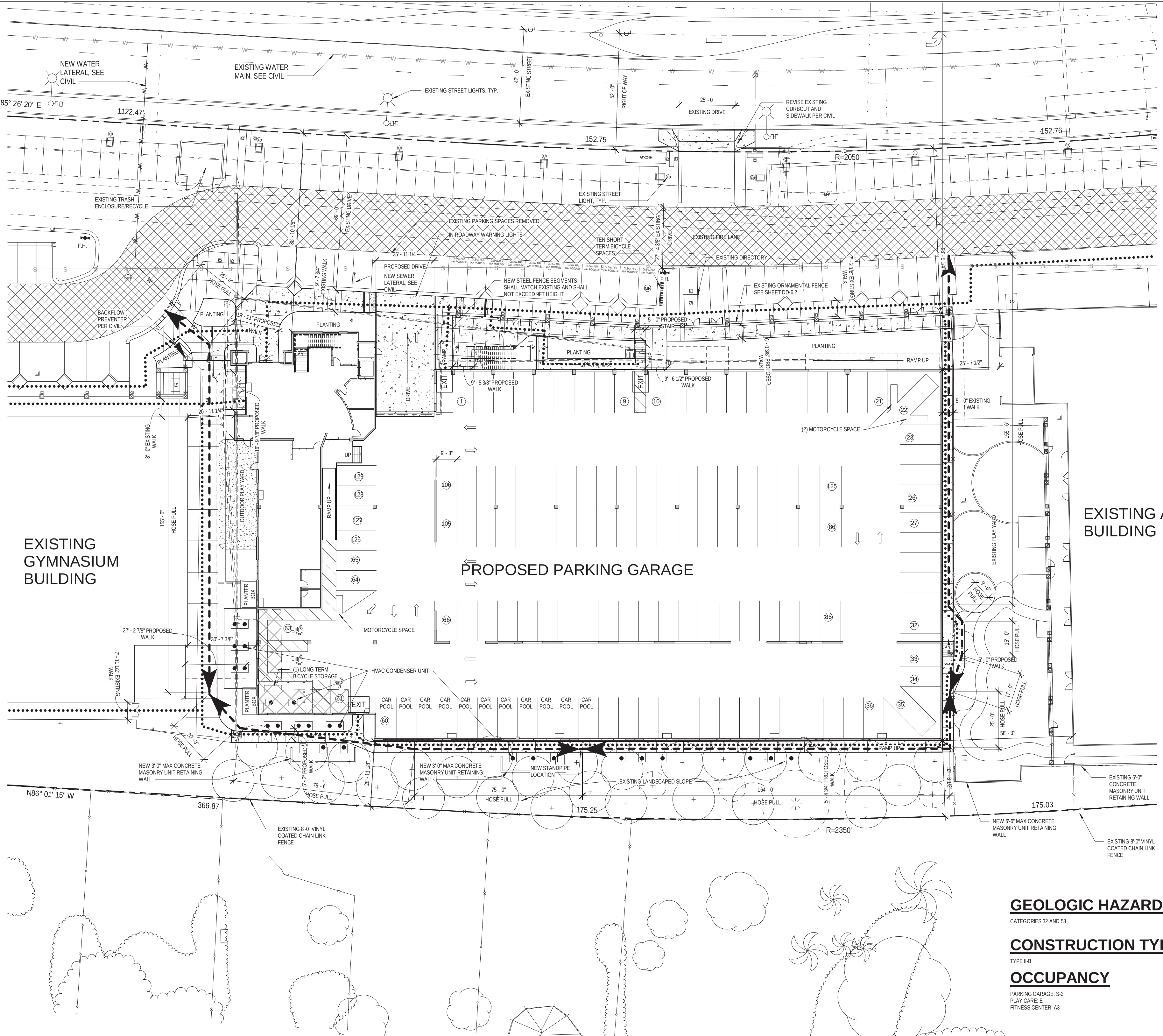

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SITE LEGEND

—W—W—	- EXISTING WATER SERVICE LINE
—S—S—	- EXISTING SEWER SERVICE LATERAL
—F—F—	- EXISTING FIRE (WATER) SERVICE LINE
—I—I—	- EXISTING IRRIGATION (WATER) SERVICE LINE
—E—E—	- EXISTING ELECTRICAL SERVICE LINE
—G—G—	- EXISTING GAS SERVICE LINE
⧓	- EXISTING FIRE HYDRANT
○—✲	- PROPOSED POLE MOUNTED LIGHT STANDARD
①	- NUMBER OF PARKING
♿	- HANDICAP PARKING SYMBOL

ACCESSIBLE PATH OF TRAVEL

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NOTES

1. YARDS USED FOR AREA INCREASES SHALL BE PERMANENTLY MAINTAINED.
2. THIS PROJECT SHALL COMPLY WITH THE 2016 EDITION OF THE CALIFORNIA BUILDING CODE (CBC), THE 2016 CALIFORNIA ELECTRICAL CODE (CEC), THE 2013 CALIFORNIA MECHANICAL CODE (CMC), THE 2016 CALIFORNIA PLUMBING CODE (CPC), THE 2016 CALIFORNIA FIRE CODE (CFC), IN ADDITION TO ALL THEIR RESPECTIVE 2013 CALIFORNIA AMENDMENTS, AND THE CURRENT EDITION OF THE CALIFORNIA ENERGY EFFICIENCY STANDARDS.
3. NO HAZARDOUS MATERIALS SHALL BE STORED AND/OR USED IN THIS BUILDING IN EXCESS OF THE QUANTITIES LISTED IN CBC TABLES 307.1 (1) AND 307.1 (2)
4. ALL PROPERTY LINES, EASEMENTS, STREET AND EXISTING AND PROPOSED STRUCTURES ARE SHOWN ON THIS SITE PLAN.
5. A GRADING PERMIT IS REQUIRED FOR THIS PROJECT
6. FIRE HYDRANTS ARE TO COMPLY WITH THE CITY'S ENGINEERING DEPARTMENT STANDARDS AND SPECIFICATIONS FOR ON-SITE FIRE HYDRANTS.
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PROPOSED BUILDING COVERAGE:	50,469 SF	9.4 %
EXISTING BUILDING COVERAGE	155,765 SF	29.02 %

TYPE OF DEVELOPMENT: RECREATION

OWNER

THE SALVATION ARMY
180 E. OCEAN BLVD - LEGAL DEPT
LONG BEACH, CA 90802
Tel:(562)491-8775
Fax:(562)591-8875
CONTACT:VICTOR DOUGHTY

GEOLOGIC HAZARD CATEGORY

CATEGORIES 32 AND 53

CONSTRUCTION TYPE

TYPE II-B

OCCUPANCY

PARKING GARAGE: S-2
PLAY CARE: E
FITNESS CENTER: A3

EXISTING DEVELOPMENT PERMITS

P.C.D. PERMIT 99-0887

ACCESSIBLE ROUTES:

FOR ACCESSIBLE ROUTES, SEE THIS PLAN & 'OVERALL SITE PLAN'

EXISTING BUILDINGS AND ADJACENT USES:

FOR ADJACENT USES SEE 'OVERALL SITE PLAN'

BUILDING ADDRESSES:

ADDRESSES SHALL BE VISIBLE AND LEGIBLE FROM THE ROAD OR STREET FRONTING THE PROPERTY PER FHPS POLICY P-00-6 (UFC 901.4.4)

LANDSCAPE SQUARE FOOTAGE

PLANTING AREA: 5,820

SQUARE FOOTAGE

Name	Area
01 FIRST FLOOR	
LOBBY / PLAY CARE	4,754 SF
PARKING	45,712 SF
01 FIRST FLOOR	50,467 SF
02 SECOND FLOOR	
FITNESS CENTER	23,007 SF
PHANTOM FLOOR	675 SF
SPORTS ROOF DECK	27,232 SF
02 SECOND FLOOR	50,913 SF
Grand total	101,380 SF

NORTH

SITE PLAN

1" = 20'-0"

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LICENSED ARCHITECT
KENNETH DUANE SMITH
No. C25315
Ren. 2/28/19
STATE OF CALIFORNIA

DATE: 05.08.2017
JOB NO: 15024
DRAWN BY: ASM
CHECKED BY: ASM

Revision Schedule

#	Date	Description

ORIGINAL PREPARATION DATE:
7/8/17

REVISION DATE(S):
2/15/18

project: Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

DD-2
SHEET: 2 of 13

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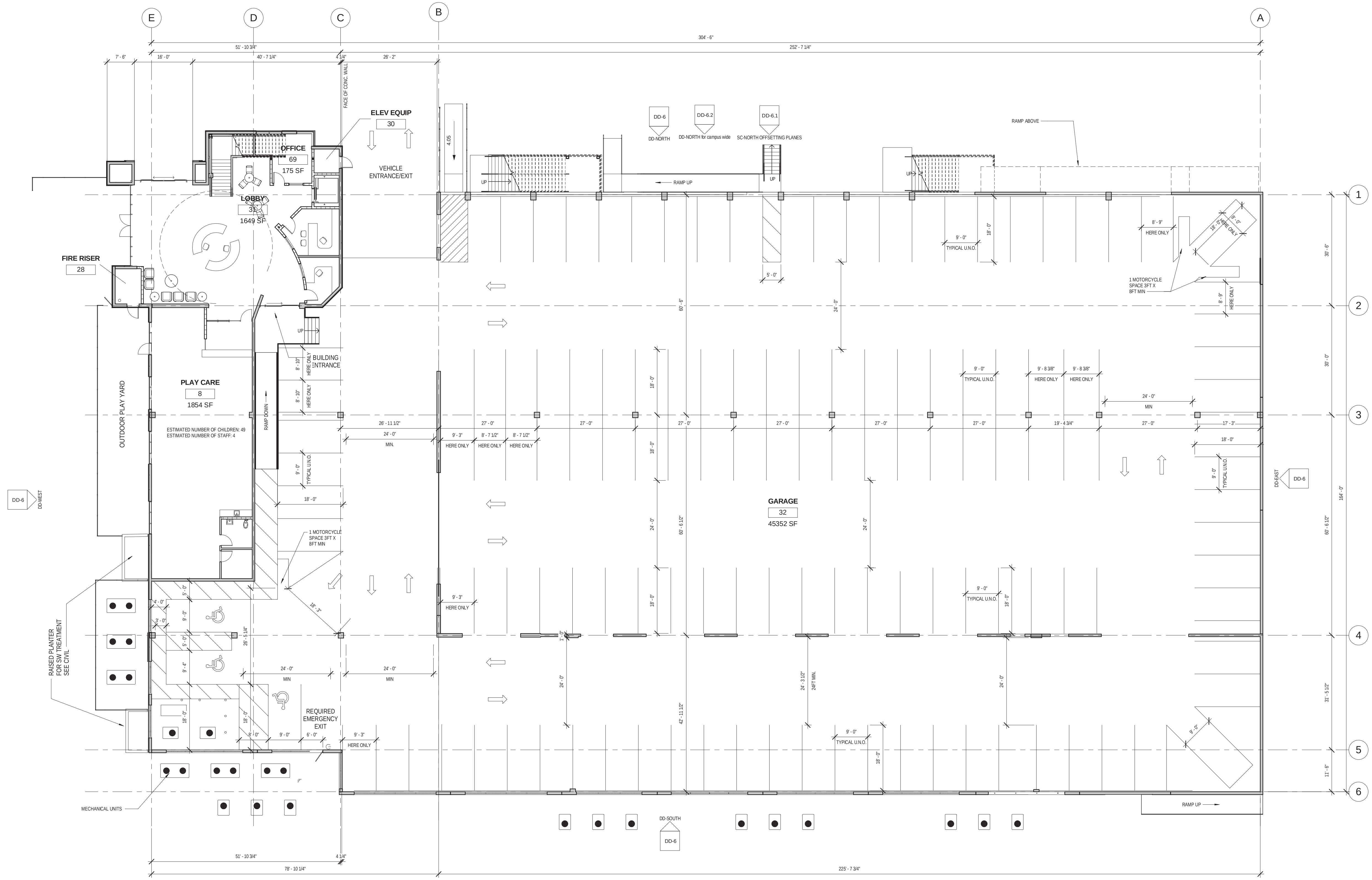

FIRST FLOOR PLAN

3/32" = 1'-0"

KENNETH D. SMITH
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EL CAJON - CA - 92020
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LICENSED ARCHITECT
KENNETH DUANE SMITH
No. C25315
Ren. 2/28/19
STATE OF CALIFORNIA

DATE: 05.08.2017
JOB NO: 15024
DRAWN BY: ASM
CHECKED BY: ASM

Revision Schedule

#	Date	Description

ORIGINAL PREPARATION DATE:
7/8/17

REVISION DATE(S):
2/15/18

project: Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

DD-3

SHEET: 3 of 13

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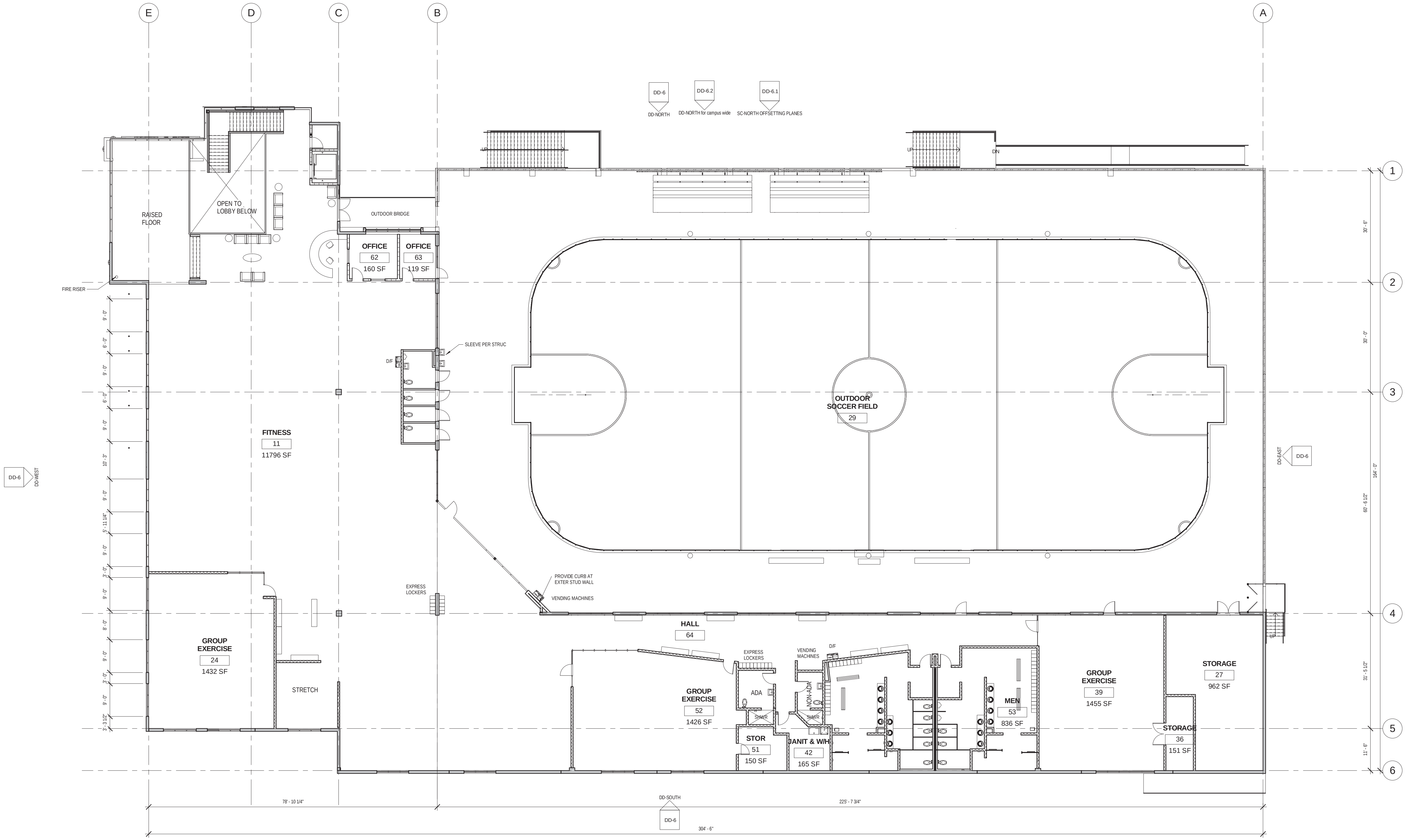

SECOND FLOOR PLAN

3/32" = 1'-0"

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Fax / 619 442 2699

KENNETH DUANE SMITH
No. C25315
Ren. 2/28/19

DATE: 05.08.2017
JOB NO: 15024
DRAWN BY: ASM
CHECKED BY: ASM

Revision Schedule

#	Date	Description

ORIGINAL PREPARATION DATE:
7/8/17

REVISION DATE(S):
2/15/18

project: Salvation Army Kroc Center
Sports & Wellness Center
San Diego, CA

DD-4

SHEET: 4 of 13

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2.0 Study Methodology

The parameters by which this transportation impact analysis was prepared included the determination of what transportation facilities are to be analyzed, the scenarios to be analyzed and the methods required for analysis. The analysis is based on the *2010 Highway Capacity Manual* (HCM) operations analysis using Level of Service (LOS) evaluation criteria and the threshold for determining an impact is based on the City of San Diego and City of La Mesa traffic impact significance thresholds (since the facilities analyzed are located in both jurisdictions).

2.1 Study Area Criteria

The project study area is generally determined by the City of San Diego *Traffic Impact Study Manual* (July 1998), which notes the study area is typically determined by the extent of 50 peak hour directional trips. The manual also states "At a minimum, any traffic impact study must address site access and adjacent intersections, plus the first major signalized intersection in each direction from the site. Beyond this minimum requirement, all known congested or potentially congested locations that may be impacted by the proposed development should be studied". The following intersections were included in this study based on the above criteria and based on coordination with City of San Diego staff:

1) University Ave/Aragon Dr (signalized)
2) University Ave/Kroc Center Main Driveway (signalized)
3) University Ave/Kroc Center East Driveway (un-signalized)
4) University Ave/70th St/Lois St (signalized)

The following street segments were also analyzed as part of this study:

1) University Avenue from Aragon Drive to Kroc Center Driveway
2) University Avenue from Kroc Center Driveway to 69th Street

Traffic counts and intersection signal timing sheets are included in **Appendix A.**

2.2 Scenario Criteria

The following study scenarios were analyzed:

1) Existing without Project Conditions
2) Existing with Project Conditions
3) Near Term Year 2020 without Project Conditions
4) Near Term Year 2020 with Project Conditions (Opening Day)
5) Horizon Year 2035 without Project Conditions
6) Horizon Year 2035 with Project Conditions

2.3 Traffic Analysis Criteria

The traffic analyses prepared for this study were based on the *2010 Highway Capacity Manual* (HCM) operations analysis using Level of Service (LOS) evaluation criteria. The operating conditions of the study intersections were measured using the HCM LOS designations, which ranges from A through F. LOS A represents the best operating condition and LOS F denotes the worst operating condition. For this traffic study, the intersections were analyzed using the City of San Diego criteria for City of San Diego facilities and City of La Mesa criteria for City of La Mesa facilities. The City of San Diego also requires a traffic study checklist, which is included in **Appendix B**. The LOS criteria for each roadway component are described below.

2.3.1 Intersections

The study intersections were analyzed based on the **operational analysis** outlined in the 2010 HCM. This process defines LOS in terms of **average control delay** per vehicle, which is measured in seconds. LOS at the intersections were calculated using the computer software program Synchro 10 (Trafficware Corporation). The HCM LOS for the range of delay by seconds for un-signalized and signalized intersections is described in **Table 1**.

TABLE 1: INTERSECTION LEVEL OF SERVICE DEFINITIONS (HCM 2010)

Level of Service	Un-Signalized (TWSC and AWSC) Control Delay (seconds/vehicle)	Signalized Control Delay (seconds/vehicle)
A	0-10	< 10
B	> 10-15	> 10-20
C	> 15-25	> 20-35
D	> 25-35	> 35-55
E	> 35-50	> 55-80
F	> 50	> 80

TWSC: Two Way Stop Control. AWSC: All Way Stop Control. Source: Highway Capacity Manual 2010

2.3.2 Street Segments

The street segments were analyzed based on the functional classification of the roadway using the City of San Diego *Average Daily Vehicle Trips* capacity lookup table. The roadway segment capacity and LOS standards used to analyze street segments are summarized in **Table 2**.

TABLE 2: STREET SEGMENT DAILY CAPACITY AND LOS (CITY OF SAN DIEGO)

Circulation Element Road Classification	LOS A	LOS B	LOS C	LOS D	LOS E
Expressway – 6 Lanes	<30,000	<42,000	<60,000	<70,000	<80,000
Prime Arterial – 6 Lanes	<25,000	<35,000	<50,000	<55,000	<60,000
Major Arterial – 6 Lanes	<20,000	<28,000	<40,000	<45,000	<50,000
Major Arterial – 4 Lanes	<15,000	<21,000	<30,000	<35,000	<40,000
Collector – 4 Lanes	<10,000	<14,000	<20,000	<25,000	<30,000
Collector (no Center Ln) – 4 Lanes Collector (with TWLTL) – 2 Lanes	<5,000	<7,000	<10,000	<13,000	<15,000
Collector – 2 Lanes (no fronting property)	<4,000	<5,500	<7,500	<9,000	<10,000
Collector – 2 Lanes (commercial-industrial fronting)	<2,500	<3,500	<5,000	<6,500	<8,000
Collector – 2 Lanes (multi-family)	<2,500	<3,500	<5,000	<6,500	<8,000
Sub-Collector – 2 Lanes (multi-family)			<2,200		

Source: City of San Diego *Traffic Impact Study Manual* July 1998, page 8.

2.4 Traffic Significance Criteria

The traffic study area falls within the City of San Diego and City of La Mesa. The significance criteria for each respective jurisdiction was used for the traffic study analysis.

2.4.1 City of San Diego Traffic Significance Criteria

A project is considered to have caused a significant impact if the new project traffic degrades a facility from acceptable LOS to unacceptable LOS or decreases the operations on the surrounding roadways by the city of San Diego defined thresholds as shown in **Table 3**.

TABLE 3: CITY OF SAN DIEGO TRAFFIC IMPACT SIGNIFICANCE THRESHOLDS

Level of Service with Project	Allowable Increase Due to Project Impacts[1]		
	Roadway Segments		Intersections
	V/C	Speed (mph)	Delay (sec.)
E[2]	0.02	1.0	2.0
F[2]	0.01	0.5	1.0

Source: City of San Diego. Notes: [1] If a proposed project's traffic impacts exceed the values shown in the table, then the impacts are deemed "significant." If the project traffic causes an acceptable LOS (i.e. A-C) to degrade to LOS E or F, then the impact is deemed "significant". The project applicant shall identify "feasible mitigations" to achieve LOS D or better. [2] The acceptable Level of Service (LOS) standard for roadways and intersections in San Diego is LOS D. However, for undeveloped locations, the goal is to achieve a LOS C. Delay measured in seconds. V/C = Volume to Capacity Ratio (capacity at LOS E should be used). Speed = Arterial speed measured in miles per hour for CMP

If a significant impact is calculated due to the addition of project traffic, then feasible mitigation is required to reduce the facility to the pre-project conditions or better.

2.4.2 City of La Mesa Traffic Significance Criteria

The City of La Mesa generally follows the San Diego Traffic Engineers' Council (SANTEC)/Institute of Transportation Engineers (ITE) Traffic Impact Study Guidelines where a project is considered to have a significant impact if project traffic is calculated to decrease the operations to worse than LOS D or exceed the allowable increase due to the addition of project traffic at locations operating under LOS E or F conditions as shown in **Table 4**.

TABLE 4: CITY OF LA MESA IMPACT SIGNIFICANT THRESHOLDS (BASED ON SANTEC/ITE)

Level of Service with Project	Allowable Increase Due to Project Impacts				
	Freeways	Roadway Segments		Intersections	Ramp Metering
	V/C	V/C	Speed (mph)	Delay (sec.)	Delay (min.)
E & F	0.01	0.02	1	2	2*

Source: Based on SANTEC Guidelines. Notes: * The impact is only considered significant if the total delay exceeds 15 minutes; Delay = Average stopped delay per vehicle measured in seconds; V/C = Volume to Capacity Ratio (capacity at LOS E should be used); Speed = Arterial speed measured in miles per hour for Congestion Management Program (CMP) analyses

2.5 Congestion Management Program Criteria

The San Diego Association of Governments (SANDAG) has the following statement on their website regarding the Congestion Management Program (CMP):

> "In October 2009, the San Diego region elected to be exempt from the State CMP and, since this decision, SANDAG has been abiding by 23 CFR 450.320 to ensure the region's continued compliance with the federal congestion management process."

3.0 Existing Conditions

This section describes the study area street system, daily volumes, and LOS.

3.1 Existing Street System

In the vicinity of the project, the following roadways were analyzed as part of this study:

University Avenue from Aragon Drive to 69th Street is classified as a 4-Lane Major in the City of San Diego *Mid-City Communities Plan* (excerpts included in **Appendix C**). This segment is constructed with a raised median, 2 (two) travel lanes in each direction and on-street parking generally allowed on both sides of the roadway. The posted speed limit is 35 Miles per Hour (MPH). No bike lanes nor Class III bike signs were observed on this segment of University Avenue.

3.2 Multi-Modal Transportation

This section describes the existing multi-modal transportation element near the project site.

3.2.1 Transit

Metropolitan Transit System (MTS) provides bus service as Route 7 on University Avenue adjacent to the project site.

MTS Bus Route 7 has a schedule with service headways of approximately 12 to 15 minutes throughout the day seven days a week. Six bus stops are located on University Avenue along the project frontage (three bus stops on the south side of the street and three bus stops on the north side of the street).

A route map and specific service times and frequency are outlined in the bus schedule included in **Appendix D**.

3.2.2 Bicycle

The City of San Diego *Bicycle Master Plan*, December 2013 shows a proposed Class II bike lane on University Avenue along the project frontage. No bike lanes are proposed on Aragon Drive along the project frontage.

The *Mid-City Communities Plan*, does not show proposed bike lanes on University Avenue nor on Aragon Drive along the project frontage.

No marked bike lanes nor Class III bike route signs were observed on University Avenue nor Aragon Drive along the project frontage. Excerpts from the City of San Diego *Bicycle Master Plan*

Update and the *Mid-City Communities Plan* are included in **Appendix E**.

3.2.3 Pedestrian

Contiguous sidewalks exist along the project frontage on University Avenue and Aragon Drive.

3.2.4 Multi-Modal Summary Map

The existing roadway conditions along with the bus route and bus stops are shown in **Figure 6**.

3.3 Existing Traffic Volumes and LOS Analysis

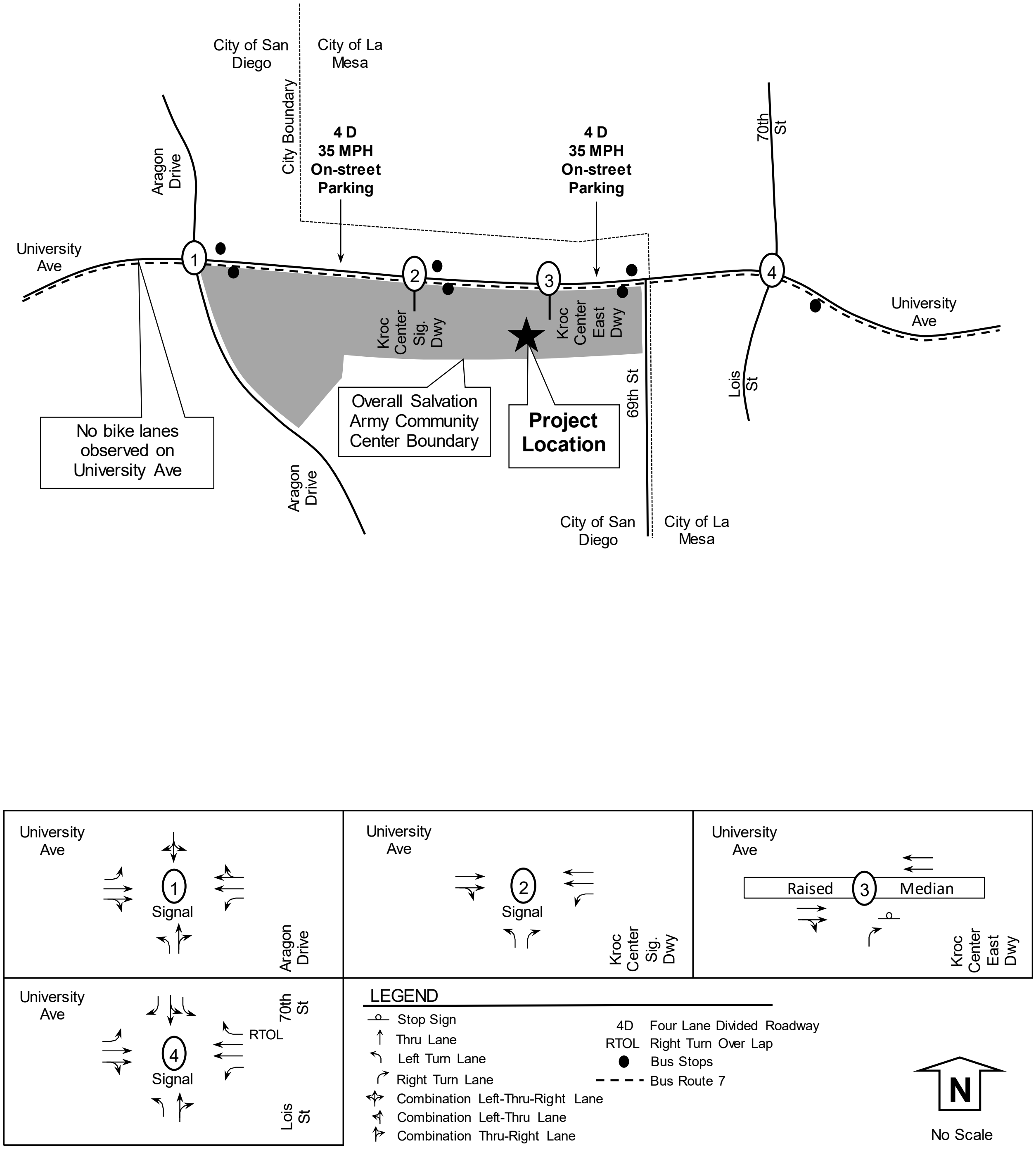
Intersection counts were collected between 7:00 AM to 9:00 AM for the AM commuter period and from 4:00 PM to 6:00 PM for the PM commuter period on Thursday, December 7, 2017. Street segment counts were also taken that day.

1) University Ave/Aragon Dr
2) University Ave/Kroc Center Main Driveway
3) University Ave/Kroc Center East Driveway
4) University Ave/70th St/Lois St

The following street segment volumes were collected on the dates noted below:

1) University Avenue from Aragon Drive to Kroc Center Main Driveway
2) University Avenue from Kroc Center Main Driveway to 69th Street

Figure 6: Existing Conditions



The existing weekday daily, and peak hour volumes are shown in **Figure 7**. The LOS calculated for the study roadway elements are included in **Tables 5 and 6**. Intersection LOS calculations are included in **Appendix F**.

TABLE 5: EXISTING INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis)[1]	Jurisdiction	Movement	Study Period	Existing	
				Delay[2]	LOS[3]
1) University Ave at	City of	All	AM	19.7	B
Aragon Dr (S)	San Diego	All	PM	18.9	B
2) University Ave at	City of	All	AM	14.6	B
Kroc Main Dwy (S)	San Diego	All	AM	15.1	B
3) University Ave at	City of	NB R	AM	10.6	B
Kroc East Dwy (U)	San Diego	NB R	PM	11.9	B
4) University Ave at	City of	All	AM	31.6	C
70th/Lois St (S)	La Mesa	All	PM	28.6	C

Notes: 1) Intersection Analysis - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service.

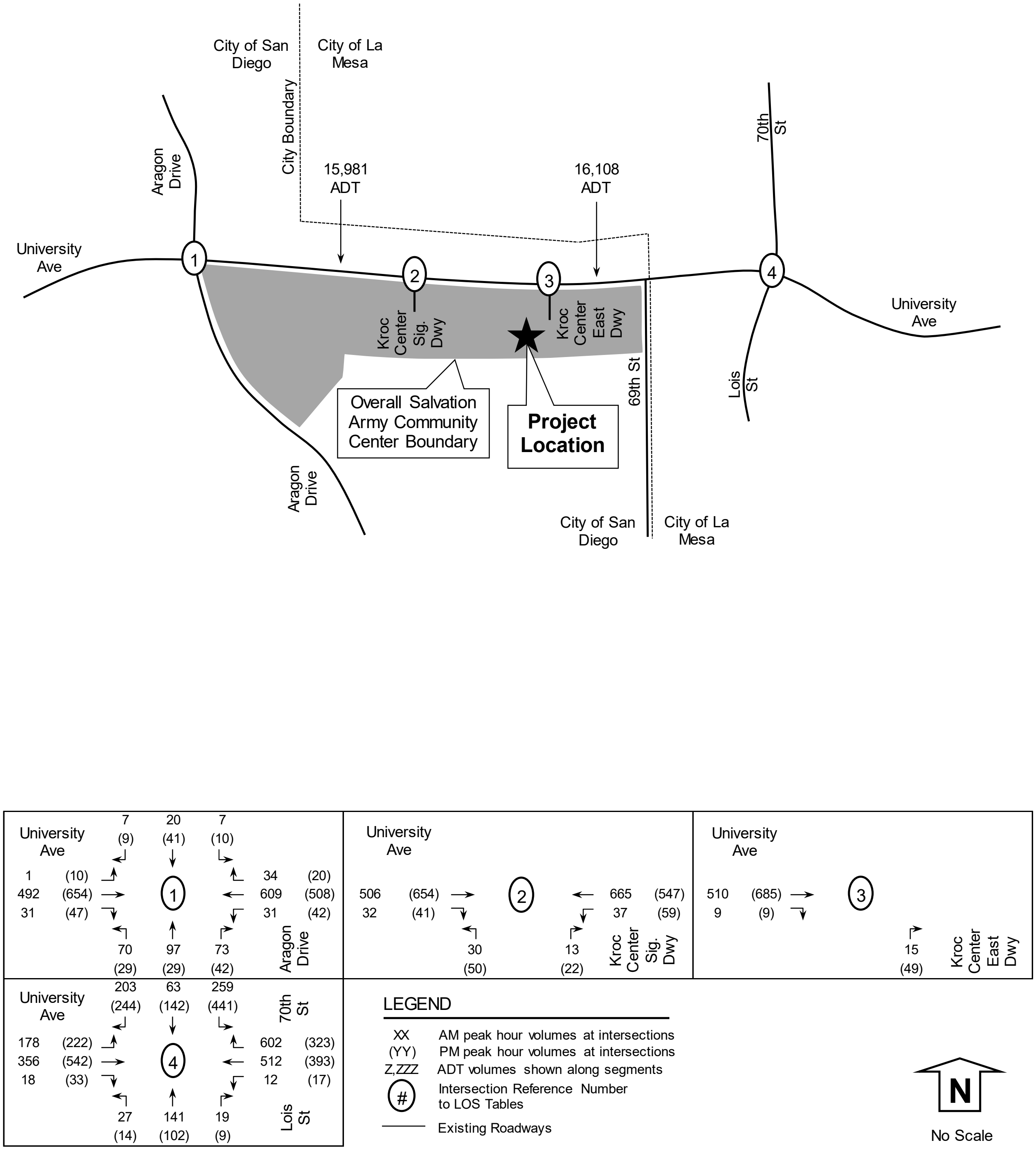
TABLE 6: EXISTING SEGMENT VOLUMES AND LEVEL OF SERVICE

Segment	Roadway Classification (as built)	LOS E Capacity	Existing		
			Daily Volume	V/C	LOS
University Avenue					
Aragon Dr to Kroc Center Main Driveway	4 Ln Major (4D)	40,000	15,981	0.400	B
Kroc Center Main Driveway to 69th Street	4 Ln Major (4D)	40,000	16,108	0.403	B

Notes: 4D = 4 lane divided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. V/C: Volume to Capacity Ratio.

Under existing conditions, all of the study intersections and segments were calculated to operate at LOS C or better.

Figure 7: Existing Volumes



4.0 Project Description

The project is a two-story recreation building (Wellness Center) with an elevated sports deck structure with at grade parking (underneath the elevated sports deck) at 6605-6845 University Avenue San Diego, California. The project will replace an existing and active soccer field on the Salvation Army Ray and Joan Kroc Community Center grounds. The project is planned to open by the year 2020. The project is located in the CC 5-3 zone within the Mid-City, Eastern Community Plan area. Project access is possible from a total of five existing driveways with two driveways on University Avenue, two driveways on Aragon Drive, and one driveway on 69th Street

4.1 Project Trip Generation

The trip generation for the project was calculated using trip rates from the City of San Diego *Trip Generation Manual*, May 2003. The overall Salvation Army Ray and Joan Kroc Community Center was originally analyzed as a community center with a trip generation of 30 daily trips per 1,000 square feet in the Linscott, Law & Greenspan Engineers traffic study from 1999 (excerpt included in **Appendix G**). To be conservative, the project was analyzed using a higher trip rate of 40 weekday trips per 1,000 square feet for the health club component and 80 weekday trips per 1,000 square feet for the accessory child/day care component. There is currently a small child/day care facility (for parents/guardians who use the overall Salvation Army Community Center) in the adjacent gymnasium building (west of the soccer field) that will relocate operations to the new proposed day care use in the new building. With some existing child/day care already occurring on-site, the proposed child/day care trip generation provides a conservative analysis (without taking credit for the existing child/day care use). The proposed Wellness Center project with a health club and day care is calculated to generate approximately 1,069 ADT with 65 AM peak hour trips (36 inbound and 29 outbound) and 111 PM peak hour trips (64 inbound and 47 outbound) as shown in **Table 7**.

TABLE 7: PROJECT TRIP GENERATION

Proposed						AM				PM	
Land Use	Rate	Size & Units	ADT	%	Split	IN	OUT	%	Split	IN	OUT
Health Club	40 /KSF	22,940 SF	918	4%	0.6 0.4	22	15	9%	0.6 0.4	50	33
Day Care	80 /KSF	1,892 SF	151	19%	0.5 0.5	14	14	18%	0.5 0.5	14	14
		Trip Generation Total:	**1,069**			**36**	**29**			**64**	**47**

Source: City of San Diego *Trip Generation Manual*, May 2003. ADT-Average Daily Traffic ; Split-percent inbound and outbound.

4.2 Project Trip Distribution and Assignment

The distribution was based on the original traffic study distribution that assigned project traffic evenly (50-50) east and west of the site (original distribution included in **Appendix H**). The project site has five (5) existing driveways that patrons may use to reach the parking structure; however, all of the new project traffic was assigned to the existing signalized driveway just west of the parking structure and to the existing right-in/right-out driveway across from the soccer field as these two driveways are closest to the parking structure providing the shortest path to a public street. The project distribution is shown in **Figure 8** while the trip assignment is shown in **Figure 9.**

Figure 8: Project Distribution

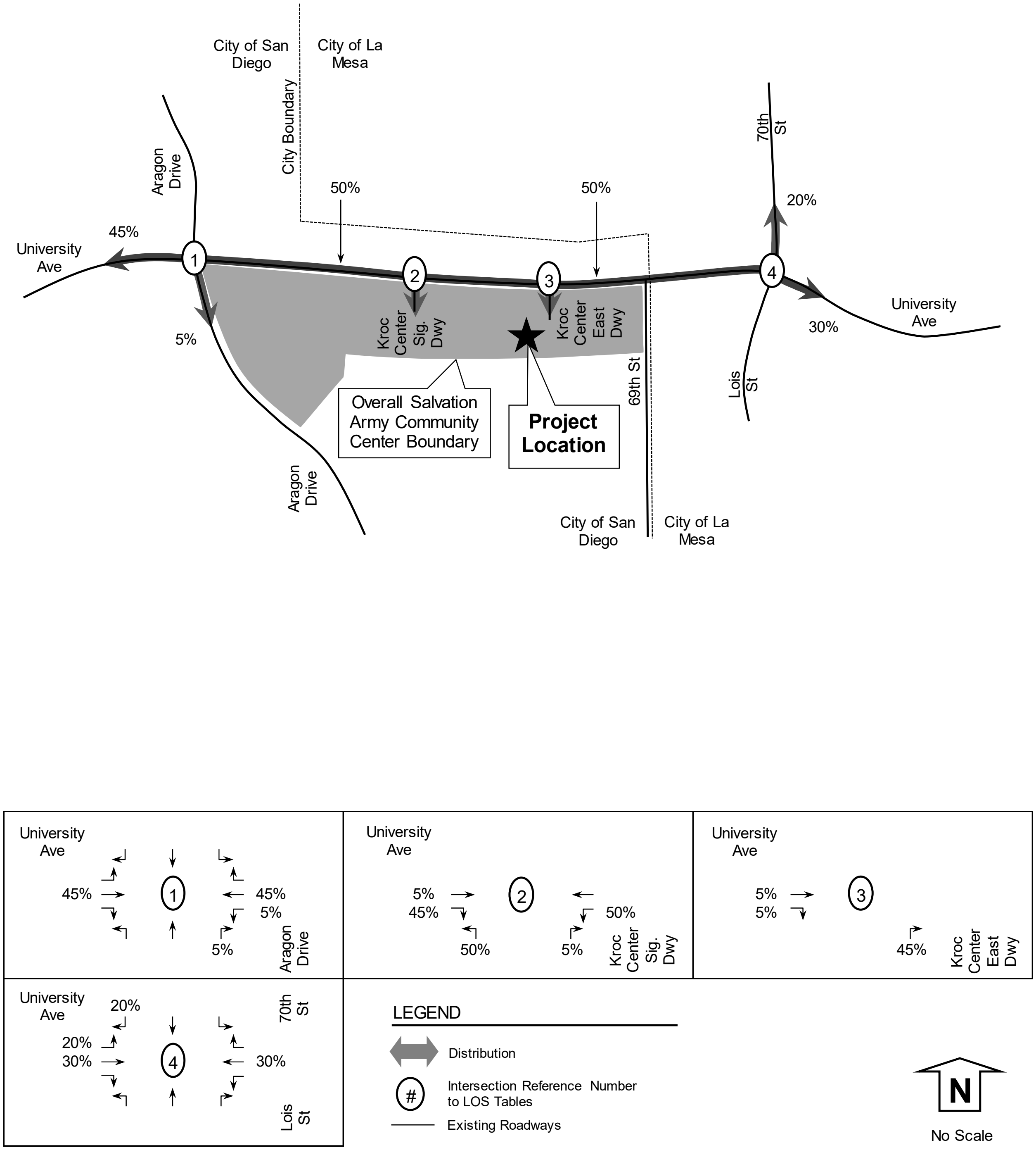
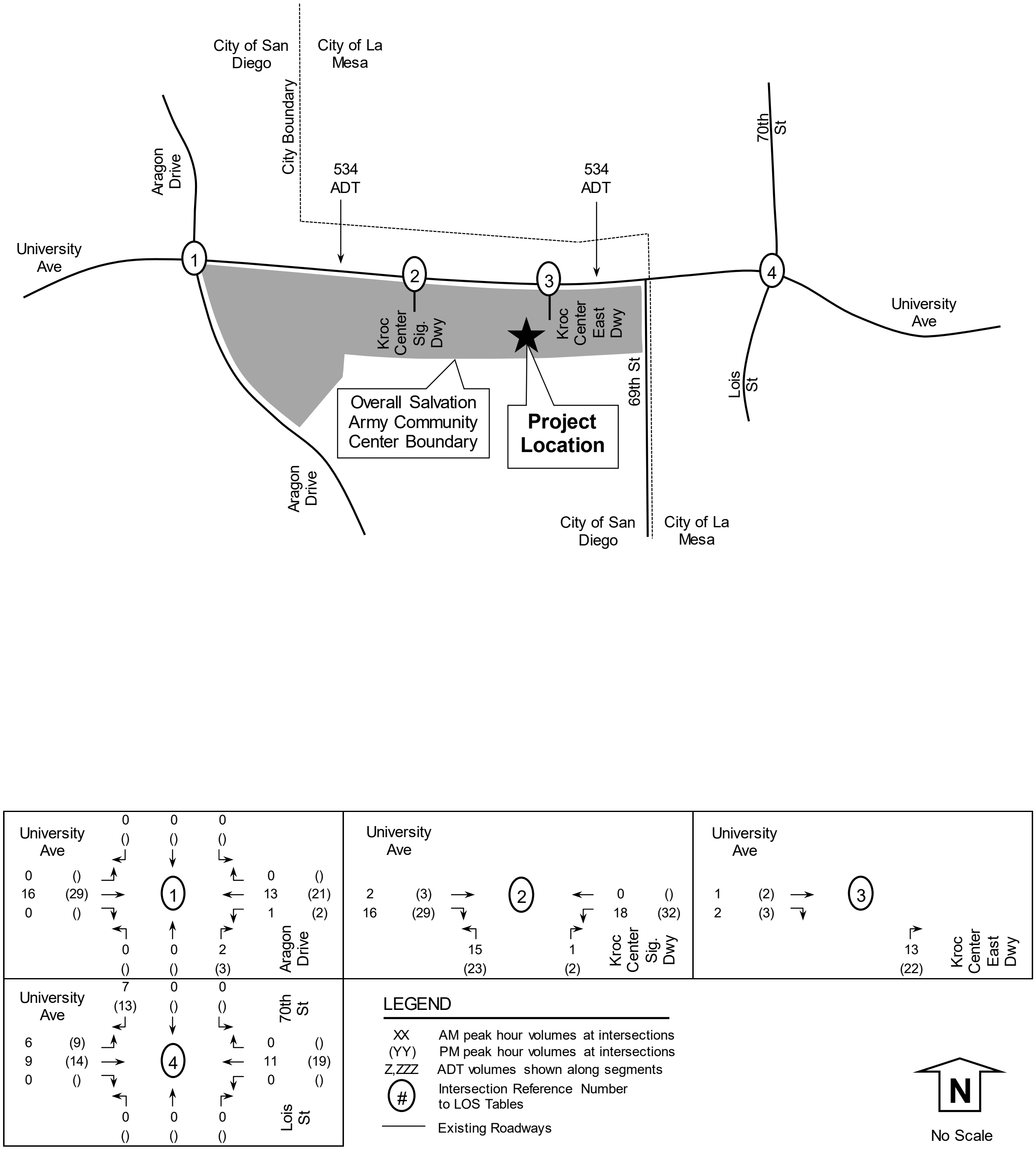


Figure 9: Project Assignment



4.3 Project Parking

The overall minimum required parking for the site is 486 spaces (existing Salvation Army Kroc Center and proposed parking structure). The proposed parking is 503 spaces resulting in a surplus of 17 spaces. A parking summary prepared by the project's Architect is shown below.

PARKING REQUIRED		
ON-SITE PARKING SHOWN ON SCR-12-11-2000:		384 SPACES
NEW WELLNESS CENTER PARKING		
FITNESS AREAS: 22940 S.F. AT 5 SPACE/1,000 S.F.:	115 SPACES	
PLAY CARE CENTER: 1892 S.F. AT 1 SPACE PER STAFF:	4	
TOTAL	119	
15% REDUCTION FOR TRANSIT OVERLAY:	<17 SPACES>	
TOTAL PARKING REQ'D FOR NEW BUILDING:	102 SPACES	102 SPACES
TOTAL PARKING REQUIRED		486 SPACES
TOTAL PARKING PROVIDED		
ACTUAL ON-SITE PARKING:		378 SPACES
PROPOSED PARKING STRUCTURE:		129 SPACES
PARKING DELETED AT STRUCTURE ENTRANCE:		<4> SPACES
TOTAL PARKING PROVIDED:		503 SPACES
SURPLUS:		17 SPACES

NOTE: ROOFTOP SOCCER FIELD IS SATISFIED BY EXISTING PARKING APPROVED IN P.C.D. PERMIT 99-0887

NOTE: THE ROOFTOP SOCCER FIELD SHALL NOT EXCEED THE SIZE OF THE EXISTING RECREATION FIELD

4.4 Project Construction Traffic

According to the applicant, the construction traffic is currently estimated to occur over a time period of approximately 11 months. Construction worker parking and laydown area are anticipated to be immediately adjacent to or within the construction work area. During peak construction periods (short durations of one to two days at a time when there is a concrete pour taking place), between 35 and 50 workers would start a 7:00 AM with 25 to 40 leaving between 3:00 and 3:30 PM with the balance leaving after 3:30 PM. However, there may be times when a few trades will need to work overtime and end later. On an average day, 20 construction workers and 10 deliveries are anticipated to occur starting around 7:00 AM and ending around 3:30 PM. For the average day, the AM peak hour is anticipated to have 60 AM peak hour trips (20 inbound worker vehicles, 20 inbound trucks with 2.0 PCE [10x2], and 20 outbound trucks with a 2.0 PCE [10x2]) and 10 or fewer PM peak hour trips (potential overtime workers and late deliveries). This traffic study trip generation accounts for 65 AM and 111 PM peak hour trips. The average construction traffic is within the range of traffic analyzed as part of the proposed project.

5.0 Existing with Project Conditions

This scenario accounts for the addition of project traffic onto existing conditions. The traffic volumes are shown in **Figure 10.** The LOS calculated for the study intersections and segments are included in **Tables 8 and 9**. Intersection LOS calculations are included in **Appendix I**.

TABLE 8: EXISTING WITH PROJECT INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis)[1]	Jurisdiction	Movement	Study Period	Existing		Existing + Project			
				Delay[2]	LOS[3]	Delay[2]	LOS[3]	Delta[4]	Direct Impact?[5]
1) University Ave at	City of	All	AM	19.7	B	19.9	B	0.2	No
Aragon Dr (S)	San Diego	All	PM	18.9	B	19.1	B	0.2	No
2) University Ave at	City of	All	AM	14.6	B	15.0	B	0.4	No
Kroc Main Dwy (S)	San Diego	All	AM	15.1	B	15.5	B	0.4	No
3) University Ave at	City of	NB R	AM	10.6	B	10.8	B	0.2	No
Kroc East Dwy (U)	San Diego	NB R	PM	11.9	B	12.5	B	0.6	No
4) University Ave at	City of	All	AM	31.6	C	32.4	C	0.8	No
70th/Lois St (S)	La Mesa	All	PM	28.6	C	29.9	C	1.3	No

Notes: 1) Intersection Analysis - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service. 4) Delta is the increase in delay from project. 5) Impact if project traffic exceeds threshold.

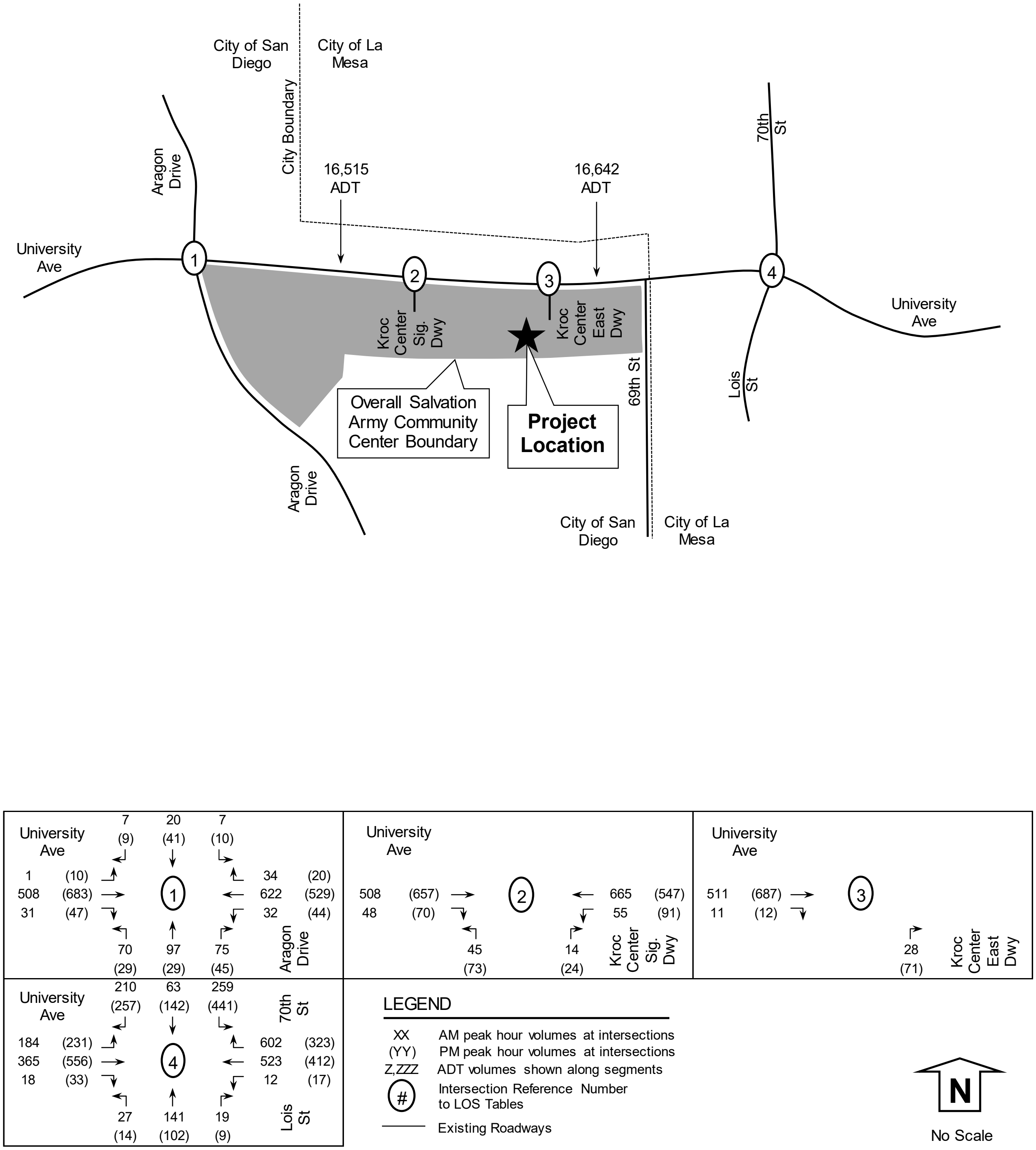
TABLE 9: EXISTING WITH PROJECT SEGMENT VOLUMES AND LEVEL OF SERVICE

Segment	Roadway Classification (as built)	LOS E Capacity	Existing			Project	Existing + Project				
			Daily Volume	V/C	LOS	Daily Volume	Daily Volume	V/C	LOS	Change in V/C	Direct Impact?
University Avenue											
Aragon Dr to Kroc Center Main Driveway	4 Ln Major (4D)	40,000	15,981	0.400	B	534	16,515	0.413	B	0.013	No
Kroc Center Main Driveway to 69th Street	4 Ln Major (4D)	40,000	16,108	0.403	B	534	16,642	0.416	B	0.013	No

Notes: 4D = 4 lane divided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. V/C: Volume to Capacity Ratio.

Under existing with project conditions, all of the study intersections and segments were calculated to operate at LOS C or better with no significant direct impacts because the addition of project traffic does not cause unacceptable levels of service.

Figure 10: Existing with Project Volumes



6.0 Near Term Year 2020 without Project Conditions

Near term without project conditions describe the anticipated roadway operations for opening day anticipated to be year 2020. Coordination with City of San Diego engineering staff resulted in no known near-by cumulative projects that would be anticipated to add traffic to the study area. Therefore, an annual growth factor of 0.31% per year was calculated from the increase in daily traffic volumes between SANDAG year 2008 and year 2035 daily volumes on University Avenue in the project vicinity (calculations included in **Appendix J**). For near term conditions, a 1% growth factor was applied to year 2017 volumes to represent year 2020 volumes (0.31% per year for 3 years = 0.93% rounded to 1%).

Near term traffic volumes (existing + growth) without the project are shown in **Figure 11**. The LOS calculated for the study intersections and segments are shown in **Tables 10 and 11**. Intersection LOS calculations are included in **Appendix K**.

TABLE 10: NEAR TERM YEAR 2020 WITHOUT PROJECT INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis)[1]	Jurisdiction	Movement	Peak Hour	Near Term Delay[2]	Near Term LOS[3]
1) University Ave at	City of	All	AM	19.7	B
Aragon Dr (S)	San Diego	All	PM	18.9	B
2) University Ave at	City of	All	AM	14.6	B
Kroc Main Dwy (S)	San Diego	All	AM	15.1	B
3) University Ave at	City of	NB R	AM	10.7	B
Kroc East Dwy (U)	San Diego	NB R	PM	12.0	B
4) University Ave at	City of	All	AM	32.1	C
70th/Lois St (S)	La Mesa	All	PM	29.2	C

Notes: 1) Intersection Analysis - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service.

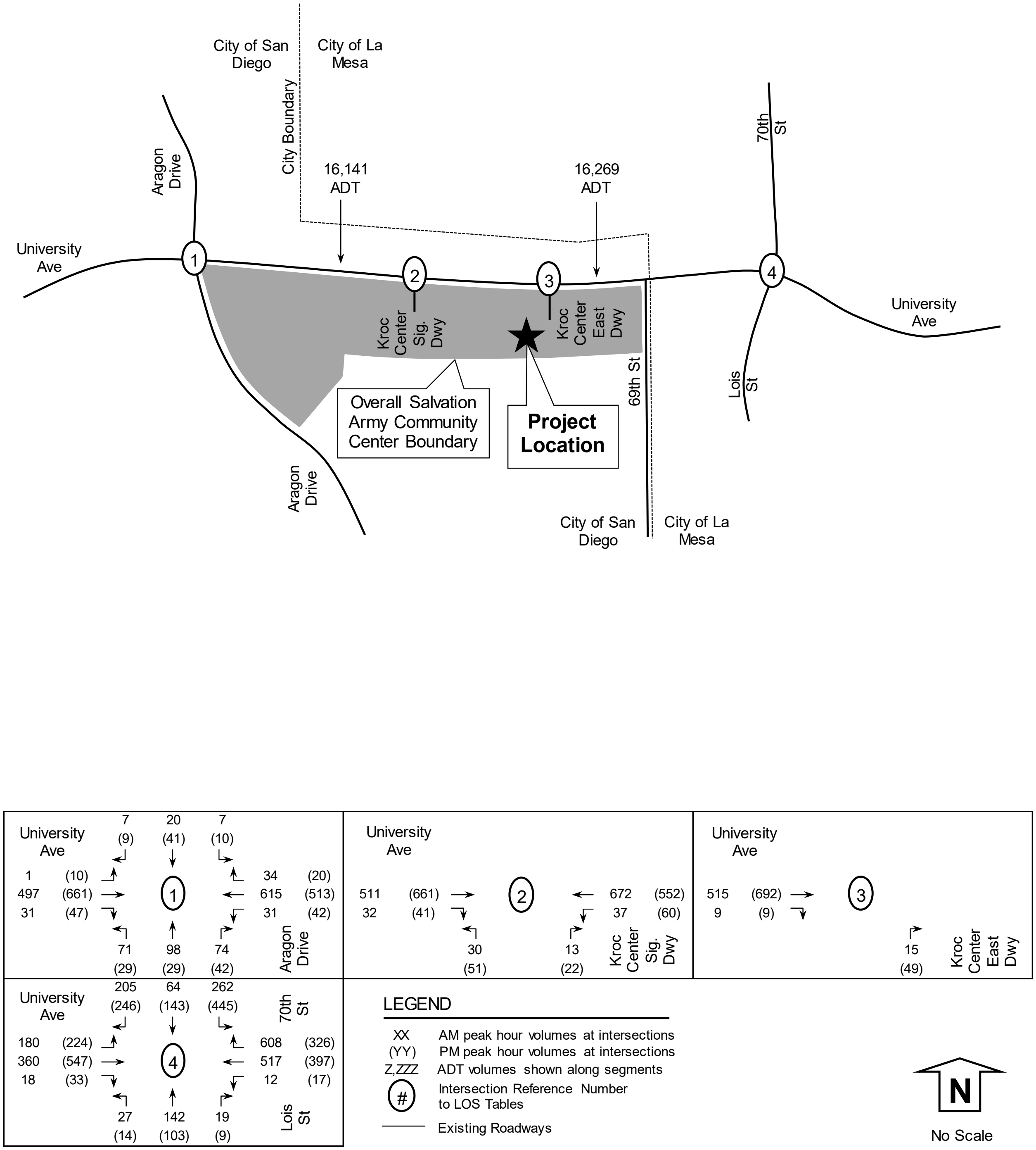
TABLE 11: NEAR TERM YEAR 2020 WITHOUT PROJECT SEGMENT VOLUMES AND LEVEL OF SERVICE

Segment	Roadway Classification (as built)	LOS E Capacity	Near Term Daily Volume	Near Term V/C	Near Term LOS
University Avenue					
Aragon Dr to Kroc Center Main Driveway	4 Ln Major (4D)	40,000	16,141	0.404	B
Kroc Center Main Driveway to 69th Street	4 Ln Major (4D)	40,000	16,269	0.407	B

Notes: 4D = 4 lane divided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. V/C: Volume to Capacity Ratio.

Under near term conditions, all of the study intersections and segments were calculated to operate at LOS C or better.

Figure 11: Near Term Year 2020 without Project Volumes



7.0 Near Term Year 2020 with Project Conditions

The near term with project conditions describe the anticipated roadway operations during opening day of the project. Near term with project traffic volumes are shown in **Figure 12.** The LOS calculated for the study intersections and segments are included in **Tables 12 and 13**. Intersection LOS calculations are included in **Appendix L**.

TABLE 12: NEAR TERM YEAR 2020 WITH PROJECT INTERSECTION LEVEL OF SERVICE

Intersection and	Jurisdiction	Movement	Peak	Near Term		Near Term + Project			
(Analysis)[1]			Hour	Delay[2]	LOS[3]	Delay[2]	LOS[3]	Delta[4]	Direct Impact[5]
1) University Ave at	City of	All	AM	19.7	B	20.0	C	0.3	No
Aragon Dr (S)	San Diego	All	PM	18.9	B	19.1	B	0.2	No
2) University Ave at	City of	All	AM	14.6	B	15.0	B	0.4	No
Kroc Main Dwy (S)	San Diego	All	AM	15.1	B	15.5	B	0.4	No
3) University Ave at	City of	NB R	AM	10.7	B	10.9	B	0.2	No
Kroc East Dwy (U)	San Diego	NB R	PM	12.0	B	12.5	B	0.5	No
4) University Ave at	City of	All	AM	32.1	C	32.9	C	0.8	No
70th/Lois St (S)	La Mesa	All	PM	29.2	C	30.5	C	1.3	No

Notes: 1) Intersection Analysis - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service. 4) Delta is the increase in delay from project. 5) Direct Impact if project traffic exceeds threshold.

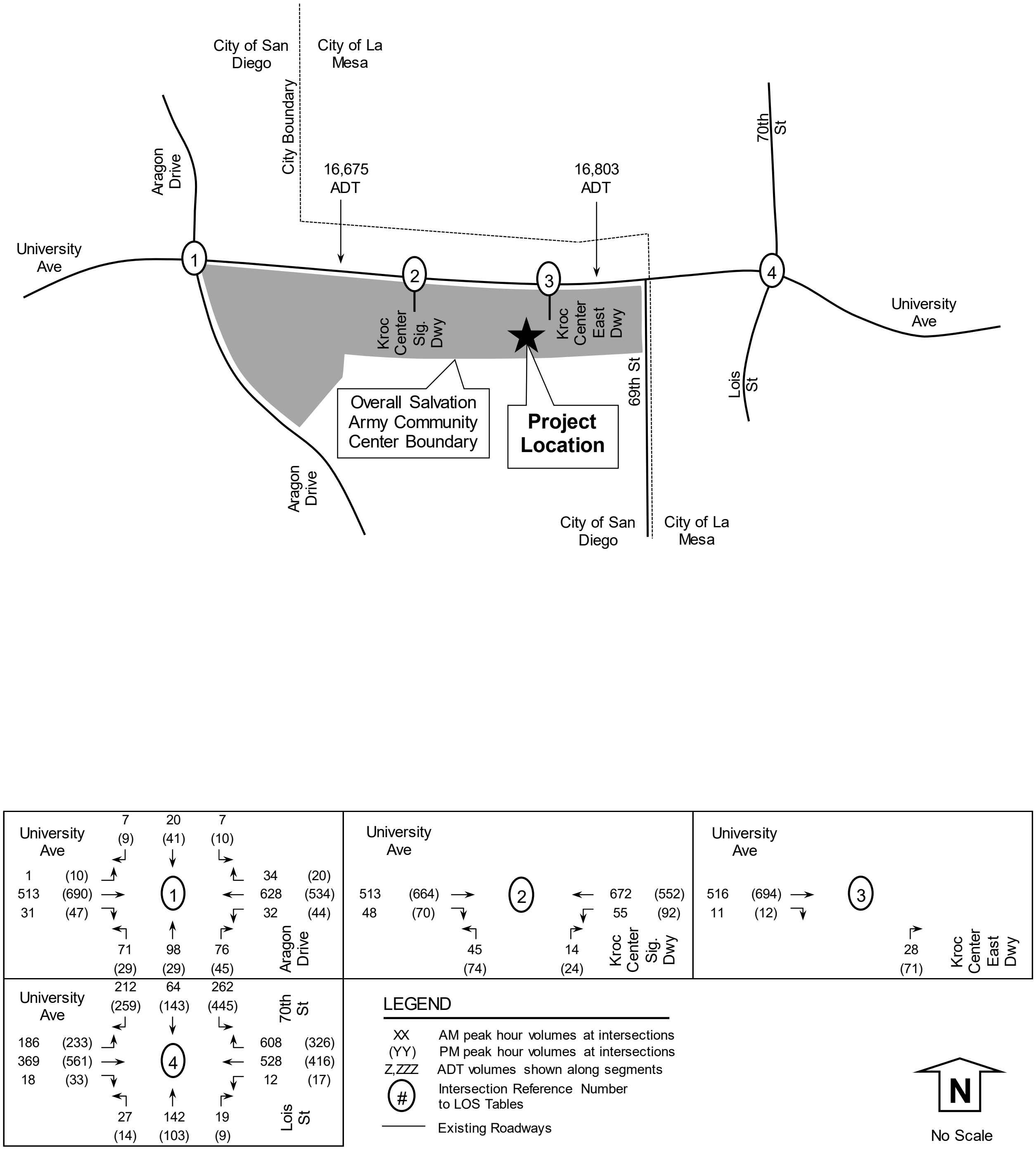
TABLE 13: NEAR TERM YEAR 2020 WITH PROJECT SEGMENT VOLUMES AND LEVEL OF SERVICE

Segment	Roadway Classification (as built)	LOS E Capacity	Near Term			Project	Near Term + Project				
			Daily Volume	V/C	LOS	Daily Volume	Daily Volume	V/C	LOS	Change in V/C	Direct Impact?
University Avenue											
Aragon Dr to Kroc Center Main Driveway	4 Ln Major (4D)	40,000	16,141	0.404	B	534	16,675	0.417	B	0.013	No
Kroc Center Main Driveway to 69th Street	4 Ln Major (4D)	40,000	16,269	0.407	B	534	16,803	0.420	B	0.013	No

Notes: 4D = 4 lane divided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. V/C: Volume to Capacity Ratio.

Under near term with project conditions, all of the study intersections and segments were calculated to operate at LOS C or better with no significant direct impacts because the addition of project traffic does not cause unacceptable levels of service.

Figure 12: Near Term Year 2020 with Project Volumes



8.0 Horizon Year 2035 without Project Conditions

The horizon year 2035 without project conditions were analyzed using an overall 5.8% growth factor calculated from the increase in daily traffic volumes between SANDAG year 2008 and year 2035 daily volumes on University Avenue in the project vicinity (calculations included in Appendix J). Specifically, year 2017 segment and intersection volumes were increase by 5.8% to represent 2035 volumes.

The existing roadway geometric conditions were held constant for the year 2035 analysis as shown in **Figure 13**. The horizon year 2035 volumes without project traffic are shown in **Figure 14.** The LOS calculated for the study intersections and segments are included in **Tables 14 and 15**. Intersection LOS calculations are included in **Appendix M**.

TABLE 14: HORIZON YEAR 2035 WITHOUT PROJECT INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis)[1]	Jurisdiction	Movement	Study Period	Horizon Year Delay[2]	LOS[3]
1) University Ave at	City of	All	AM	18.5	B
Aragon Dr (S)	San Diego	All	PM	19.0	B
2) University Ave at	City of	All	AM	14.7	B
Kroc Main Dwy (S)	San Diego	All	AM	15.0	B
3) University Ave at	City of	NB R	AM	10.9	B
Kroc East Dwy (U)	San Diego	NB R	PM	12.3	B
4) University Ave at	City of	All	AM	34.7	C
70th/Losi St (S)	La Mesa	All	PM	29.3	C

Notes: 1) Intersection Analysis - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service.

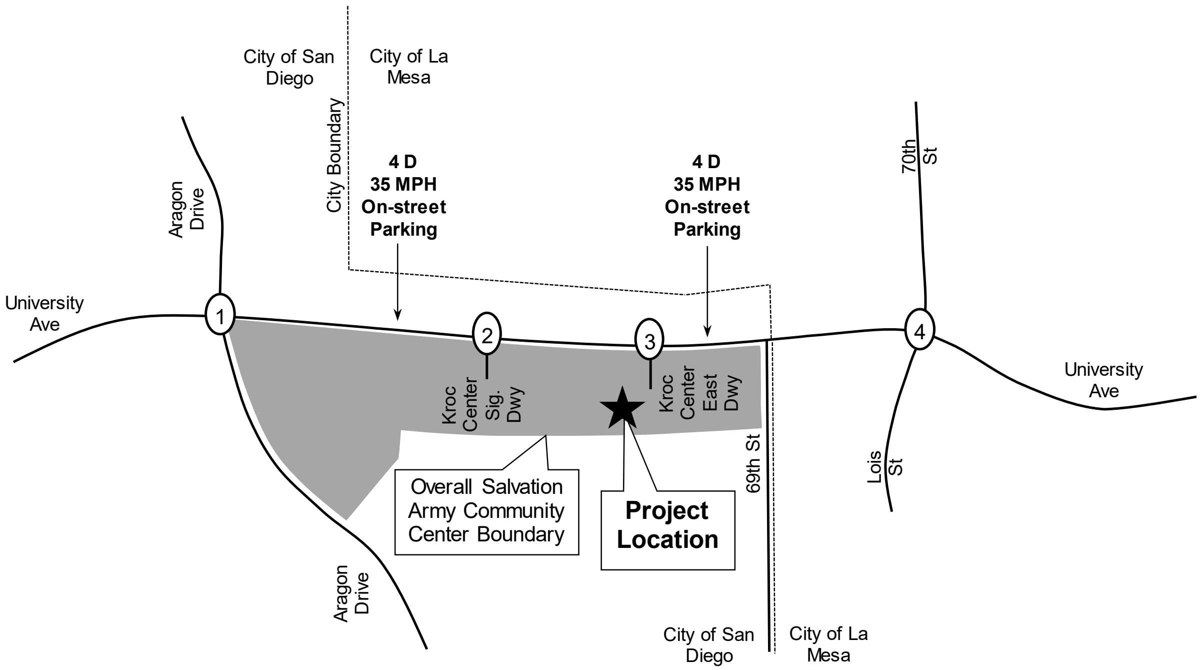
TABLE 15: HORIZON YEAR 2035 WITHOUT PROJECT SEGMENT VOLUMES AND LEVEL OF SERVICE

Segment	Classification	LOS E Capacity	Horizon Year Daily Volume	V/C	LOS
University Avenue					
Aragon Dr to Kroc Center Main Driveway	4 Ln Major (4D)	40,000	17,000	0.425	B
Kroc Center Main Driveway to 69th Street	4 Ln Major (4D)	40,000	17,000	0.425	B

Notes: 4D = 4 lane divided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. V/C: Volume to Capacity Ratio.

Under horizon year 2035 conditions, all of the study intersections and segments were calculated to operate at LOS D or better.

Figure 13: Horizon Year 2035 Analysis Roadway Geometry



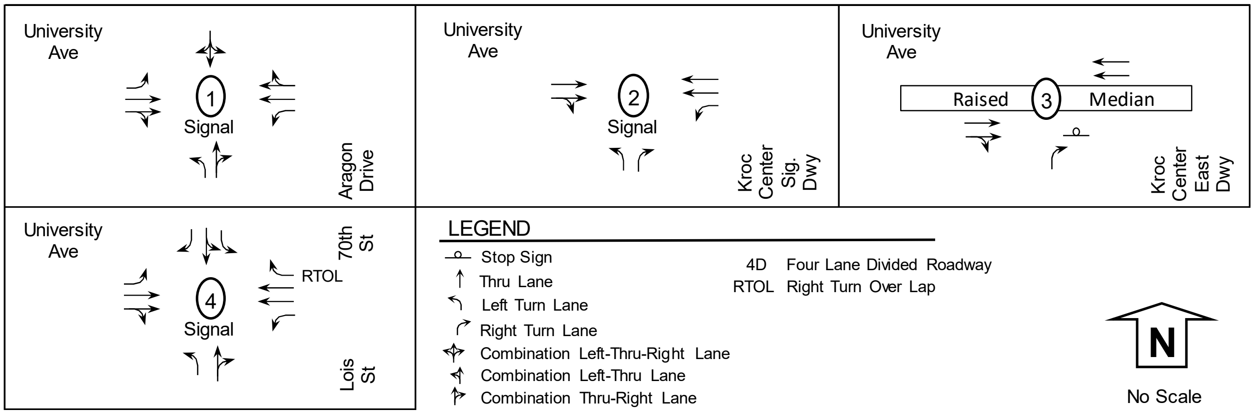
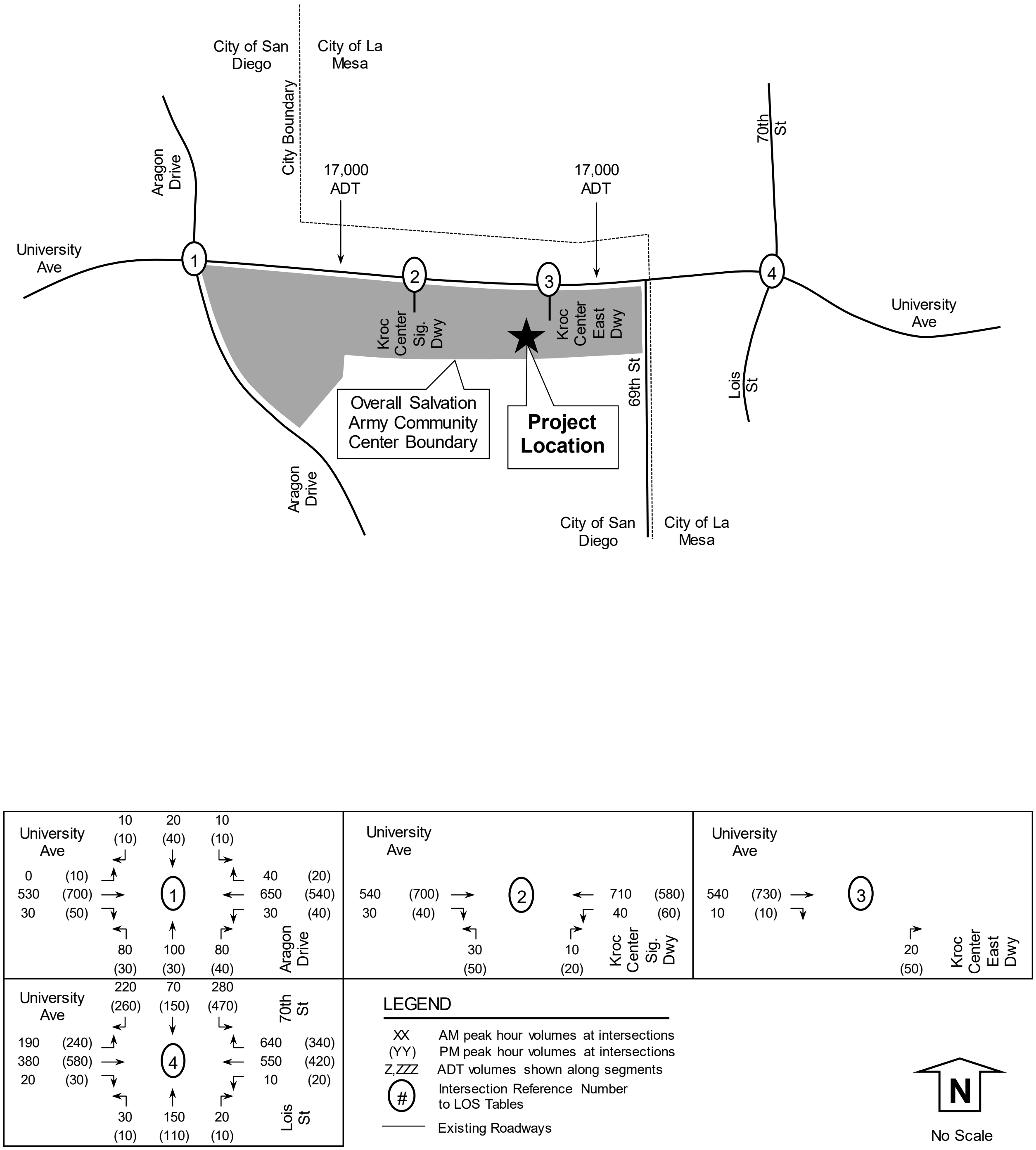


Figure 14: Horizon Year 2035 without Project Volumes



9.0 Horizon Year 2035 with Project Conditions

The horizon year 2035 with the project conditions were analyzed by adding the project traffic onto horizon year 2035 volumes. The horizon year 2035 volumes with project traffic are shown in **Figure 15.** The LOS calculated for the study roadway elements are included in **Tables 16 and 17**. LOS calculations are included in **Appendix N**.

TABLE 16: HORIZON YEAR 2035 WITH PROJECT INTERSECTION LEVEL OF SERVICE

Intersection and	Jurisdiction	Movement	Study	Horizon Year		Horizon Year + Project			
(Analysis)[1]			Period	Delay[2]	LOS[3]	Delay[2]	LOS[3]	Delta[4]	Cumulative Impact?[5]
1) University Ave at	City of	All	AM	18.5	B	18.7	B	0.2	No
Aragon Dr (S)	San Diego	All	PM	19.0	B	19.2	B	0.2	No
2) University Ave at	City of	All	AM	14.7	B	15.0	B	0.3	No
Kroc Main Dwy (S)	San Diego	All	AM	15.0	B	15.5	B	0.5	No
3) University Ave at	City of	NB R	AM	10.9	B	11.1	B	0.2	No
Kroc East Dwy (U)	San Diego	NB R	PM	12.3	B	12.9	B	0.6	No
4) University Ave at	City of	All	AM	34.7	C	35.1	D	0.4	No
70th/Losi St (S)	La Mesa	All	PM	29.3	C	30.0	C	0.7	No

Notes: 1) Intersection Analysis - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service. 4) Delta is the increase in delay from project. 5) Cumulative Impact if project traffic exceeds threshold.

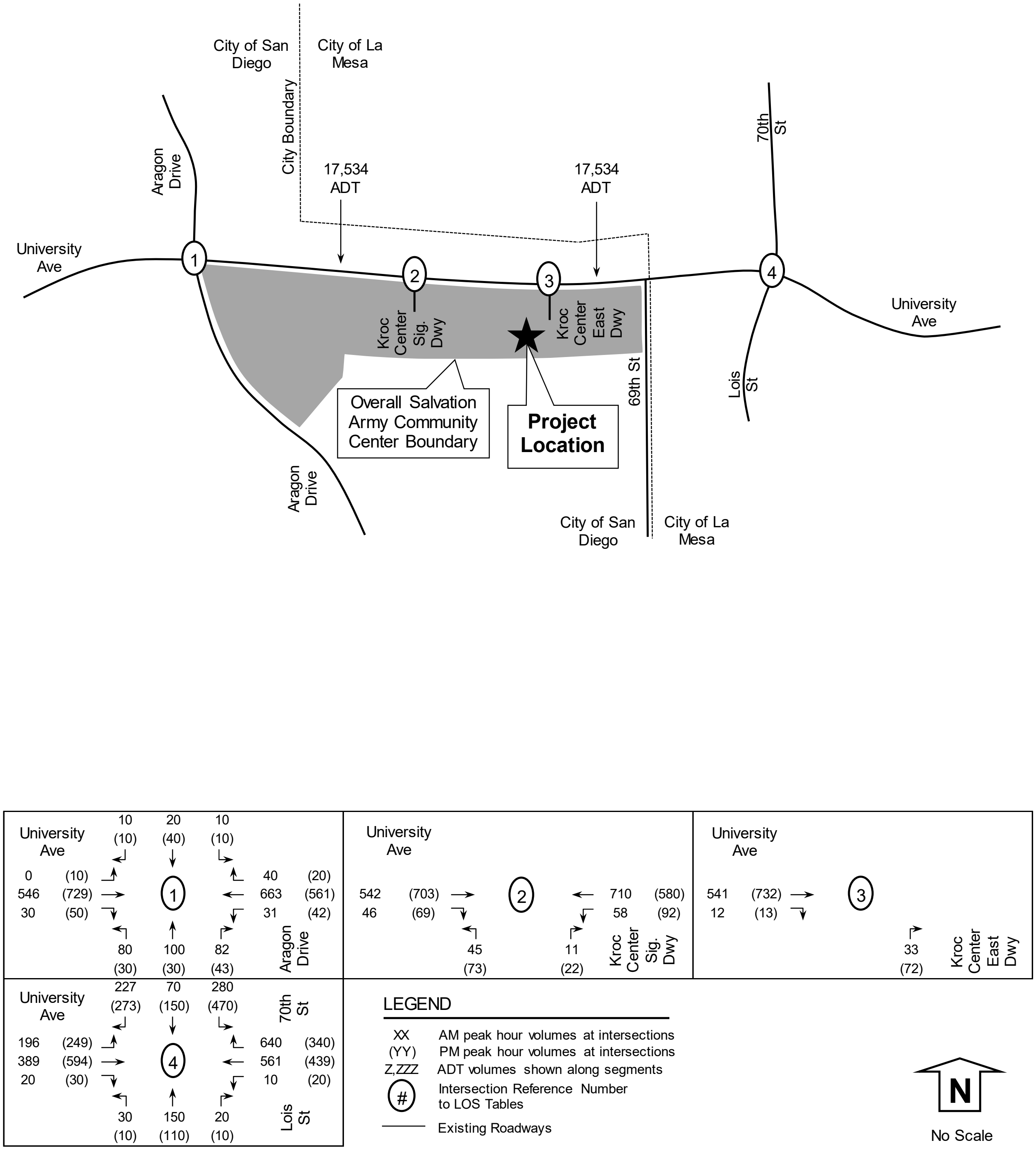
TABLE 17: HORIZON YEAR 2035 WITH PROJECT SEGMENT VOLUMES AND LEVEL OF SERVICE

Segment	Classification	LOS E	Horizon Year			Project	Horizon Year + Project				
		Capacity	Daily Volume	V/C	LOS	Daily Volume	Daily Volume	V/C	LOS	Change In V/C	Cumulative Impact?
University Avenue											
Aragon Dr to Kroc Center Main Driveway	4 Ln Major (4D)	40,000	17,000	0.425	B	534	17,534	0.438	B	0.013	No
Kroc Center Main Driveway to 69th Street	4 Ln Major (4D)	40,000	17,000	0.425	B	534	17,534	0.438	B	0.013	No

Notes: 4D = 4 lane divided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. V/C: Volume to Capacity Ratio.

Under horizon year 2035 with project conditions, all of the study intersections and segments were calculated to operate at LOS D or better with no significant cumulative impacts because the addition of project traffic does not cause unacceptable levels of service.

Figure 15: Horizon Year 2035 with Project Volumes



10.0 Summary of Potential Impacts

The project has no calculated traffic impacts (based on the significance criteria); therefore, mitigation measures are not required. A summary table of the findings is shown in **Table 18.**

TABLE 18: DIRECT AND CUMULATIVE IMPACT SUMMARY

Roadway Facility	Existing and Near Term Direct Impacts	Mitigation
Intersection	None	None
Segment	None	None
Roadway Facility	**Horizon Year 2035 Plus Project Cumulative Impacts**	**Mitigation**
Intersection	None	None
Segment	None	None

11.0 Transportation Demand Management

A Transportation Demand Management (TDM) plan will provide the means to disseminate information to help patrons and employees learn about and use alternative forms of transportation other than single occupancy vehicles. Therefore, the following TDM plan will be shared with patrons and employees.

1) Provide information about SANDAG's existing icommute program (www.icommutesd.com),

2) Provide showers and lockers as documented in the Climate Action Plan,

3) Encourage carpooling through incentives such as acknowledgement and through providing carpool spaces at premium locations in the parking structure,

4) Encourage transit usage through the display of maps, routes, and schedules near the site in the lobby, and

5) Include a bike rack for 10 short term spaces and 1 long term space.

12.0 Conclusion

The project is to add a two-story recreation building (Wellness Center) with an elevated sports deck structure with at grade parking (underneath the elevated sports deck) at 6605-6845 University Avenue San Diego, California. The project will replace an existing and active soccer field on the Salvation Army Ray and Joan Kroc Community Center grounds. The project is planned to open by the year 2020. Project access is from five existing driveways: two on University Avenue, two driveways on Aragon Drive, and one driveway on 69th Street.

The project trip generation for the project was calculated using trip rates from the city of San Diego *Trip Generation Manual*, May 2003. The proposed wellness center project with a health club and day care is calculated to generate 1,069 ADT with 65 AM peak hour trips (36 inbound and 29 outbound) and 111 PM peak hour trips (64 inbound and 47 outbound).

The minimum required parking for the site is 486 spaces (existing Salvation Army Kroc Center and proposed parking structure). The proposed parking is 503 spaces resulting in a surplus of 17 spaces.

The following scenarios were analyzed: Existing, Existing with Project, Near Term, Near Term with Project, Horizon Year 2035, and Horizon Year 2035 with Project Conditions. For each scenario, the findings include:

1) Under existing conditions, all of the study intersections and segments were calculated to operate at LOS C or better.

2) Under existing with project conditions, all of the study intersections and segments were calculated to operate at LOS C or better with no significant direct impacts because the addition of project traffic does not cause unacceptable levels of service.

3) Under near term conditions, all of the study intersections and segments were calculated to operate at LOS C or better.

4) Under near term with project conditions, all of the study intersections and segments were calculated to operate at LOS C or better with no significant direct impacts because the addition of project traffic does not cause unacceptable levels of service.

5) Under horizon year 2035 conditions, all of the study intersections and segments were calculated to operate at LOS D or better.

6) Under horizon year 2035 with project conditions, all of the study intersections and segments were calculated to operate at LOS D or better with no significant cumulative impacts because the addition of project traffic does not cause unacceptable levels of service.

The project has no calculated traffic impacts based on the significance criteria; therefore, mitigation measures are not required.

13.0 References and List of Preparers

13.1 References

City of San Diego *Traffic Impact Study Manual,* July 1998.

San Diego Traffic Engineers' Council (SANTEC). March 2, 2002. *SANTEC/ITE Guidelines for Traffic Impact Studies in the San Diego Region.*

Trafficware Corporation, 2006. Synchro Version 10 computer software.

Transportation Research Board National Research Council Washington, D.C. *Highway Capacity Manual 2010*. CD ROM.

13.2 List of Preparers

Justin Rasas, P.E. (TR 2135), LOS Engineering, Inc. Author

Appendix A

Count Data and Signal Timing Sheets

PO Box 1178
Corona, CA 92880
951-268-6268

Location: San Diego
N/S: Aragon Drive
E/W: University Avenue

Date: 12/7/2017
Day: THURSDAY
Project # 143-17844

TURNING MOVEMENT COUNT

Count Period: **7:00 AM to 9:00 AM**
Peak Hour: **7:30AM to 8:30 AM**

Vehicle Counts

	Aragon Drive Northbound			Aragon Drive Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
7:00 AM	8	16	14	1	3	0	0	70	0	6	91	5	214
7:15 AM	7	14	14	0	3	1	1	93	4	1	114	5	257
7:30 AM	19	12	17	1	6	3	0	155	7	6	127	5	358
7:45 AM	7	33	22	1	4	3	0	112	7	7	183	12	391
8:00 AM	23	23	20	1	4	1	1	115	7	10	176	10	391
8:15 AM	21	29	14	4	6	0	0	110	10	8	123	7	332
8:30 AM	16	27	9	0	4	2	3	129	5	10	123	6	334
8:45 AM	8	17	7	4	5	0	1	128	8	7	97	10	292
TOTAL VOLUMES:	109	171	117	12	35	10	6	912	48	55	1034	60	2569

AM Peak Hr Begins at: 730 AM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	70	97	73	7	20	7	1	492	31	31	609	34	1472

PEAK HR FACTOR:	0.909	0.850	0.809	0.834	0.941

Bicycle Counts

	Aragon Drive Northbound			Aragon Drive Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	1	0	0	0	0	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	1
8:45 AM	0	1	0	0	0	0	0	0	0	0	0	0	1
TOTAL VOLUMES:	0	1	0	0	0	0	0	2	0	0	0	0	3

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Counts

	Aragon Drive North Leg	Aragon Drive South Leg	University Avenue East Leg	University Avenue West Leg	TOTAL
7:00 AM	0	1	0	0	1
7:15 AM	0	1	0	0	1
7:30 AM	0	2	0	10	12
7:45 AM	0	3	0	5	8
8:00 AM	0	1	0	2	3
8:15 AM	1	2	0	8	11
8:30 AM	0	3	0	0	3
8:45 AM	0	2	0	0	2
TOTAL VOLUMES:	1	15	0	25	41

	North Leg	South Leg	East Leg	West Leg	TOTAL
PEAK VOLUMES:	1	8	0	25	34

PO Box 1178
Corona, CA 92880
951-268-6268

Location: San Diego
N/S: Aragon Drive
E/W: University Avenue

Date: 12/7/2017
Day: THURSDAY
Project # 143-17844

TURNING MOVEMENT COUNT

Count Period: **4:00 PM to 6:00 PM**
Peak Hour: **4:30 PM to 5:30 PM**

Vehicle Counts

	Aragon Drive Northbound			Aragon Drive Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	12	7	19	3	7	0	4	161	12	14	116	7	362
4:15 PM	9	5	10	1	5	3	5	147	14	7	127	2	335
4:30 PM	7	9	10	1	11	2	3	162	14	17	123	8	367
4:45 PM	8	7	11	3	7	5	2	142	8	12	120	4	329
5:00 PM	6	6	10	3	15	1	2	182	7	6	125	3	366
5:15 PM	8	7	11	3	8	1	3	168	18	7	140	5	379
5:30 PM	6	10	13	4	9	1	4	158	10	13	92	8	328
5:45 PM	11	10	9	2	4	2	4	165	10	11	98	6	332
TOTAL VOLUMES:	67	61	93	20	66	15	27	1285	93	87	941	43	2798

PM Peak Hr Begins at: 430 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	29	29	42	10	41	9	10	654	47	42	508	20	1441

PEAK HR FACTOR:	0.962	0.789	0.931	0.938	0.951

Bicycle Counts

	Aragon Drive Northbound			Aragon Drive Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
5:00 PM	0	1	0	0	0	0	0	1	0	0	0	0	2
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	1	0	0	0	0	0	2	0	0	1	0	4

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	1	0	0	0	0	0	1	0	0	1	0	3

Pedestrian Counts

	Aragon Drive North Leg	Aragon Drive South Leg	University Avenue East Leg	University Avenue West Leg	TOTAL
4:00 PM	1	0	0	15	16
4:15 PM	0	1	0	6	7
4:30 PM	0	2	0	9	11
4:45 PM	3	1	0	7	11
5:00 PM	0	0	0	1	1
5:15 PM	0	1	0	1	2
5:30 PM	0	1	1	0	2
5:45 PM	0	0	0	2	2
TOTAL VOLUMES:	4	6	1	41	52

	North Leg	South Leg	East Leg	West Leg	TOTAL
PEAK VOLUMES:	3	4	0	18	25

PO Box 1178
Corona, CA 92880
951-268-6268

Location: San Diego
N/S: SA Kroc Signalized Dwy
E/W: University Avenue

Date: 12/7/2017
Day: THURSDAY
Project # 143-17844

TURNING MOVEMENT COUNT

Count Period: **7:00 AM to 9:00 AM**
Peak Hour: **7:30AM to 8:30 AM**

Vehicle Counts

	SA Kroc Signalized Dwy Northbound			SA Kroc Signalized Dwy Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
7:00 AM	4	0	2	0	0	0	0	81	5	2	100	0	194
7:15 AM	4	0	0	0	0	0	0	100	3	4	116	0	227
7:30 AM	6	0	3	0	0	0	0	156	5	8	140	0	318
7:45 AM	6	0	3	0	0	0	0	124	9	7	210	0	359
8:00 AM	10	0	4	0	0	0	0	124	9	10	190	0	347
8:15 AM	8	0	3	0	0	0	0	102	9	12	125	0	259
8:30 AM	1	0	3	0	0	0	0	95	4	8	109	0	220
8:45 AM	8	0	2	0	0	0	0	128	10	11	111	0	270
TOTAL VOLUMES:	47	0	20	0	0	0	0	910	54	62	1101	0	2194

AM Peak Hr Begins at: 730 AM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	30	0	13	0	0	0	0	506	32	37	665	0	1283

PEAK HR FACTOR:	0.768	0.000	0.835	0.809	0.893

Bicycle Counts

	SA Kroc Signalized Dwy Northbound			SA Kroc Signalized Dwy Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0	0	0	1	0	0	0	0	1

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	0	0	0	0	0	1	0	0	0	0	1

Pedestrian Counts

	SA Kroc Signalized Dwy North Leg	SA Kroc Signalized Dwy South Leg	University Avenue East Leg	University Avenue West Leg	TOTAL
7:00 AM	0	1	0	0	1
7:15 AM	0	0	0	0	0
7:30 AM	0	1	0	0	1
7:45 AM	0	1	0	0	1
8:00 AM	0	0	0	1	1
8:15 AM	0	0	0	0	0
8:30 AM	0	1	0	2	3
8:45 AM	0	1	0	0	1
TOTAL VOLUMES:	0	5	0	3	8

	North Leg	South Leg	East Leg	West Leg	TOTAL
PEAK VOLUMES:	0	2	0	1	3

PO Box 1178
Corona, CA 92880
951-268-6268

Location: San Diego
N/S: SA Kroc Signalized Dwy
E/W: University Avenue

Date: 12/7/2017
Day: THURSDAY
Project # 143-17844

TURNING MOVEMENT COUNT

Count Period: **4:00 PM to 6:00 PM**
Peak Hour: **4:30 PM to 5:30 PM**

Vehicle Counts

	SA Kroc Signalized Dwy Northbound			SA Kroc Signalized Dwy Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	7	0	7	0	0	0	0	182	9	9	113	0	327
4:15 PM	6	0	3	0	0	0	0	157	17	10	139	0	332
4:30 PM	16	0	6	0	0	0	0	170	10	13	137	0	352
4:45 PM	7	0	3	0	0	0	0	148	9	9	131	0	307
5:00 PM	10	0	7	0	0	0	0	169	9	19	121	0	335
5:15 PM	17	0	6	0	0	0	0	167	13	18	158	0	379
5:30 PM	16	0	14	0	0	0	0	180	14	16	108	0	348
5:45 PM	10	0	11	0	0	0	0	157	10	8	107	0	303
TOTAL VOLUMES:	89	0	57	0	0	0	0	1330	91	102	1014	0	2683

PM Peak Hr Begins at: 430 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	50	0	22	0	0	0	0	654	41	59	547	0	1373

PEAK HR FACTOR:	0.783	0.000	0.965	0.861	0.906

Bicycle Counts

	SA Kroc Signalized Dwy Northbound			SA Kroc Signalized Dwy Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	1	0	0	0	0	0	1	0	0	0	0	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	1	0	0	0	0	0	4	0	0	0	0	5

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	1	0	0	0	0	0	2	0	0	0	0	3

Pedestrian Counts

	SA Kroc Signalized Dwy North Leg	SA Kroc Signalized Dwy South Leg	University Avenue East Leg	University Avenue West Leg	TOTAL
4:00 PM	0	3	0	1	4
4:15 PM	0	1	0	2	3
4:30 PM	0	5	0	0	5
4:45 PM	0	2	0	1	3
5:00 PM	0	0	0	3	3
5:15 PM	0	0	0	1	1
5:30 PM	0	1	0	0	1
5:45 PM	0	2	0	0	2
TOTAL VOLUMES:	0	14	0	8	22

	North Leg	South Leg	East Leg	West Leg	TOTAL
PEAK VOLUMES:	0	7	0	5	12

PO Box 1178
Corona, CA 92880
951-268-6268

Location:	San Diego	Date:	12/7/2017
N/S:	SA Kroc Unsignalized Dwy	Day:	THURSDAY
E/W:	University Avenue	Project #	143-17844

TURNING MOVEMENT COUNT

Count Period: **7:00 AM to 9:00 AM**
Peak Hour: **7:30AM to 8:30 AM**

Vehicle Counts

	SA Kroc Unsignalized Dwy Northbound			SA Kroc Unsignalized Dwy Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
7:00 AM	0	0	4	0	0	0	0	83	0	0	0	0	189
7:15 AM	0	0	1	0	0	0	0	98	2	0	0	0	221
7:30 AM	0	0	4	0	0	0	0	157	2	0	0	0	311
7:45 AM	0	0	1	0	0	0	0	126	1	0	0	0	345
8:00 AM	0	0	4	0	0	0	0	125	3	0	0	0	332
8:15 AM	0	0	6	0	0	0	0	102	3	0	0	0	248
8:30 AM	0	0	5	0	0	0	0	96	2	0	0	0	220
8:45 AM	0	0	4	0	0	0	0	127	3	0	0	0	256
TOTAL VOLUMES:	0	0	29	0	0	0	0	914	16	0	0	0	2122

AM Peak Hr Begins at: 730 AM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	15	0	0	0	0	510	9	0	0	0	1236

PEAK HR FACTOR:	0.625	0.000	0.816	0.000	0.896

Bicycle Counts

	SA Kroc Unsignalized Dwy Northbound			SA Kroc Unsignalized Dwy Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0	0	0	0	0	0	0	0	0

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Counts

	SA Kroc Unsignalized Dwy North Leg	SA Kroc Unsignalized Dwy South Leg	University Avenue East Leg	University Avenue West Leg	TOTAL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

	North Leg	South Leg	East Leg	West Leg	TOTAL
PEAK VOLUMES:	0	0	0	0	0

PO Box 1178
Corona, CA 92880
951-268-6268

Location: San Diego
N/S: SA Kroc Unsignalized Dwy
E/W: University Avenue

Date: 12/7/2017
Day: THURSDAY
Project # 143-17844

TURNING MOVEMENT COUNT

Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:45 PM to 5:45 PM

Vehicle Counts

	SA Kroc Unsignalized Dwy Northbound			SA Kroc Unsignalized Dwy Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	0	0	3	0	0	0	0	185	4	0	0	0	314
4:15 PM	0	0	7	0	0	0	0	156	4	0	0	0	316
4:30 PM	0	0	5	0	0	0	0	173	3	0	0	0	331
4:45 PM	0	0	5	0	0	0	0	150	1	0	0	0	296
5:00 PM	0	0	17	0	0	0	0	174	2	0	0	0	334
5:15 PM	0	0	8	0	0	0	0	169	4	0	0	0	357
5:30 PM	0	0	19	0	0	0	0	192	2	0	0	0	337
5:45 PM	0	0	8	0	0	0	0	168	0	0	0	0	291
TOTAL VOLUMES:	0	0	72	0	0	0	0	1367	20	0	0	0	2576

PM Peak Hr Begins at: 445 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	49	0	0	0	0	685	9	0	0	0	1324

PEAK HR FACTOR:	0.645	0.000	0.894	0.000	0.927

Bicycle Counts

	SA Kroc Unsignalized Dwy Northbound			SA Kroc Unsignalized Dwy Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0	0	0	0	0	0	0	0	0

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Counts

	SA Kroc Unsignalized Dwy North Leg	SA Kroc Unsignalized Dwy South Leg	University Avenue East Leg	University Avenue West Leg	TOTAL
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	0

	North Leg	South Leg	East Leg	West Leg	TOTAL
PEAK VOLUMES:	0	0	0	0	0

Counts unlimited
PO Box 1178
Corona, CA 92880
951-268-6268

Location: San Diego
N/S: 70th Street
E/W: University Avenue

Date: 12/7/2017
Day: THURSDAY
Project # 143-17844

TURNING MOVEMENT COUNT

Count Period: **7:00 AM to 9:00 AM**
Peak Hour: **7:30AM to 8:30 AM**

Vehicle Counts

	70th Street Northbound			70th Street Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
7:00 AM	1	36	2	51	8	27	34	60	3	0	76	148	446
7:15 AM	7	27	4	56	14	35	30	77	1	1	91	145	488
7:30 AM	4	31	10	80	10	36	45	95	5	0	107	132	555
7:45 AM	11	45	4	49	16	53	53	90	7	5	167	161	661
8:00 AM	6	30	2	60	21	54	40	85	4	6	148	175	631
8:15 AM	6	35	3	70	16	60	40	86	2	1	90	134	543
8:30 AM	6	35	2	64	12	56	40	89	4	3	91	126	528
8:45 AM	2	23	0	59	12	46	49	94	3	2	77	127	494
TOTAL VOLUMES:	43	262	27	489	109	367	331	676	29	18	847	1148	4346

AM Peak Hr Begins at: 730 AM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	27	141	19	259	63	203	178	356	18	12	512	602	2390

PEAK HR FACTOR:	0.779	0.899	0.920	0.845	0.904

Bicycle Counts

	70th Street Northbound			70th Street Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
7:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	2	0	0	0	0	2
7:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	1	0	0	0	0	0	3	0	0	0	0	4

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Counts

	70th Street North Leg	70th Street South Leg	University Avenue East Leg	University Avenue West Leg	TOTAL
7:00 AM	1	0	0	0	1
7:15 AM	2	0	0	0	2
7:30 AM	6	0	1	1	8
7:45 AM	1	1	0	3	5
8:00 AM	0	0	0	0	0
8:15 AM	1	1	0	0	2
8:30 AM	5	1	0	1	7
8:45 AM	0	1	0	0	1
TOTAL VOLUMES:	16	4	1	5	26

	North Leg	South Leg	East Leg	West Leg	TOTAL
PEAK VOLUMES:	8	2	1	4	15

PO Box 1178
Corona, CA 92880
951-268-6268

Location: San Diego
N/S: 70th Street
E/W: University Avenue

Date: 12/7/2017
Day: THURSDAY
Project # 143-17844

TURNING MOVEMENT COUNT

Count Period: **4:00 PM to 6:00 PM**
Peak Hour: **4:45 PM to 5:45 PM**

Vehicle Counts

	70th Street Northbound			70th Street Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	3	14	0	106	30	50	56	109	3	2	90	75	538
4:15 PM	5	22	2	98	28	60	56	98	6	6	69	61	511
4:30 PM	6	25	2	79	36	60	41	87	12	2	80	61	491
4:45 PM	4	31	3	104	35	61	53	121	5	3	101	78	599
5:00 PM	2	21	1	109	41	61	55	141	8	5	90	86	620
5:15 PM	4	23	1	111	31	72	65	127	9	3	119	82	647
5:30 PM	4	27	4	117	35	50	49	153	11	6	83	77	616
5:45 PM	5	24	3	109	33	47	47	141	8	5	77	73	572
TOTAL VOLUMES:	33	187	16	833	269	461	422	977	62	32	709	593	4594

PM Peak Hr Begins at: 445 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	14	102	9	441	142	244	222	542	33	17	393	323	2482

PEAK HR FACTOR:	0.822	0.966	0.935	0.898	0.959

Bicycle Counts

	70th Street Northbound			70th Street Southbound			University Avenue Eastbound			University Avenue Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	0	0	0	0	1	0	0	1	0	0	1	0	3
4:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
4:30 PM	0	0	0	0	1	0	0	1	0	0	0	0	2
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	3	0	0	4	0	0	1	0	8

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	0	0	1	0	0	1	0	0	0	0	2

Pedestrian Counts

	70th Street North Leg	70th Street South Leg	University Avenue East Leg	University Avenue West Leg	TOTAL
4:00 PM	1	0	0	0	1
4:15 PM	1	0	0	0	1
4:30 PM	2	0	0	1	3
4:45 PM	0	0	0	1	1
5:00 PM	5	0	0	1	6
5:15 PM	5	0	0	3	8
5:30 PM	1	2	0	0	3
5:45 PM	2	0	0	0	2
TOTAL VOLUMES:	17	2	0	6	25

	North Leg	South Leg	East Leg	West Leg	TOTAL
PEAK VOLUMES:	11	2	0	5	18

ITERSECTION: ARAGON @ UNIVERSITY

223 .m

Group Assignment: NONE
Field Master Assignment: NONE

N/S Street Name: ARAGON
E/W Street Name: UNIVERSITY

N

Last Database Change: 5/2/02 16:47
System Ref. Number: 438
Drawing Number:
Timing Implemented On: 12/24/01
Timing Sheet By:
Approved By:

Row	Column # ---> / Phase # --->	1	2	3	4	5	6	7	8
		↲	→		↓ ↑	↱	←		
0	Ped Walk		7		7		7		
1	Ped FDW		15		24		6		
2	Min Green	4	7		4	4	7		
3	Type 3 Limit								
4	Add/Veh								
5	Veh Extn	2.0	5.1		2.0	2.0	3.9		
6	Max Gap	2.0	5.1		2.0	2.0	3.9		
7	Min Gap	2.0	0.2		2.0	2.0	0.2		
8	Max Limit	30	60		40	30	60		
9	Max Limit 2								
A	Bus Adv								
B	Call to Phs								
C	Reduce By		0.1				0.1		
D	Every		0.6				0.8		
E	Yellow	3.4 ~~3.0~~	3.9 ~~3.6~~		3.9 ~~3.5~~	3.4 ~~3.0~~	4.2		
F	Red Clear	1.0	1.0		1.0	1.0	1.0		

DOC
2/24/03

Phase Timing - Bank 1
F + Phase + Row

<F Page>

	E
RR-1 Delay	
RR-1 Clear	
EV-A Delay	
EV-A Clear	
EV-B Delay	
EV-B Clear	
EV-C Delay	
EV-C Clear	
EV-D Delay	
EV-D Clear	
RR-2 Delay	
RR-2 Clear	
View EV Delay	---
View EV Clear	---
View RR Delay	---
View RR Clear	---

Preempt Timing
F + E + Row

	F	Row
Permit	12_456__	0
Red Lock		1
Yellow Lock	_2___6__	2
Min Recall		3
Ped Recall		4
Peds (View)	_2_4_6__	5
Rest In Walk		6
Red Rest		7
Dbl Entry		8
Max Recall		9
Soft Recall	_2___6__	A
Max 2		B
Cond Serv		C
Ped Lock	12345678	D
Yellow Start	_2___6__	E
1st Phases	___4____	F

Phase Functions
<F Page>
F + F + Row

Max Initial	0	F + 0 + E
Red Revert	5.0	F + 0 + F
All Red Start	0.0	F + C + 0

Start / Revert Times

Drop Number	14	C + 0 + 0
Zone Number	14	C + 0 + 1
Area Number	0	C + 0 + 2
Area Address	140	C + 0 + 3
QuicNet Channel	DIGI75:	(QuicNet)

Communication Addresses

C + F + 0	F	Row
Free Lag	_2_4_6__	0

Lag Phases <C Page>

Overlap Timing

	Row	9 Green Clear	C Yellow Change	D Red Clear	0 Load-Switch #
Overlap A	A				
Overlap B	B				
Overlap C	C				
Overlap D	D				

<F Page>
F + COLOR +

<D Page>
D + 0 + OVERLAP

Downtime Flash	255	(minutes)

Downtime Before Auto Manual Flash
F + 0 + 8

Manual Plan	0	C + A + 1
Manual Offset	0	C + B + 1

Manual Selection

Manual Plan
0 = Automatic
1-9 = Plan 1-9
14 = Free
15 = Flash

Manual Offset
0 = Automatic
1 = Offset A
2 = Offset B
3 = Offset C

Disable Ports	_234____

Disable Communication Ports
D + D + 9

Printed on 5/7/02 10:04 AM

City of San Diego

INTERSECTION: ARAGON @ UNIVERSITY

223 Program

Coordination Timing By: VAC
Implemented On: 12/26/01

		Plan								
	Column # --->	1	2	3	4	5	6	7	8	9
Row	Plan Name --->									
0	Cycle Length	55	55	60	90	88	102	100		
1	Phase 1 - ForceOff	46	46	46	52	55	56	56		
2	Phase 2 - ForceOff	0	0	0	0	0	0	0	0	0
3	Phase 3 - ForceOff									
4	Phase 4 - ForceOff	31	31	31	37	37	37	37		
5	Phase 5 - ForceOff	46	46	46	52	55	57	57		
6	Phase 6 - ForceOff	0	0	0	0	0	0	0	0	0
7	Phase 7 - ForceOff									
8	Phase 8 - ForceOff									
9	Ring Offset									
A	Offset A	0	31	13	75	71	61	75		
B	Offset B									
C	Offset C									
D	Permissive	5	5	5	9	9	10	10		
E	Hold Release	255	255	255	255	255	255	255		
F	Ped Shift	0	0	0	0	0	0	0		

Coordination **<C Page>**

C + Plan + ROW

FOR OBSERVATION ONLY

Master Plan	C + A + 2
Current Plan	C + A + 3
Next Plan	C + A + 4
T.O.D. Plan	C + A + 5
Master Cycle	C + A + 0
Ring A Cycle	C + B + 0
Ring B Cycle	C + D + 0
Min Cycle	C + A + E
Max Cycle	C + B + E

Row	Time	Plan	Offset	Day of Week
0	07 : 00	4	A	_23456_
1	10 : 00	5	A	_23456_
2	14 : 00	7	A	_23456_
3	18 : 00	E	A	1234567
4	:			
5	:			
6	:			
7	:			
8	:			
9	:			
A	:			
B	:			
C	:			
D	:			
E	:			
F	:			

TOD Coordination

<9 Key with C+0+9=1>

	E
Plan 1	_2___6_
Plan 2	_2___6_
Plan 3	_2___6_
Plan 4	_2___6_
Plan 5	_2___6_
Plan 6	_2___6_
Plan 7	_2___6_
Plan 8	_2___6_
Plan 9	_2___6_
Coord Ped*	
NEMA Hold	

Sync Phases

C + E + FUNCTION #

Row		F
0	Free Lag	_2_4_6__
1	Plan 1 - Lag	_2_4_6__
2	Plan 2 - Lag	_2_4_6__
3	Plan 3 - Lag	_2_4_6__
4	Plan 4 - Lag	_2_4_6_8
5	Plan 5 - Lag	_2_4_6_8
6	Plan 6 - Lag	_2_4_6_8
7	Plan 7 - Lag	_2_4_6_8
8	Plan 8 - Lag	_2_4_6_8
9	Plan 9 - Lag	_2_4_6_8
A	Coord Max *	
B	Coord Lag *	
C		
D		
E		
F		

Lag Phases <C Page>

C + F + FUNCTION #

Plan Select
1 thru 9 = Coordination
Plan 1 thru 9
14 or E = Free
15 or F = Flash

Transition Type	0

TBC Transition
C + D + D

Transition Type
0 = Shortway
Non-zero = Lengthen

City of San Diego
University Avenue
B/ Aragon Drive - Kroc Center Driveway

File Name 001
Site Code: 143-17844
24 Hour Directional Volume Count

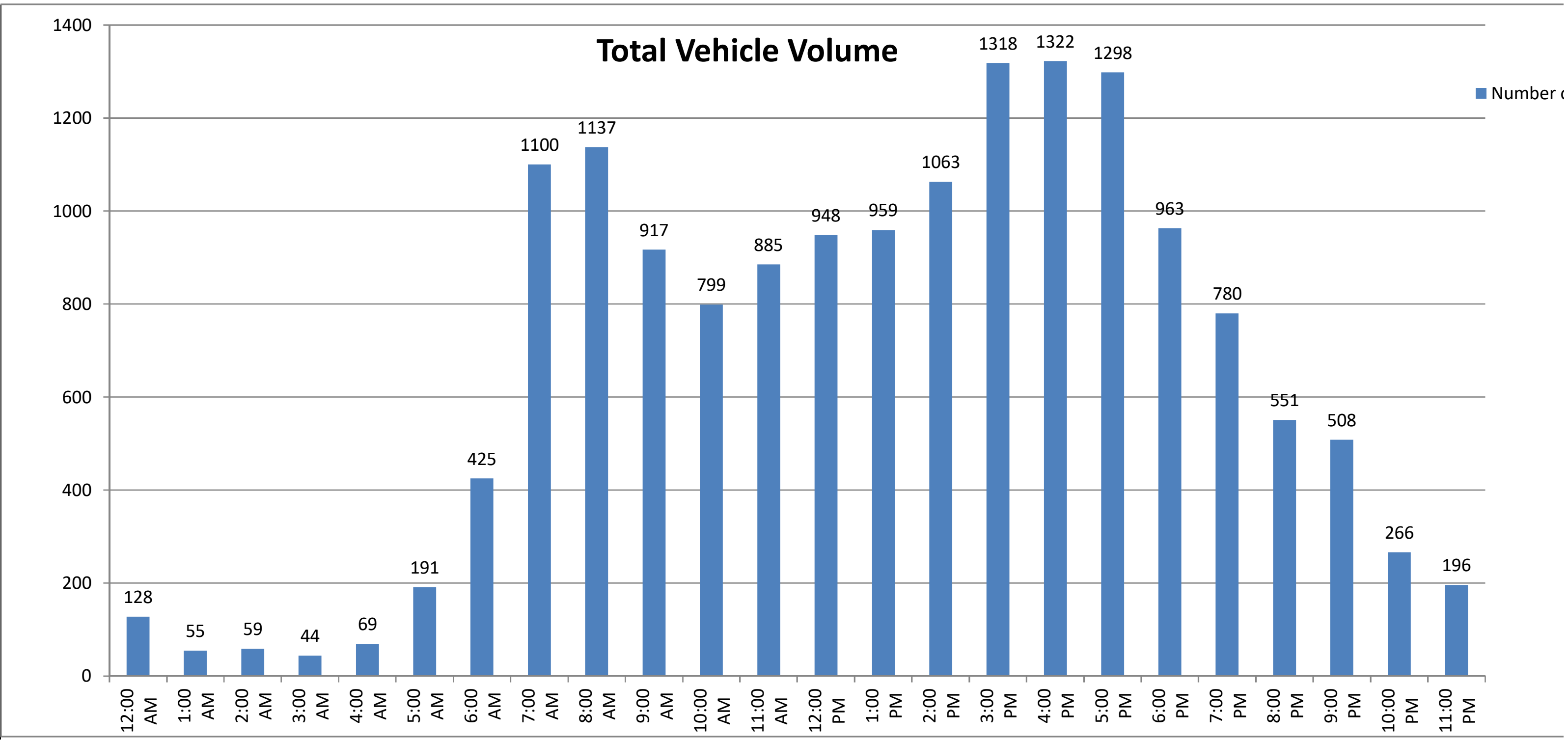
Date:	Eastbound				Westbound					
12/7/2017	15 Minute Totals		Hourly Totals		15 Minute Totals		Hourly Totals		Combined Totals	
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00	14	114			16	117				
12:15	19	121			22	111				
12:30	17	114			10	123				
12:45	13	131	63	480	17	117	65	468	128	948
1:00	7	134			4	106				
1:15	11	131			7	101				
1:30	7	133			1	99				
1:45	8	151	33	549	10	104	22	410	55	959
2:00	8	145			9	106				
2:15	9	125			10	98				
2:30	8	177			5	140				
2:45	4	141	29	588	6	131	30	475	59	1063
3:00	8	164			6	166				
3:15	9	175			3	155				
3:30	3	185			8	128				
3:45	6	193	26	717	1	152	18	601	44	1318
4:00	4	199			4	126				
4:15	7	181			9	156				
4:30	12	182			4	148				
4:45	19	180	42	742	10	150	27	580	69	1322
5:00	18	193			17	134				
5:15	25	184			13	171				
5:30	32	196			18	127				
5:45	40	174	115	747	28	119	76	551	191	1298
6:00	39	141			25	128				
6:15	39	136			37	101				
6:30	61	120			65	113				
6:45	77	136	216	533	82	88	209	430	425	963
7:00	91	117			103	97				
7:15	109	117			132	101				
7:30	169	86			145	103				
7:45	137	72	506	392	214	87	594	388	1100	780
8:00	135	91			198	65				
8:15	124	72			145	67				
8:30	133	64			139	53				
8:45	143	71	535	298	120	68	602	253	1137	551
9:00	132	101			100	69				
9:15	119	65			107	46				
9:30	139	75			108	56				
9:45	119	61	509	302	93	35	408	206	917	508
10:00	112	45			95	44				
10:15	111	45			91	29				
10:30	99	33			88	26				
10:45	111	26	433	149	92	18	366	117	799	266
11:00	91	33			103	26				
11:15	115	29			97	26				
11:30	120	21			118	19				
11:45	133	23	459	106	108	19	426	90	885	196
Totals	2966	5603			2843	4569				
Combined Totals		8569				7412				
ADT										15981
AM Peak Hour	730	AM			730	AM				
Volume	565				702					
P.H.F.	0.836				0.820					
PM Peak Hour		330	PM			430	PM			
Volume		758				603				
P.H.F.		0.952				0.882				
Percentage	34.6%	65.4%			38.4%	61.6%				

24 Hour Volume Plot

University Avenue
B/ Aragon Drive - Kroc Center Driveway

12/7/2017

Start Time	12/7/2017
12:00 AM	128
1:00 AM	55
2:00 AM	59
3:00 AM	44
4:00 AM	69
5:00 AM	191
6:00 AM	425
7:00 AM	1100
8:00 AM	1137
9:00 AM	917
10:00 AM	799
11:00 AM	885
12:00 PM	948
1:00 PM	959
2:00 PM	1063
3:00 PM	1318
4:00 PM	1322
5:00 PM	1298
6:00 PM	963
7:00 PM	780
8:00 PM	551
9:00 PM	508
10:00 PM	266
11:00 PM	196
Total	15981



Volumes represent the combined totals for both directions

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878

City of San Diego
University Avenue
B/ Kroc Center Driveway - 70th Street

File Name 002
Site Code: 143-17844
24 Hour Directional Volume Count

Date:	Eastbound				Westbound					
12/7/2017	15 Minute Totals		Hourly Totals		15 Minute Totals		Hourly Totals		Combined Totals	
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00	31	126			21	129				
12:15	16	117			17	103				
12:30	19	124			15	115				
12:45	8	116	74	483	11	121	64	468	138	951
1:00	8	139			5	105				
1:15	9	129			8	101				
1:30	10	139			2	108				
1:45	7	144	34	551	11	117	26	431	60	982
2:00	10	148			9	90				
2:15	6	144			6	112				
2:30	7	166			4	124				
2:45	5	149	28	607	6	127	25	453	53	1060
3:00	6	148			7	177				
3:15	7	175			2	155				
3:30	5	162			7	140				
3:45	5	192	23	677	2	136	18	608	41	1285
4:00	12	178			5	150				
4:15	1	167			8	153				
4:30	15	182			7	159				
4:45	17	177	45	704	10	143	30	605	75	1309
5:00	19	214			18	148				
5:15	20	174			21	170				
5:30	35	195			24	113				
5:45	36	183	110	766	27	126	90	557	200	1323
6:00	34	156			33	129				
6:15	46	131			39	91				
6:30	76	137			66	121				
6:45	77	137	233	561	81	87	219	428	452	989
7:00	93	104			115	118				
7:15	105	128			137	104				
7:30	178	113			153	83				
7:45	122	70	498	415	225	84	630	389	1128	804
8:00	131	92			177	60				
8:15	116	84			144	66				
8:30	131	64			143	60				
8:45	124	79	502	319	130	69	594	255	1096	574
9:00	138	94			90	66				
9:15	127	66			93	55				
9:30	122	83			101	52				
9:45	111	57	498	300	109	34	393	207	891	507
10:00	114	49			91	44				
10:15	119	43			87	28				
10:30	96	25			93	27				
10:45	111	39	440	156	94	24	365	123	805	279
11:00	104	37			99	25				
11:15	134	30			93	25				
11:30	126	27			110	18				
11:45	120	20	484	114	110	28	412	96	896	210
Totals	2969	5653			2866	4620				
Combined Totals		8622				7486				
ADT										16108
AM Peak Hour	730	AM			730	AM				
Volume	547				699					
P.H.F.	0.768				0.777					
PM Peak Hour		500	PM			430	PM			
Volume		766				620				
P.H.F.		0.895				0.912				
Percentage	34.4%	65.6%			38.3%	61.7%				

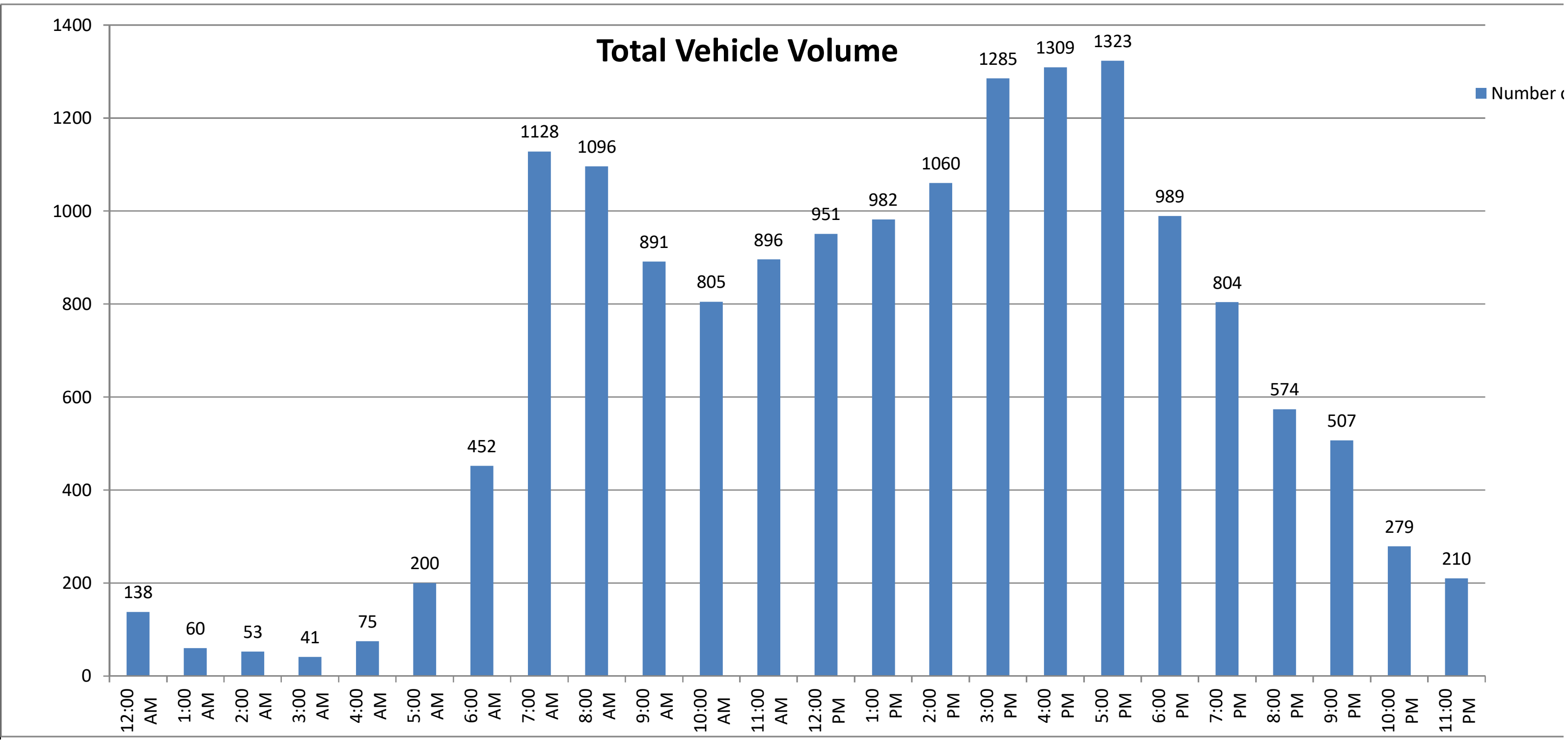
24 Hour Volume Plot

University Avenue

B/ Kroc Center Driveway - 70th Street

12/7/2017

Start Time	12/7/2017
12:00 AM	138
1:00 AM	60
2:00 AM	53
3:00 AM	41
4:00 AM	75
5:00 AM	200
6:00 AM	452
7:00 AM	1128
8:00 AM	1096
9:00 AM	891
10:00 AM	805
11:00 AM	896
12:00 PM	951
1:00 PM	982
2:00 PM	1060
3:00 PM	1285
4:00 PM	1309
5:00 PM	1323
6:00 PM	989
7:00 PM	804
8:00 PM	574
9:00 PM	507
10:00 PM	279
11:00 PM	210
Total	16108



Volumes represent the combined totals for both directions

Appendix B

City of San Diego Traffic Study Checklist

To be completed by City Staff:
Date Received ____________
Reviewer ________________
Date Screen Check _____

CITY OF SAN DIEGO
TRANSPORTATION DEVELOPMENT SECTION
TRAFFIC IMPACT STUDY
SCREEN CHECK

To be completed by consultant (including page #):
Name of Traffic Study SALVATION ARMY KROC CENTER SPORTS & WELLNESS CENTER
Consultant LOS ENGINEERING, INC.
Date Submitted JANUARY 2018

Satisfactory
YES NO NOT REQUIRED

Indicate Page # in report:

pg. ii 1. Table of contents, list of figures and list of tables. ☐ ☐
pg. iv 2. Executive summary. ☐ ☐

pg. 2 3. Map of the proposed project location ☐ ☐

4. General project description and background information:

pg. 16 a. Proposed project description (acres, dwelling units....) ☐ ☐
pg. 16 b. Total trip generation of proposed project. ☐ ☐
pg. 16 c. Community plan assumption for the proposed site. ☐ ☐
pg. 10 d. Discuss how project affects the Congestion Management program. ☐ ☐

pg. 11,12,19 5. Parking, transit and on-site circulation discussions are included. ☐ ☐

pg. 7 6. Map of the Transportation Impact Study Area and specific intersections studied in the traffic report. ☐ ☐

pg. 11 7. Existing Transportation Conditions:

13 a. Figure identifying roadway conditions including raised medians, median openings, separate left and right turn lanes, roadway and intersection dimensions, bike lanes, parking, number of travel lanes, posted speed, intersection controls, turn restrictions and intersection lane configurations. ☐ ☐
15 b. Figure indicating the daily (ADT) and peak hour volumes. ☐ ☐
14 c. Figure or table showing level of service (LOS) for intersections during peak hours and roadway sections within the study area (analysis sheets included in the appendix). ☐ ☐

8. Project Trip Generation:

pg. 16 Table showing the calculated project generated daily (ADT) and the peak hour volumes. ☐ ☐

pg. 17 9. Project Trip Distribution using the current TRANPLAN Computer Traffic Model (provide a computer plot) or manual assignment if previously approved. (Identify which method was used.) ☐ ☐

10. Project Traffic Assignment:

pg. 18 a. Figure indicating the daily (ADT) and peak hour volumes. ☐ ☐
pg. NA b. Figure showing pass-by-trip adjustments, if cumulative trip rates are used. ☐ ☐ ☐

11. Existing + Other Pending Projects:

pg. 23 a. Figure indicating the daily (ADT) and peak hour volumes. ☐ ☐
pg. 22 b. Figure or table showing the projected LOS for intersections during peak hours and roadway sections within the study area (analysis sheets included in the appendix). ☐ ☐
pg. NA c. Traffic signal warrant analysis for appropriate locations (signal warrants included in the appendix). ☐ ☐

Satisfactory
YES NO NOT REQUIRED

12. Existing + Other Pending Projects + Project (short term cumulative):

pg. 24 a. Figure or table showing the projected LOS for intersections during peak hours and roadway sections with the project (analysis sheets included in the appendix). ☐ ☐

pg. NA b. Figure showing other projects that were included in the study, and the assignment of their site traffic. ☐ ☐

pg. NA c. Traffic signal warrant analysis for appropriate locations (signal warrants in the appendix). ☐ ☐

13. Build-out Transportation Conditions (if project conforms to the community plan):

pg. 26 a. Build-out ADT and street classification that reflect the community plan. ☐ ☐ ☐

pg. 28 b. Figure or table showing the build-out LOS for intersections during peak hours and roadway sections with the project (analysis sheets included in the appendix). ☐ ☐ ☐

pg. NA c. Traffic signal warrant analysis at appropriate locations (signal warrants included in the appendix). ☐ ☐ ☐

14. Build-out Transportation Conditions (if project does not conform to the community plan).

pg. NA a. Build-out ADT and street classification as shown in the community plan. ☐ ☐ ☐

pg. NA b. Build-out ADT and street classification for two scenarios: with the proposed project and with the land use assumed in the community plan. ☐ ☐ ☐

pg. NA c. Figure or table showing the build-out LOS for intersections during peak hours and roadway sections for two scenarios: with the proposed project and with the land use assumed in the community plan (analysis sheets included in the appendix). ☐ ☐ ☐

pg. NA d. Traffic signal warrant analysis at appropriate locations with the land use assumed in the community plan (signal warrants included in the appendix). ☐ ☐ ☐

pg. 20, 24, 29 15. A summary table showing the comparison of Existing, Existing + Other Pending Projects, Existing + Other Pending Projects + Proposed Project, and Buildout, LOS on roadway sections and intersections during peak hours. ☐ ☐

16. Transportation Mitigation Measures.

pg. 31 a. Table identifying the mitigations required that are the responsibility of the developer and others. A phasing plan is required if mitigations are proposed in phases. ☐ ☐

pg. 31 b. Figure showing all proposed mitigations that include: intersection lane configurations, lane widths, raised medians, median openings, roadway and intersection dimensions, right-of-way, offset, etc. ☐ ☐

pg. UPON FINAL VERSION 17. The traffic study is signed by a California Registered Traffic Engineer. ☐ ☐

pg. 7 18. The Highway Capacity Manual Operational Method or other approved method is used at appropriate locations within the study area. ☐ ☐

pg. 10 19. Analysis complies with Congestion Management requirements. ☐ ☐ ☐

pg. NA 20. Appropriate freeway analysis is included. ☐ ☐ ☐

pg. NA 21. Appropriate freeway ramp metering analysis is included. ☐ ☐ ☐

THE TRAFFIC STUDY SCREEN CHECK FOR THE SUBJECT PROJECT IS:

__________ Approved

__________ Not approved because the following items are missing:

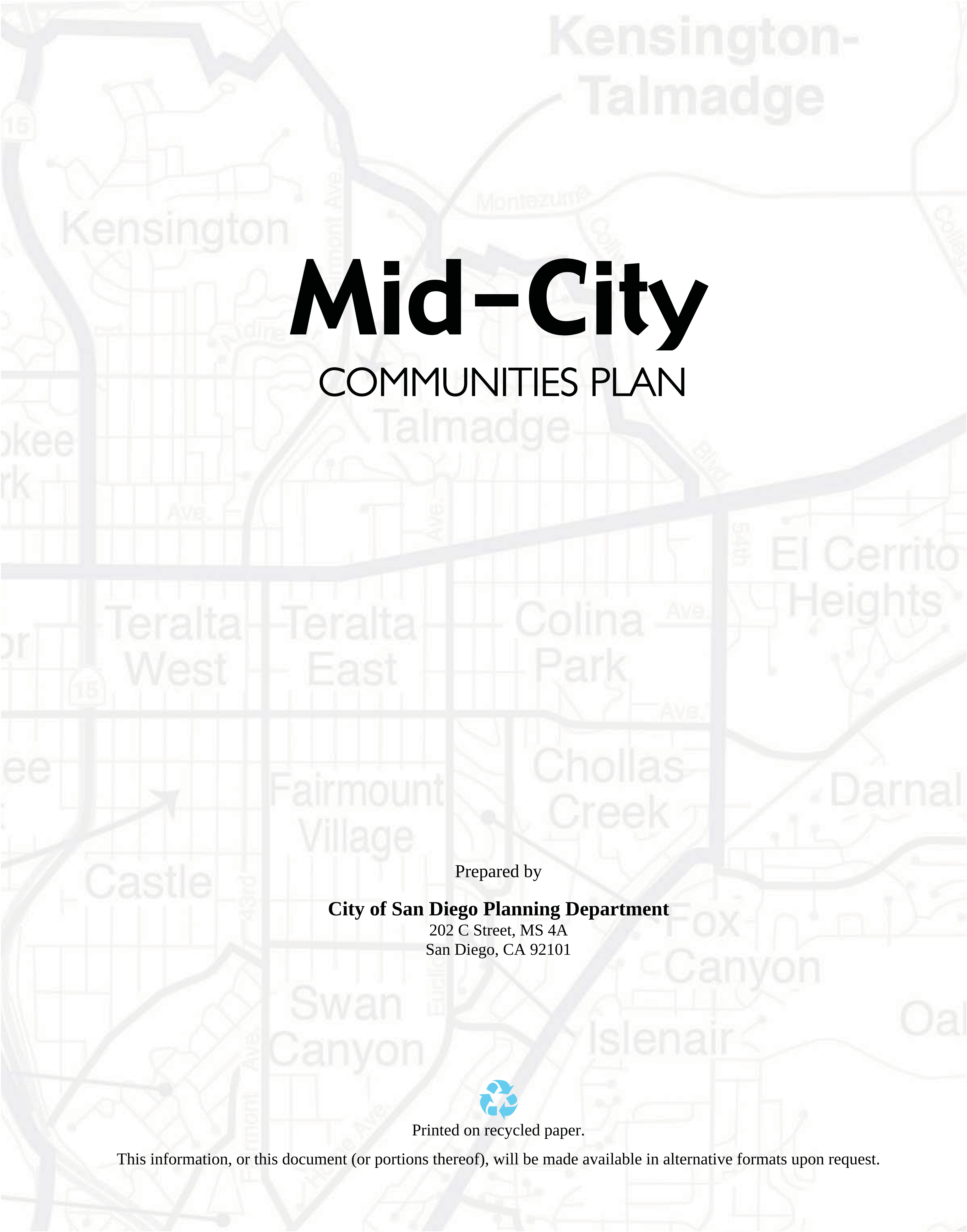
Appendix C

City of San Diego Community Plan Excerpts

Mid-City Communities Plan

FINAL

AUGUST 4, 1998



Mid–City

COMMUNITIES PLAN

Prepared by

City of San Diego Planning Department
202 C Street, MS 4A
San Diego, CA 92101

Printed on recycled paper.

This information, or this document (or portions thereof), will be made available in alternative formats upon request.

MID-CITY COMMUNITIES PLAN AMENDMENTS

The following amendments have been incorporated into this May 2005 posting of this Plan:

Amendment	Date Approved by Planning Commission	Resolution Number	Date Adopted by City Council	Resolution Number
Mid-City Communities Plan approved			August 4, 1998	R-290608
Redesignates 6 acres from Residential (11-15 du/ac) to Open Space, 5.36 acres from Park to Institutional, and 2 acres from Open Space to Institutional associated with the Central Police Facility in City Heights	July 24, 2003		September 23, 2003	R-298418

MID-CITY COMMUNITIES PLAN

MID-CITY PLAN UPDATE COMMITTEE

Ed Gergosian, Chair
Stephen Boeh, - Eastern Area Planning Group
Bob Forsythe – Normal Heights Planning Group
Allard Jensen – Kensington-Talmadge Planning Group
Johannes Long – Eastern Area Planning Group
David Nelson – City Heights Planning Group
Steve Russell – The Boulevard Planning Group
Gary Weber – Normal Heights Planning Group
David Wilson – Kensington-Talmadge Planning Group
Michael Sprague – City Heights Planning Group
Karen Busey – City Heights Planning Group

CONSULTING STAFF

Angeles Leira, Principal Planner
John Wilhoit, Senior Planner
Tom Romstad, Associate Planner

SUPPORT STAFF

Siavash Pazargadi, Senior Traffic Engineer
Siprian Sandu, Associate Traffic Engineer
Anne Lowry, Environmental Review

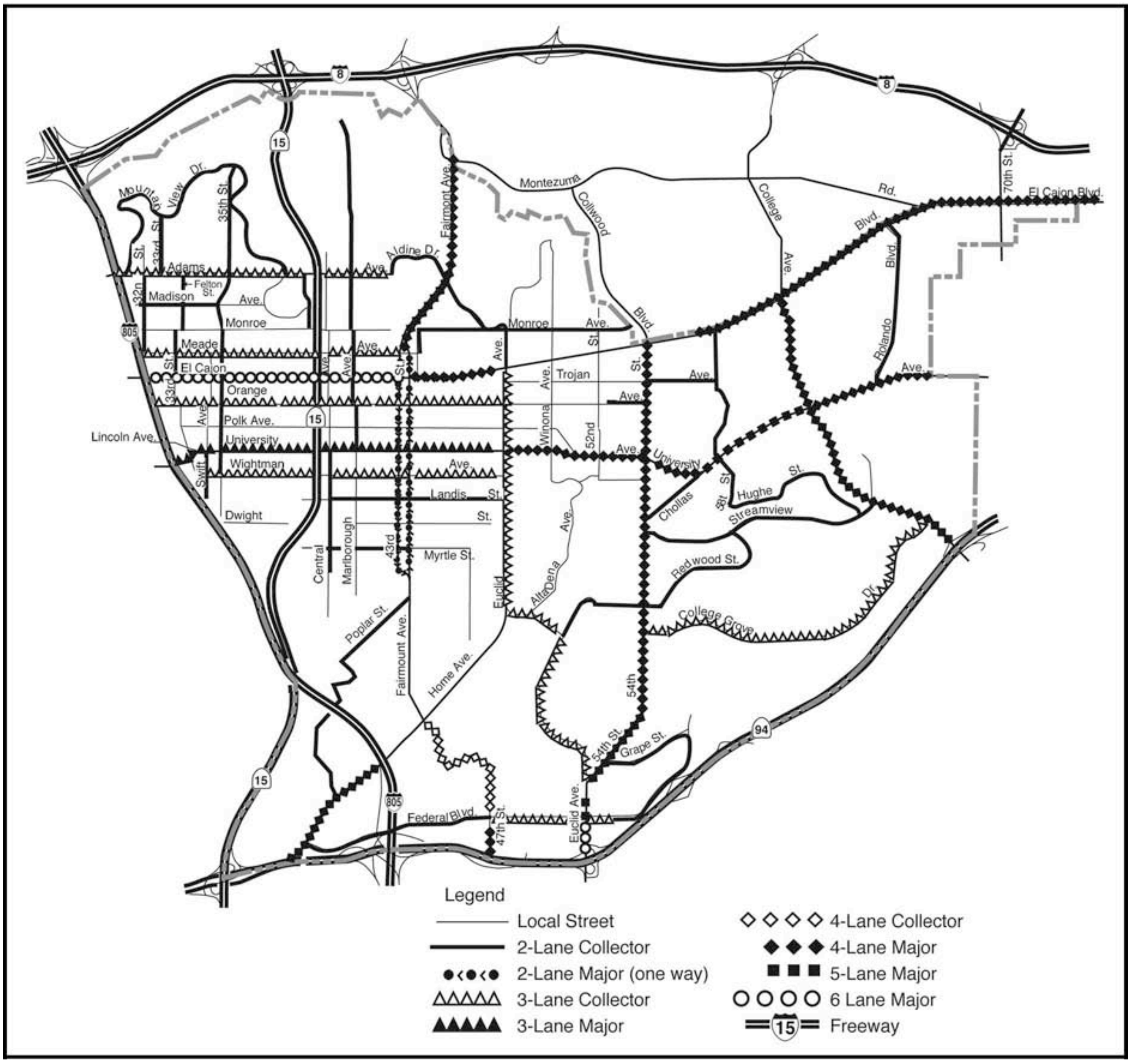
PRODUCTION STAFF

Michelle McCartt, Planning Intern
Janet Atha, Senior Drafting Aide
Victoria Charfauros, Word Processing Operator

CITY OF SAN DIEGO

Community and Economic Development Department
Community Planning and Development Division
Kurt Chilcott, Community and Economic Development Manager
Betsy McCullough, Director, Neighborhood Planning and Development
City Administration Building, M.S. 4A
San Diego, CA 92101

Figure 24
Future Recommended Street Network



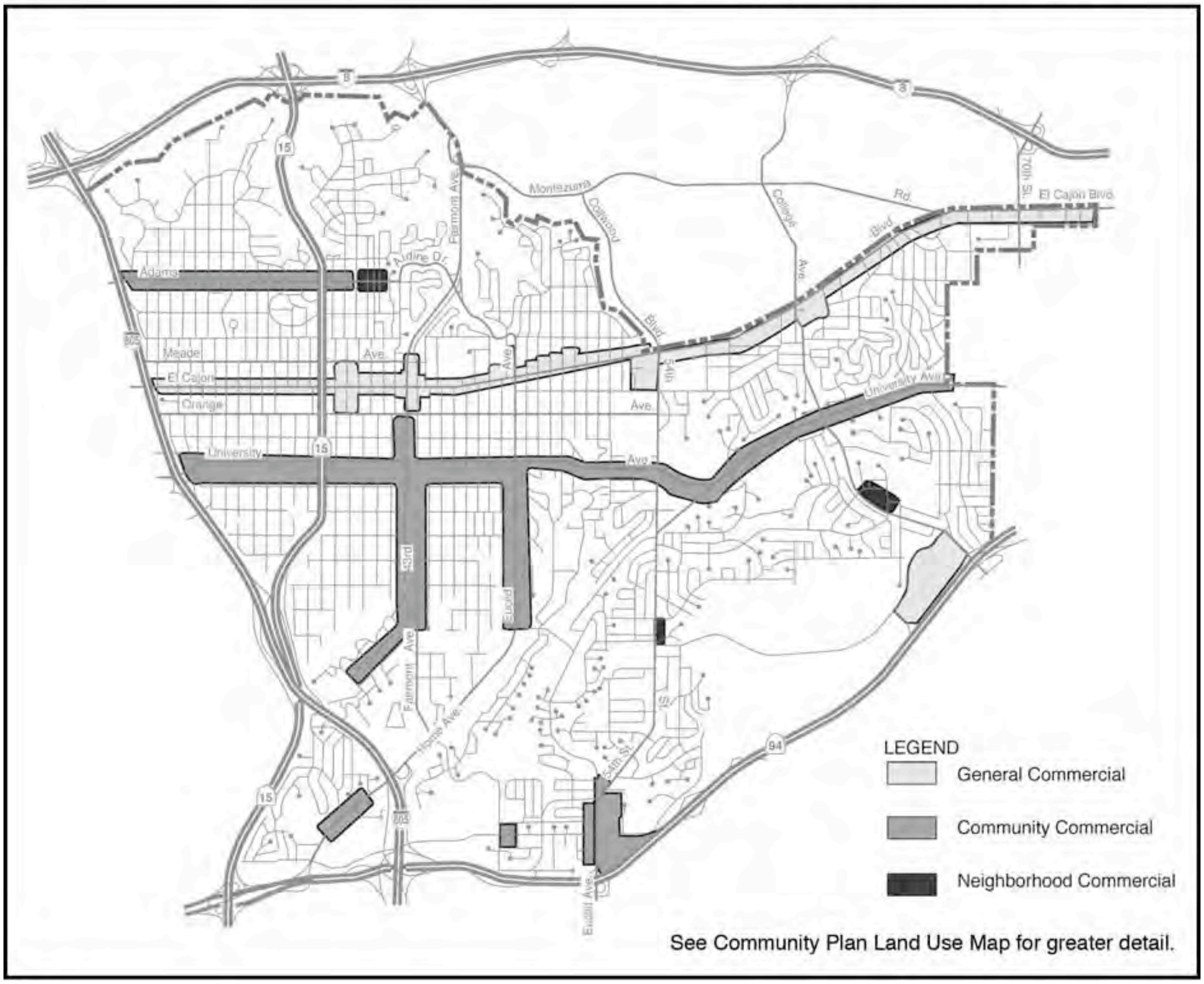
Streets and Highways

With the exception of State Route 15, which is to be completed, the existing system should be maintained and operational improvements made. Recommendations are based on a proven need to increase efficiency and accommodate planned growth.

The recommended future street network is shown on **Figure 24**. The future daily volumes are shown on **Figure 25**.

Figure 17

Conceptual Commercial Element



Appendix D

Transit Map and Schedule


Mission
San Diego
4,
Green Line
San Diego State University
Montezuma Rd
11
14
115
Montezuma
14
215
856
955
Aldine Dr
11
Fairmount Av
Collwood Bl
Campanile Dr
College Av
1
Rolando Bl
13
Monroe Av
215
1
El Cajon Bl
936
7
City Heights
University Av
7
10
University Av
10
Landis St
41st St
965
Myrtle Av
Fairmount Av
Euclid Av
955
Streamview Dr
916
917
College Grove P
856, 916, 917, 936
965
Chollas Lake
Poplar St
54th St
College Grove Dr

CASH FARES / *Tarifas en efectivo*

Exact fare, please / *Favor de pagar la cantidad exacta*

Day Pass (Regional) / *Pase diario (Regional)* Compass Card required ($2) / *Se requiere un Compass Card ($2)*	**$5.00**
One-Way Fare / *Tarifa de una direccíon*	**$2.25**
Senior (60+)/Disabled/Medicare *Mayores de 60 años/Discapacitados/Medicare*	**$1.10***
Children 5 & under / *Niños de 5 años o menos* Up to two children ride free per paying adult / *Máximo dos niños viajan gratis por cada adulto*	**FREE / *GRATIS***

MONTHLY PASSES / *Pases mensual*

Adult / *Adulto*	**$72.00**
Senior (60+)/Disabled/Medicare *Mayores de 60 años/Discapacitados/Medicare*	**$18.00***
Youths (18 and under) *Jóvenes (18 años o menos)*	**$36.00***

*I.D. required for discount fare or pass.
**Se requiere identificación para tarifas o pases de descuento.*

DAY PASS (REGIONAL) / *Pase diario (Regional)*

All passes are sold on Compass Card, which can be reloaded and reused for up to five years. Compass Cards are available for $2 at select outlets. A $5 Day Pass requires a Compass Card. A paper Day Pass can be purchased on board buses for an additional $2 fee.

Todos los pases se venden en el Compass Card, el cual puede ser recargado y reutilizado por hasta cinco años. Compass Cards están disponibles por $2 en selectas sucursales. Un pase de un día por $5 requiere un Compass Card. Un pase de un día de papel se puede obtener a bordo los autobuses por un costo adicional de $2.

DIRECTORY / *Directorio*

Regional Transit Information *Información de transporte público regional*	**511** or/ó **(619) 233-3004**
TTY/TDD (teletype for hearing impaired) *Teletipo para sordos*	**(619) 234-5005** or/ó **(888) 722-4889**
InfoExpress (24-hour info via Touch-Tone phone) *Información las 24 horas (via teléfono de teclas)*	**(619) 685-4900**
Customer Service / Suggestions *Servicio al cliente / Sugerencias*	**(619) 557-4555**
SafeWatch	**(619) 557-4500**
Lost & Found *Objetos extraviados*	**(619) 427-5660** or/ó **(800) 409-3310**
The Transit Store	**(619) 234-1060** 1st & Broadway, Downtown San Diego M–F 9am–5pm
For MTS online trip planning *Planificación de viajes por Internet*	**www.sdmts.com**

For more information on riding MTS services, pick up a Rider's Guide on a bus or at The Transit Store, or visit **www.sdmts.com.**

*Para obtener más información sobre el uso de los servicios de MTS, recoja un 'Rider's Guide' en un autobús o en The Transit Store, o visita a **www.sdmts.com.***

Thank you for riding MTS! ***¡Gracias por viajar con MTS!***

Effective JUNE 8, 2014

1

Hillcrest –
Grossmont Transit Ctr. (1) or 70th St. Trolley (1A)

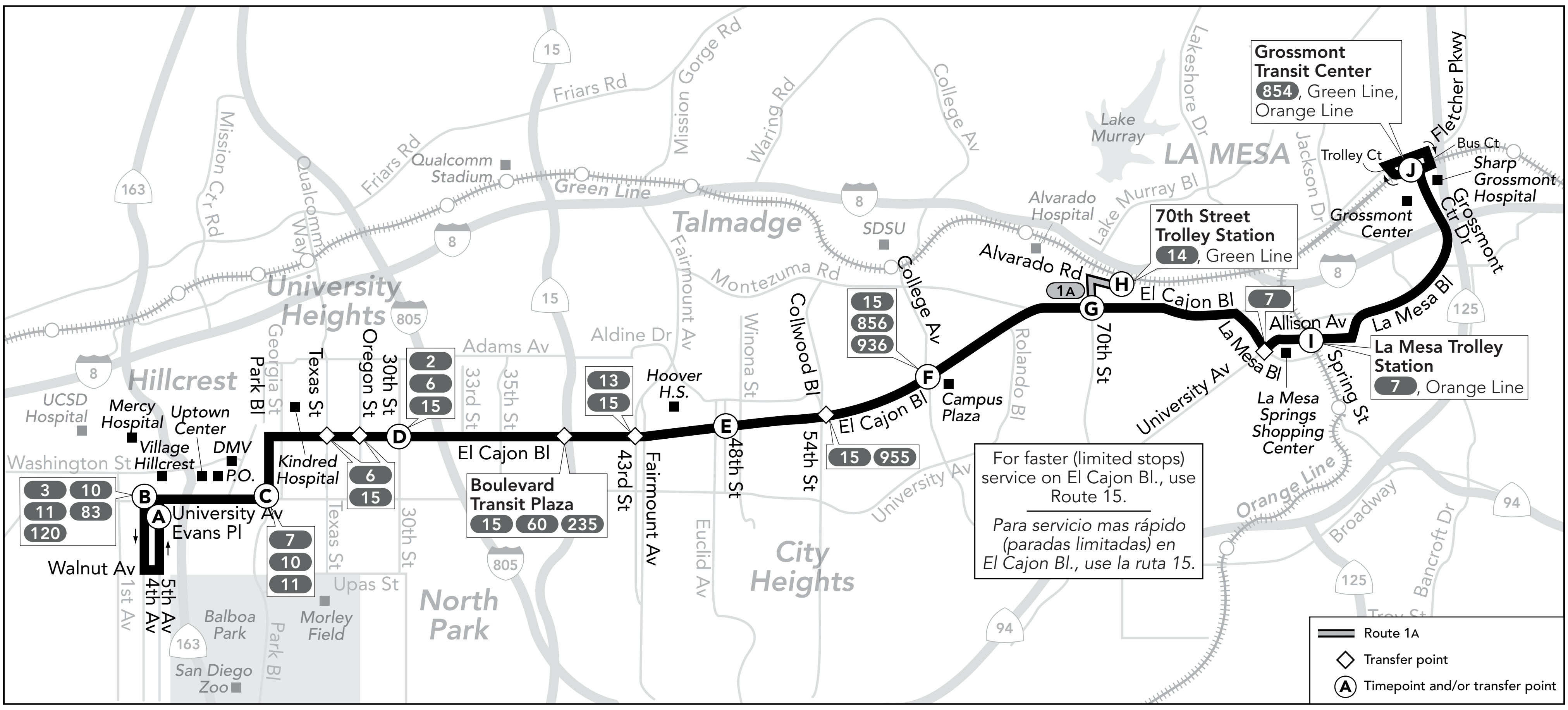
via El Cajon Bl.

DESTINATIONS
- Downtown La Mesa
- Grossmont Center
- Hillcrest DMV
- Sharp Grossmont Hospital
- Uptown Shopping Center

TROLLEY CONNECTIONS
70th St.
La Mesa Bl.
Grossmont

MTS Metropolitan Transit System

Alternative formats available upon request. Please call: (619) 557-4555 / *Formato alternativo disponible al preguntar. Favor de llamar: (619) 557-4555*



A Saturday or Sunday schedule will be operated on the following holidays and observed holidays >>> New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, Christmas

Se operará con horario de sábado o domingo durante los siguientes días festivos y feriados observados

Route 1 – Sunday / *domingo*

Hillcrest ➡ City Heights ➡ La Mesa

Ⓐ 5th Av. & Evans Pl. **DEPART**	Ⓑ 5th Av. & University Av.	Ⓒ Park Bl. & University Av.	Ⓓ El Cajon Bl. & 30th St.	Ⓔ El Cajon Bl. & 48th St.	Ⓕ El Cajon Bl. & College Av.	Ⓖ El Cajon Bl. & 70th St.	Ⓗ 70th St. Trolley Station	Ⓘ La Mesa Bl. Trolley Station	Ⓙ Grossmont Transit Ctr. **ARRIVE**
6:28a	6:29a	6:33a	6:41a	6:51a	6:58a	7:05a	—	7:13a	7:21a
7:32	7:33	7:39	7:47	7:58	8:06	8:13	—	8:21	8:30
8:15	8:16	8:23	8:32	8:45	8:54	9:01	—	9:09	9:20
8:45	8:46	8:53	9:02	9:15	9:24	9:31	—	9:39	9:50
9:12	9:13	9:20	9:29	9:42	9:51	9:58	—	10:06	10:17
9:39	9:40	9:47	9:57	10:11	10:20	10:27	—	10:35	10:46
10:04	10:05	10:12	10:22	10:36	10:45	10:53	—	11:02	11:13
10:29	10:30	10:38	10:49	11:04	11:14	11:22	—	11:31	11:43
10:59	11:00	11:08	11:19	11:34	11:44	11:52	—	**12:01p**	**12:13p**
11:29	11:30	11:38	11:49	**12:04p**	**12:14p**	**12:22p**	**—**	**12:31**	**12:43**
11:59	**12:00p**	**12:09p**	**12:20p**	**12:36**	**12:46**	**12:54**	**—**	**1:03**	**1:15**
12:29p	**12:30**	**12:39**	**12:50**	**1:06**	**1:16**	**1:24**	**—**	**1:33**	**1:45**
12:59	**1:00**	**1:09**	**1:20**	**1:36**	**1:46**	**1:54**	**—**	**2:03**	**2:15**
1:29	**1:30**	**1:39**	**1:50**	**2:06**	**2:16**	**2:24**	**—**	**2:33**	**2:45**
1:59	**2:00**	**2:09**	**2:20**	**2:36**	**2:46**	**2:54**	**—**	**3:03**	**3:15**
2:29	**2:30**	**2:39**	**2:50**	**3:06**	**3:16**	**3:24**	**—**	**3:33**	**3:45**
2:59	**3:00**	**3:09**	**3:20**	**3:36**	**3:46**	**3:54**	**—**	**4:03**	**4:15**
3:29	**3:30**	**3:39**	**3:50**	**4:06**	**4:16**	**4:24**	**—**	**4:33**	**4:45**
3:59	**4:00**	**4:09**	**4:20**	**4:36**	**4:46**	**4:54**	**—**	**5:03**	**5:15**
4:29	**4:30**	**4:39**	**4:50**	**5:06**	**5:16**	**5:24**	**—**	**5:33**	**5:45**
4:59	**5:00**	**5:08**	**5:18**	**5:33**	**5:42**	**5:50**	**—**	**5:58**	**6:08**
5:47	**5:48**	**5:56**	**6:05**	**6:18**	**6:26**	**6:33**	**—**	**6:41**	**6:51**
6:34	**6:35**	**6:43**	**6:52**	**7:05**	**7:13**	**7:20**	**—**	**7:28**	**—**
7:34	**7:35**	**7:42**	**7:50**	**7:59**	**8:06**	**8:13**	**—**	**8:20**	**—**
8:34	**8:35**	**8:42**	**8:50**	**8:59**	**9:06**	**9:13**	**—**	**9:20**	**—**

La Mesa ➡ City Heights ➡ Hillcrest

Ⓙ Grossmont Transit Ctr. **DEPART**	Ⓘ La Mesa Bl. Trolley Station	Ⓗ 70th St. Trolley Station	Ⓖ El Cajon Bl. & 70th St.	Ⓕ El Cajon Bl. & College Av.	Ⓔ El Cajon Bl. & 48th St.	Ⓓ El Cajon Bl. & 30th St.	Ⓒ Park Bl. & University Av.	Ⓑ 4th Av. & University Av.	Ⓐ 5th Av. & Evans Pl. **ARRIVE**
—	5:37a	—	5:44a	5:48a	5:55a	6:04a	6:11a	6:16a	6:19a
—	6:37	—	6:45	6:48	6:55	7:04	7:11	7:16	7:19
7:31a	7:42	—	7:50	7:56	8:05	8:17	8:24	8:31	8:34
8:40	8:51	—	9:00	9:06	9:15	9:28	9:36	9:43	9:46
9:40	9:51	—	10:00	10:06	10:16	10:30	10:38	10:45	10:48
10:10	10:21	—	10:30	10:36	10:46	11:00	11:08	11:15	11:18
10:38	10:50	—	11:00	11:07	11:17	11:31	11:39	11:46	11:49
11:02	11:14	—	11:24	11:31	11:41	11:55	**12:03p**	**12:11p**	**12:15p**
11:30	11:42	—	11:52	11:59	**12:09p**	**12:23p**	**12:31**	**12:39**	**12:43**
12:00p	**12:12p**	**—**	**12:22p**	**12:29p**	**12:39**	**12:53**	**1:01**	**1:09**	**1:13**
12:30	**12:42**	**—**	**12:52**	**12:59**	**1:09**	**1:23**	**1:31**	**1:39**	**1:43**
1:00	**1:12**	**—**	**1:22**	**1:29**	**1:39**	**1:53**	**2:01**	**2:09**	**2:13**
1:30	**1:42**	**—**	**1:52**	**1:59**	**2:09**	**2:23**	**2:31**	**2:39**	**2:43**
2:00	**2:12**	**—**	**2:22**	**2:29**	**2:39**	**2:53**	**3:01**	**3:09**	**3:13**
2:30	**2:42**	**—**	**2:52**	**2:59**	**3:09**	**3:23**	**3:31**	**3:39**	**3:43**
3:00	**3:12**	**—**	**3:22**	**3:29**	**3:39**	**3:53**	**4:01**	**4:09**	**4:13**
3:30	**3:42**	**—**	**3:52**	**3:59**	**4:09**	**4:23**	**4:31**	**4:39**	**4:43**
4:00	**4:12**	**—**	**4:22**	**4:29**	**4:39**	**4:53**	**5:01**	**5:09**	**5:13**
4:30	**4:42**	**—**	**4:52**	**4:59**	**5:09**	**5:23**	**5:31**	**5:39**	**5:43**
5:00	**5:12**	**—**	**5:22**	**5:29**	**5:39**	**5:53**	**6:01**	**6:09**	**6:13**
5:30	**5:42**	**—**	**5:52**	**5:59**	**6:09**	**6:23**	**6:31**	**6:39**	**6:43**
6:18	**6:30**	**—**	**6:39**	**6:45**	**6:53**	**7:05**	**7:12**	**7:20**	**7:23**
7:18	**7:30**	**—**	**7:39**	**7:45**	**7:53**	**8:05**	**8:12**	**8:20**	**8:23**

Route 1 – Monday through Friday / *lunes a viernes*

Hillcrest ➡ City Heights ➡ La Mesa

	Ⓐ 5th Av. & Evans Pl. **DEPART**	Ⓑ 5th Av. & University Av.	Ⓒ Park Bl. & University Av.	Ⓓ El Cajon Bl. & 30th St.	Ⓔ El Cajon Bl. & 48th St.	Ⓕ El Cajon Bl. & College Av.	Ⓖ El Cajon Bl. & 70th St.	Ⓗ 70th St. Trolley Station	Ⓘ La Mesa Bl. Trolley Station	Ⓙ Grossmont Transit Ctr. **ARRIVE**
	4:49a	4:50a	4:53a	5:01a	5:10a	5:17a	5:24a	—	5:32a	5:39a
	5:19	5:20	5:23	5:31	5:40	5:47	5:54	—	6:02	6:09
	5:44	5:45	5:48	5:56	6:05	6:12	6:19	—	6:27	6:34
	6:04	6:05	6:09	6:17	6:27	6:34	6:41	—	6:49	6:57
1A	6:22	6:23	6:27	6:35	6:45	6:52	6:59	7:02a	—	—
	6:37	6:38	6:42	6:50	7:02	7:10	7:17	—	7:25	7:34
1A	6:51	6:52	6:57	7:05	7:17	7:25	7:32	7:36	—	—
	7:05	7:06	7:12	7:21	7:33	7:41	7:48	—	7:57	8:06
1A	7:20	7:21	7:27	7:36	7:48	7:56	8:03	8:07	—	—
	7:35	7:36	7:42	7:51	8:03	8:11	8:18	—	8:27	8:36
1A	7:50	7:51	7:57	8:06	8:18	8:26	8:33	8:37	—	—
	8:05	8:06	8:12	8:21	8:33	8:41	8:48	—	8:57	9:06
1A	8:20	8:21	8:27	8:36	8:48	8:56	9:03	9:07	—	—
	8:35	8:36	8:42	8:51	9:03	9:11	9:18	—	9:27	9:36
1A	8:50	8:51	8:57	9:06	9:18	9:26	9:33	9:37	—	—
	9:05	9:06	9:13	9:22	9:35	9:43	9:51	—	10:01	10:10
1A	9:22	9:23	9:30	9:39	9:52	10:01	10:09	10:13	—	—
	9:37	9:38	9:45	9:54	10:07	10:16	10:24	—	10:34	10:43
1A	9:52	9:53	10:00	10:09	10:22	10:31	10:39	10:43	—	—
	10:07	10:08	10:15	10:24	10:37	10:46	10:54	—	11:04	11:13
1A	10:22	10:23	10:30	10:39	10:52	11:01	11:09	11:13	—	—
	10:37	10:38	10:46	10:56	11:10	11:19	11:27	—	11:38	11:49
1A	10:52	10:53	11:01	11:11	11:25	11:34	11:42	11:46	—	—
	11:07	11:08	11:16	11:26	11:40	11:49	11:57	—	**12:08p**	**12:19p**
1A	11:22	11:23	11:31	11:41	11:55	**12:04p**	**12:12p**	**12:16p**	—	—
	11:37	11:38	11:46	11:56	**12:10p**	**12:19**	**12:27**	—	**12:38**	**12:49**
	11:56	11:57	**12:06p**	**12:17p**	**12:32**	**12:42**	**12:50**	—	**1:01**	**1:13**
1A	**12:14p**	**12:15p**	**12:24**	**12:35**	**12:50**	**1:00**	**1:08**	**1:12**	—	—
	12:29	**12:30**	**12:39**	**12:50**	**1:05**	**1:15**	**1:23**	—	**1:34**	**1:46**
1A	**12:44**	**12:45**	**12:54**	**1:05**	**1:20**	**1:30**	**1:38**	**1:42**	—	—
	12:59	**1:00**	**1:09**	**1:20**	**1:35**	**1:45**	**1:53**	—	**2:04**	**2:16**
1A	**1:14**	**1:15**	**1:24**	**1:35**	**1:50**	**2:00**	**2:08**	**2:12**	—	—
	1:29	**1:30**	**1:39**	**1:50**	**2:05**	**2:15**	**2:23**	—	**2:34**	**2:46**
1A	**1:44**	**1:45**	**1:54**	**2:05**	**2:20**	**2:30**	**2:38**	**2:42**	—	—
	1:59	**2:00**	**2:09**	**2:20**	**2:35**	**2:45**	**2:53**	—	**3:04**	**3:16**
1A	**2:14**	**2:15**	**2:24**	**2:35**	**2:50**	**3:00**	**3:08**	**3:12**	—	—
	2:29	**2:30**	**2:39**	**2:50**	**3:06**	**3:16**	**3:25**	—	**3:36**	**3:49**
1A	**2:44**	**2:45**	**2:54**	**3:05**	**3:21**	**3:31**	**3:39**	**3:43**	—	—
	2:59	**3:00**	**3:09**	**3:20**	**3:36**	**3:46**	**3:55**	—	**4:06**	**4:19**
1A	**3:14**	**3:15**	**3:24**	**3:35**	**3:51**	**4:01**	**4:10**	**4:14**	—	—
	3:29	**3:30**	**3:39**	**3:50**	**4:06**	**4:16**	**4:25**	—	**4:36**	**4:49**
1A	**3:44**	**3:45**	**3:54**	**4:05**	**4:21**	**4:31**	**4:40**	**4:44**	—	—
	3:59	**4:00**	**4:09**	**4:20**	**4:36**	**4:46**	**4:55**	—	**5:06**	**5:19**
1A	**4:14**	**4:15**	**4:24**	**4:35**	**4:51**	**5:01**	**5:10**	**5:14**	—	—
	4:29	**4:30**	**4:39**	**4:50**	**5:06**	**5:16**	**5:25**	—	**5:36**	**5:49**
1A	**4:44**	**4:45**	**4:54**	**5:05**	**5:21**	**5:31**	**5:40**	**5:44**	—	—
	4:59	**5:00**	**5:09**	**5:19**	**5:34**	**5:43**	**5:52**	—	**6:02**	**6:14**
1A	**5:14**	**5:15**	**5:24**	**5:34**	**5:49**	**5:58**	**6:07**	**6:11**	—	—
	5:29	**5:30**	**5:39**	**5:49**	**6:04**	**6:13**	**6:22**	—	**6:32**	**6:44**
1A	**5:44**	**5:45**	**5:54**	**6:04**	**6:19**	**6:28**	**6:37**	**6:41**	—	—
	6:04	**6:05**	**6:13**	**6:23**	**6:36**	**6:44**	**6:53**	—	**7:02**	**7:14**
1A	**6:24**	**6:25**	**6:33**	**6:42**	**6:54**	**7:02**	**7:10**	**7:13**	—	—
	6:44	**6:45**	**6:53**	**7:02**	**7:14**	**7:22**	**7:30**	—	**7:38**	**7:49**
	7:04	**7:05**	**7:13**	**7:22**	**7:34**	**7:42**	**7:50**	—	**7:58**	**8:07**
	7:34	**7:35**	**7:42**	**7:50**	**7:59**	**8:06**	**8:13**	—	**8:20**	**8:28**
	8:08	**8:09**	**8:16**	**8:24**	**8:33**	**8:40**	**8:47**	—	**8:54**	**9:02**
	8:38	**8:39**	**8:46**	**8:54**	**9:03**	**9:10**	**9:17**	—	**9:24**	**9:32**
	9:08	**9:09**	**9:16**	**9:24**	**9:33**	**9:40**	**9:47**	—	**9:54**	**10:02**
	9:44	**9:45**	**9:51**	**9:59**	**10:08**	**10:15**	**10:21**	—	**10:28**	**10:35**
	10:14	**10:15**	**10:20**	**10:27**	**10:36**	**10:43**	**10:49**	—	**10:56**	**11:03**
	10:44	**10:45**	**10:50**	**10:57**	**11:06**	**11:13**	**11:19**	—	**11:26**	**11:33**
	11:14	**11:15**	**11:20**	**11:27**	**11:36**	**11:43**	**11:49**	—	**11:56**	—

La Mesa ➡ City Heights ➡ Hillcrest

Ⓙ Grossmont Transit Ctr. **DEPART**	Ⓘ La Mesa Bl. Trolley Station	Ⓗ 70th St. Trolley Station	Ⓖ El Cajon Bl. & 70th St.	Ⓕ El Cajon Bl. & College Av.	Ⓔ El Cajon Bl. & 48th St.	Ⓓ El Cajon Bl. & 30th St.	Ⓒ Park Bl. & University Av.	Ⓑ 4th Av. & University Av.	Ⓐ 5th Av. & Evans Pl. **ARRIVE**
—	—	4:55a	4:59a	5:03a	5:10a	5:19a	5:26a	5:31a	5:34a
—	—	5:10	5:14	5:18	5:25	5:34	5:41	5:46	5:49
5:15a	5:25a	—	5:32	5:36	5:44	5:53	6:00	6:06	6:09
—	—	5:44	5:48	5:53	6:02	6:11	6:18	6:25	6:28
5:45	5:55	—	6:03	6:08	6:17	6:27	6:34	6:41	6:44
—	—	6:18	6:23	6:28	6:37	6:48	6:55	7:02	7:05
6:20	6:30	—	6:38	6:43	6:52	7:03	7:10	7:17	7:20
—	—	6:48	6:53	6:59	7:08	7:20	7:27	7:35	7:38
6:48	6:59	—	7:08	7:14	7:23	7:36	7:43	7:51	7:54
—	—	7:18	7:23	7:29	7:39	7:52	7:59	8:07	8:10
7:17	7:28	—	7:38	7:44	7:54	8:07	8:14	8:22	8:25
—	—	7:48	7:53	7:59	8:09	8:22	8:29	8:37	8:40
7:47	7:58	—	8:08	8:14	8:24	8:37	8:44	8:52	8:55
—	—	8:18	8:23	8:29	8:39	8:52	9:00	9:08	9:11
8:16	8:28	—	8:38	8:44	8:54	9:07	9:15	9:23	9:27
—	—	8:48	8:53	8:59	9:09	9:22	9:30	9:38	9:42
8:46	8:58	—	9:08	9:14	9:24	9:37	9:45	9:53	9:57
—	—	9:18	9:23	9:29	9:39	9:52	10:00	10:08	10:12
9:16	9:28	—	9:38	9:44	9:54	10:07	10:15	10:23	10:27
—	—	9:48	9:53	9:59	10:09	10:22	10:30	10:38	10:42
9:46	9:58	—	10:08	10:14	10:24	10:37	10:45	10:53	10:57
—	—	10:20	10:25	10:31	10:41	10:54	11:02	11:11	11:15
10:19	10:32	—	10:42	10:48	10:58	11:11	11:20	11:29	11:33
—	—	10:54	10:59	11:05	11:15	11:28	11:37	11:46	11:50
10:53	11:06	—	11:16	11:22	11:32	11:45	11:54	**12:03p**	**12:07p**
—	—	11:26	11:31	11:37	11:47	**12:00p**	**12:09p**	**12:18**	**12:22**
11:27	11:40	—	11:50	11:56	**12:06p**	**12:19**	**12:28**	**12:37**	**12:41**
—	—	**12:04p**	**12:09p**	**12:15p**	**12:25**	**12:38**	**12:47**	**12:56**	**1:00**
12:01p	**12:14p**	—	**12:24**	**12:30**	**12:40**	**12:53**	**1:02**	**1:11**	**1:15**
—	—	**12:34**	**12:39**	**12:45**	**12:55**	**1:08**	**1:17**	**1:26**	**1:30**
12:31	**12:44**	—	**12:54**	**1:00**	**1:10**	**1:23**	**1:32**	**1:41**	**1:45**
—	—	**1:04**	**1:09**	**1:15**	**1:25**	**1:38**	**1:47**	**1:56**	**2:00**
1:00	**1:13**	—	**1:24**	**1:30**	**1:40**	**1:53**	**2:02**	**2:11**	**2:15**
—	—	**1:34**	**1:39**	**1:45**	**1:55**	**2:08**	**2:17**	**2:26**	**2:30**
1:30	**1:43**	—	**1:54**	**2:00**	**2:10**	**2:23**	**2:32**	**2:41**	**2:45**
—	—	**2:04**	**2:09**	**2:15**	**2:25**	**2:38**	**2:47**	**2:56**	**3:00**
2:00	**2:13**	—	**2:24**	**2:30**	**2:40**	**2:53**	**3:02**	**3:11**	**3:15**
—	—	**2:34**	**2:39**	**2:45**	**2:55**	**3:08**	**3:17**	**3:26**	**3:30**
2:30	**2:43**	—	**2:54**	**3:00**	**3:10**	**3:23**	**3:32**	**3:41**	**3:45**
—	—	**3:04**	**3:09**	**3:15**	**3:25**	**3:38**	**3:47**	**3:56**	**4:00**
3:00	**3:13**	—	**3:24**	**3:30**	**3:40**	**3:54**	**4:03**	**4:12**	**4:16**
—	—	**3:34**	**3:39**	**3:46**	**3:56**	**4:10**	**4:19**	**4:28**	**4:32**
3:29	**3:43**	—	**3:54**	**4:01**	**4:11**	**4:25**	**4:34**	**4:43**	**4:47**
—	—	**4:04**	**4:09**	**4:16**	**4:26**	**4:40**	**4:49**	**4:58**	**5:02**
3:59	**4:13**	—	**4:24**	**4:31**	**4:41**	**4:55**	**5:04**	**5:13**	**5:17**
—	—	**4:34**	**4:39**	**4:46**	**4:56**	**5:10**	**5:19**	**5:28**	**5:32**
4:29	**4:43**	—	**4:54**	**5:01**	**5:11**	**5:25**	**5:34**	**5:43**	**5:47**
—	—	**5:04**	**5:09**	**5:15**	**5:25**	**5:39**	**5:48**	**5:57**	**6:01**
5:00	**5:14**	—	**5:24**	**5:30**	**5:40**	**5:53**	**6:01**	**6:10**	**6:14**
—	—	**5:34**	**5:39**	**5:45**	**5:55**	**6:08**	**6:16**	**6:25**	**6:29**
5:30	**5:44**	—	**5:54**	**6:00**	**6:10**	**6:23**	**6:31**	**6:40**	**6:44**
—	—	**6:05**	**6:09**	**6:15**	**6:24**	**6:37**	**6:45**	**6:54**	**6:58**
6:02	**6:15**	—	**6:24**	**6:30**	**6:39**	**6:52**	**6:59**	**7:08**	**7:12**
—	—	**6:35**	**6:39**	**6:45**	**6:53**	**7:06**	**7:13**	**7:22**	**7:26**
6:33	**6:45**	—	**6:54**	**7:00**	**7:08**	**7:20**	**7:27**	**7:36**	**7:39**
—	—	**7:05**	**7:09**	**7:15**	**7:23**	**7:35**	**7:42**	**7:50**	**7:53**
7:03	**7:15**	—	**7:24**	**7:30**	**7:38**	**7:50**	**7:57**	**8:05**	**8:08**
7:26	**7:38**	—	**7:47**	**7:53**	**8:01**	**8:13**	**8:20**	**8:28**	**8:31**
8:01	**8:12**	—	**8:20**	**8:25**	**8:33**	**8:45**	**8:51**	**8:58**	**9:01**
8:38	**8:49**	—	**8:57**	**9:02**	**9:10**	**9:22**	**9:28**	**9:35**	**9:38**
9:10	**9:20**	—	**9:28**	**9:33**	**9:39**	**9:50**	**9:56**	**10:02**	**10:05**
9:40	**9:50**	—	**9:58**	**10:03**	**10:09**	**10:20**	**10:26**	**10:32**	**10:35**
10:10	**10:20**	—	**10:28**	**10:33**	**10:39**	**10:50**	**10:56**	**11:02**	**11:05**
10:42	**10:51**	—	**10:58**	**11:02**	**11:07**	**11:17**	**11:23**	**11:28**	—
11:12	**11:21**	—	**11:28**	**11:32**	**11:37**	**11:47**	**11:53**	**11:58**	—
11:42	**11:51**	—	**11:58**	12:02a	12:07a	12:17a	12:23a	12:28a	—

Route 1 – Saturday / *sábado*

Hillcrest ➡ City Heights ➡ La Mesa

Ⓐ 5th Av. & Evans Pl. **DEPART**	Ⓑ 5th Av. & University Av.	Ⓒ Park Bl. & University Av.	Ⓓ El Cajon Bl. & 30th St.	Ⓔ El Cajon Bl. & 48th St.	Ⓕ El Cajon Bl. & College Av.	Ⓖ El Cajon Bl. & 70th St.	Ⓗ 70th St. Trolley Station	Ⓘ La Mesa Bl. Trolley Station	Ⓙ Grossmont Transit Ctr. **ARRIVE**
5:24a	5:25a	5:28a	5:36a	5:45a	5:52a	5:59a	—	6:07a	6:14a
6:24	6:25	6:29	6:37	6:47	6:54	7:01	—	7:09	7:17
6:54	6:55	7:00	7:08	7:19	7:27	7:34	—	7:42	7:51
7:24	7:25	7:30	7:38	7:49	7:57	8:04	—	8:12	8:21
7:54	7:55	8:01	8:09	8:21	8:29	8:36	—	8:44	8:55
8:24	8:25	8:32	8:41	8:54	9:03	9:10	—	9:18	9:29
8:54	8:55	9:02	9:11	9:24	9:33	9:40	—	9:48	9:59
9:27	9:28	9:35	9:45	9:59	10:08	10:16	—	10:25	10:36
9:59	10:00	10:07	10:17	10:31	10:40	10:48	—	10:57	11:08
10:29	10:30	10:38	10:49	11:04	11:14	11:22	—	11:31	11:43
10:59	11:00	11:08	11:19	11:34	11:44	11:52	—	**12:01p**	**12:13p**
11:29	11:30	11:38	11:49	**12:04p**	**12:14p**	**12:22p**	—	**12:31**	**12:43**
11:59	**12:00p**	**12:09p**	**12:20p**	**12:36**	**12:46**	**12:54**	—	**1:03**	**1:15**
12:29p	**12:30**	**12:39**	**12:50**	**1:06**	**1:16**	**1:24**	—	**1:33**	**1:45**
12:59	**1:00**	**1:09**	**1:20**	**1:36**	**1:46**	**1:54**	—	**2:03**	**2:15**
1:29	**1:30**	**1:39**	**1:50**	**2:06**	**2:16**	**2:24**	—	**2:33**	**2:45**
1:59	**2:00**	**2:09**	**2:20**	**2:36**	**2:46**	**2:54**	—	**3:03**	**3:15**
2:29	**2:30**	**2:39**	**2:50**	**3:06**	**3:16**	**3:24**	—	**3:33**	**3:45**
2:59	**3:00**	**3:09**	**3:20**	**3:36**	**3:46**	**3:54**	—	**4:03**	**4:15**
3:29	**3:30**	**3:39**	**3:50**	**4:06**	**4:16**	**4:24**	—	**4:33**	**4:45**
3:59	**4:00**	**4:09**	**4:20**	**4:36**	**4:46**	**4:54**	—	**5:03**	**5:15**
4:29	**4:30**	**4:39**	**4:50**	**5:06**	**5:16**	**5:24**	—	**5:33**	**5:45**
4:59	**5:00**	**5:08**	**5:18**	**5:33**	**5:42**	**5:50**	—	**5:58**	**6:09**
5:29	**5:30**	**5:38**	**5:48**	**6:03**	**6:12**	**6:20**	—	**6:28**	**6:39**
5:59	**6:00**	**6:08**	**6:17**	**6:30**	**6:38**	**6:45**	—	**6:53**	**7:04**
6:29	**6:30**	**6:38**	**6:47**	**7:00**	**7:08**	**7:15**	—	**7:23**	**7:34**
6:59	**7:00**	**7:07**	**7:16**	**7:28**	**7:35**	**7:42**	—	**7:49**	**7:59**
7:29	**7:30**	**7:37**	**7:46**	**7:58**	**8:05**	**8:12**	—	**8:19**	**8:28**
8:01	**8:02**	**8:09**	**8:17**	**8:26**	**8:33**	**8:40**	—	**8:47**	**8:55**
8:31	**8:32**	**8:39**	**8:47**	**8:56**	**9:03**	**9:10**	—	**9:17**	**9:25**
9:08	**9:09**	**9:16**	**9:24**	**9:33**	**9:40**	**9:47**	—	**9:54**	**10:02**
9:44	**9:45**	**9:51**	**9:59**	**10:08**	**10:15**	**10:21**	—	**10:28**	**10:35**
10:14	**10:15**	**10:20**	**10:27**	**10:36**	**10:43**	**10:49**	—	**10:56**	**11:03**
10:44	**10:45**	**10:50**	**10:57**	**11:06**	**11:13**	**11:19**	—	**11:26**	**11:33**
11:14	**11:15**	**11:20**	**11:27**	**11:36**	**11:43**	**11:49**	—	**11:56**	—

La Mesa ➡ City Heights ➡ Hillcrest

Ⓙ Grossmont Transit Ctr. **DEPART**	Ⓘ La Mesa Bl. Trolley Station	Ⓗ 70th St. Trolley Station	Ⓖ El Cajon Bl. & 70th St.	Ⓕ El Cajon Bl. & College Av.	Ⓔ El Cajon Bl. & 48th St.	Ⓓ El Cajon Bl. & 30th St.	Ⓒ Park Bl. & University Av.	Ⓑ 4th Av. & University Av.	Ⓐ 5th Av. & Evans Pl. **ARRIVE**
5:40a	5:49a	—	5:56a	6:00a	6:07a	6:16a	6:23a	6:28a	6:31a
6:40	6:50	—	6:58	7:02	7:10	7:20	7:27	7:33	7:36
7:10	7:20	—	7:28	7:33	7:42	7:53	8:00	8:07	8:10
7:40	7:51	—	7:59	8:05	8:14	8:26	8:33	8:40	8:43
8:10	8:21	—	8:29	8:35	8:44	8:56	9:03	9:10	9:13
8:40	8:51	—	9:00	9:06	9:15	9:28	9:36	9:43	9:46
9:10	9:21	—	9:30	9:36	9:45	9:58	10:06	10:13	10:16
9:40	9:51	—	10:00	10:06	10:16	10:30	10:38	10:45	10:48
10:10	10:21	—	10:30	10:36	10:46	11:00	11:08	11:15	11:18
10:38	10:50	—	11:00	11:07	11:17	11:31	11:39	11:46	11:49
11:02	11:14	—	11:24	11:31	11:41	11:55	**12:03p**	**12:11p**	**12:15p**
11:30	11:42	—	11:52	11:59	**12:09p**	**12:23p**	**12:31**	**12:39**	**12:43**
12:00p	**12:12p**	—	**12:22p**	**12:29p**	**12:39**	**12:53**	**1:01**	**1:09**	**1:13**
12:30	**12:42**	—	**12:52**	**12:59**	**1:09**	**1:23**	**1:31**	**1:39**	**1:43**
1:00	**1:12**	—	**1:22**	**1:29**	**1:39**	**1:53**	**2:01**	**2:09**	**2:13**
1:30	**1:42**	—	**1:52**	**1:59**	**2:09**	**2:23**	**2:31**	**2:39**	**2:43**
2:00	**2:12**	—	**2:22**	**2:29**	**2:39**	**2:53**	**3:01**	**3:09**	**3:13**
2:30	**2:42**	—	**2:52**	**2:59**	**3:09**	**3:23**	**3:31**	**3:39**	**3:43**
3:00	**3:12**	—	**3:22**	**3:29**	**3:39**	**3:53**	**4:01**	**4:09**	**4:13**
3:30	**3:42**	—	**3:52**	**3:59**	**4:09**	**4:23**	**4:31**	**4:39**	**4:43**
4:00	**4:12**	—	**4:22**	**4:29**	**4:39**	**4:53**	**5:01**	**5:09**	**5:13**
4:30	**4:42**	—	**4:52**	**4:59**	**5:09**	**5:23**	**5:31**	**5:39**	**5:43**
5:00	**5:12**	—	**5:22**	**5:29**	**5:39**	**5:53**	**6:01**	**6:09**	**6:13**
5:30	**5:42**	—	**5:52**	**5:59**	**6:09**	**6:23**	**6:31**	**6:39**	**6:43**
6:00	**6:12**	—	**6:21**	**6:28**	**6:37**	**6:50**	**6:57**	**7:05**	**7:09**
6:30	**6:42**	—	**6:51**	**6:57**	**7:05**	**7:17**	**7:24**	**7:32**	**7:35**
7:00	**7:12**	—	**7:21**	**7:27**	**7:35**	**7:47**	**7:54**	**8:02**	**8:05**
7:30	**7:42**	—	**7:51**	**7:57**	**8:05**	**8:17**	**8:24**	**8:32**	**8:35**
8:00	**8:11**	—	**8:19**	**8:24**	**8:32**	**8:44**	**8:50**	**8:57**	**9:00**
8:38	**8:49**	—	**8:57**	**9:02**	**9:10**	**9:22**	**9:28**	**9:35**	**9:38**
9:10	**9:20**	—	**9:28**	**9:33**	**9:39**	**9:50**	**9:56**	**10:02**	**10:05**
9:40	**9:50**	—	**9:58**	**10:03**	**10:09**	**10:20**	**10:26**	**10:32**	**10:35**
10:10	**10:20**	—	**10:28**	**10:33**	**10:39**	**10:50**	**10:56**	**11:02**	**11:05**
10:42	**10:51**	—	**10:58**	**11:02**	**11:07**	**11:17**	**11:23**	**11:28**	—
11:12	**11:21**	—	**11:28**	**11:32**	**11:37**	**11:47**	**11:53**	**11:58**	—

1A = Route 1A trips terminate at 70th St. Trolley Station / *Viajes de Ruta 1A terminan en 70th St. Trolley Station*

CASH FARES / *Tarifas en efectivo*

Exact fare, please / *Favor de pagar la cantidad exacta*	
Day Pass (Regional) / *Pase diario (Regional)* Compass Card required ($2) / *Se requiere un Compass Card ($2)*	$5.00
One-Way Fare / *Tarifa de una direccíon*	$2.25
Senior (60+)/Disabled/Medicare *Mayores de 60 años/Discapacitados/Medicare*	$1.10*
Children 5 & under / *Niños de 5 años o menos* Up to two children ride free per paying adult / *Máximo dos niños viajan gratis por cada adulto*	FREE / *GRATIS*

MONTHLY PASSES / *Pases mensual*

Adult / *Adulto*	$72.00
Senior (60+)/Disabled/Medicare *Mayores de 60 años/Discapacitados/Medicare*	$18.00*
Youths (18 and under) *Jóvenes (18 años o menos)*	$36.00*

*I.D. required for discount fare or pass.
**Se requiere identificación para tarifas o pases de descuento.*

DAY PASS (REGIONAL) / *Pase diario (Regional)*

All passes are sold on Compass Card, which can be reloaded and reused for up to five years. Compass Cards are available for $2 at select outlets. A $5 Day Pass requires a Compass Card. A paper Day Pass can be purchased on board buses for an additional $2 fee.

Todos los pases se venden en el Compass Card, el cual puede ser recargado y reutilizado por hasta cinco años. Compass Cards están disponibles por $2 en selectas sucursales. Un pase de un día por $5 requiere un Compass Card. Un pase de un día de papel se puede obtener a bordo los autobuses por un costo adicional de $2.

DIRECTORY / *Directorio*

Regional Transit Information *Información de transporte público regional*	511 or/ó (619) 233-3004
TTY/TDD (teletype for hearing impaired) *Teletipo para sordos*	(619) 234-5005 or/ó (888) 722-4889
InfoExpress (24-hour info via Touch-Tone phone) *Información las 24 horas (via teléfono de teclas)*	(619) 685-4900
Customer Service / Suggestions *Servicio al cliente / Sugerencias*	(619) 557-4555
SafeWatch	(619) 557-4500
Lost & Found *Objetos extraviados*	(619) 557-4555
Transit Store	(619) 234-1060 12th & Imperial Transit Center M–F 8am–5pm
For MTS online trip planning *Planificación de viajes por Internet*	sdmts.com

For more information on riding MTS services, pick up a Rider's Guide on a bus or at the Transit Store, or visit **sdmts.com**.

Para obtener más información sobre el uso de los servicios de MTS, recoja un 'Rider's Guide' en un autobús o en la Transit Store, o visita a ***www.sdmts.com****.*

Thank you for riding MTS! ***¡Gracias por viajar con MTS!***

Effective SEPTEMBER 3, 2017

Rapid
215
SDSU – Downtown

DESTINATIONS

- San Diego State University
- El Cajon Bl.
- Hoover High School
- The Boulevard Transit Plaza
- Balboa Park
- San Diego Zoo
- City College

TROLLEY CONNECTIONS

SDSU
City College
America Plaza
Santa Fe Depot

Metropolitan Transit System

09/17

Alternative formats available upon request. Please call: (619) 557-4555 / *Formato alternativo disponible al preguntar. Favor de llamar: (619) 557-4555*

The schedules and other information shown in this timetable are subject to change. MTS does not assume responsibility for errors in timetables nor for any inconvenience caused by delayed buses.
Los horarios e información que se indican en este itinerario están sujetos a cambios. MTS no asume responsabilidad por errores en los itinerarios, ni por ningún perjuicio que se origine por los autobuses demorados.

Route 215 – Monday through Friday / *lunes a viernes*

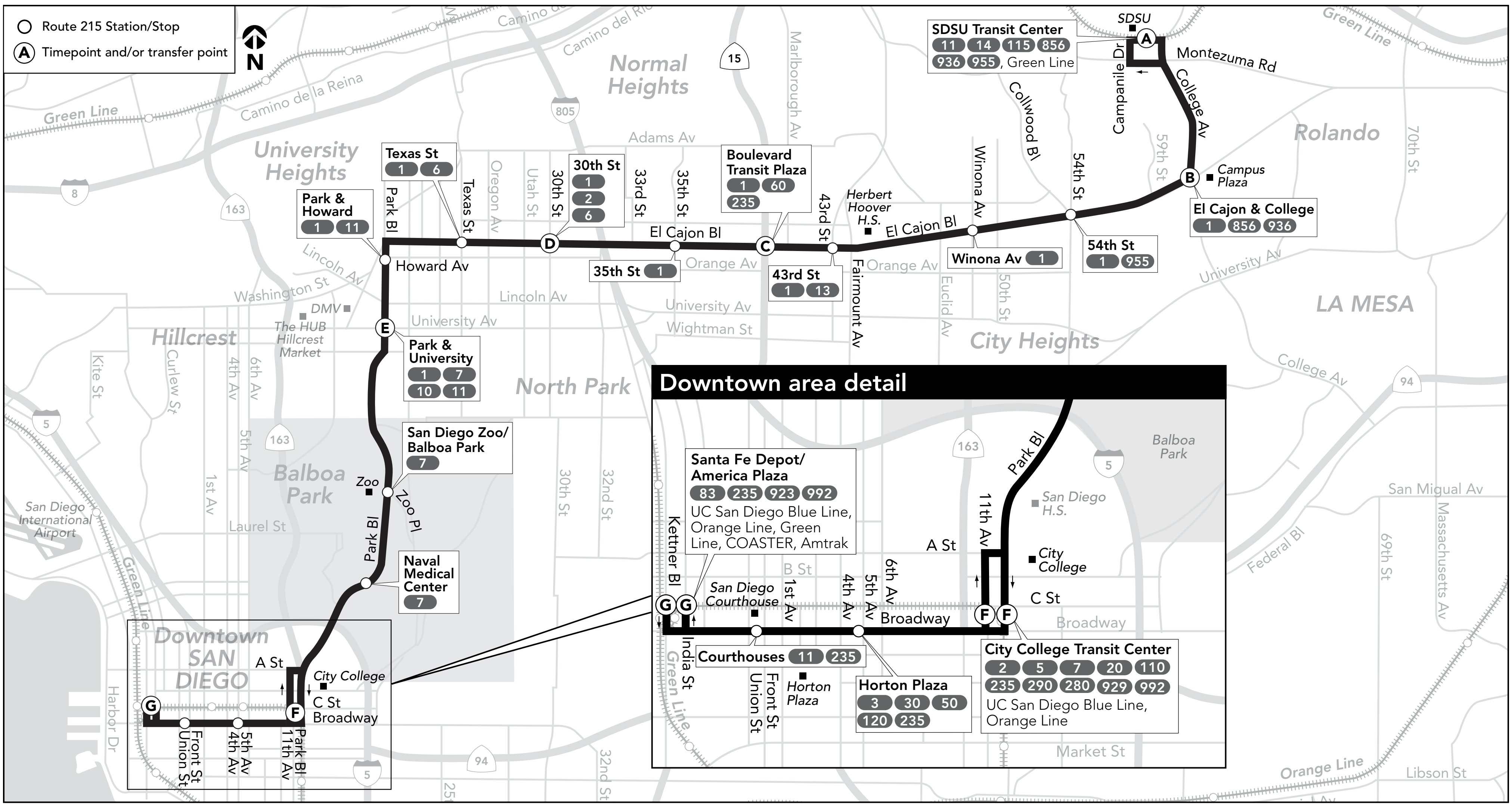
SDSU ➡ City Heights ➡ Downtown

Ⓐ SDSU Transit Center **DEPART**	Ⓑ El Cajon Bl. & College Av.	Ⓒ El Cajon Bl. & I-15	Ⓓ El Cajon Bl. & 30th St.	Ⓔ Park Bl. & University Av.	Ⓕ City College Transit Center (Park Bl.)	Ⓖ America Plaza Trolley Station **ARRIVE**
—	—	4:28a	4:32a	4:37a	4:44a	4:51a
4:35a	4:38a	4:46	4:50	4:55	5:02	5:09
4:50	4:53	5:01	5:05	5:10	5:17	5:24
5:05	5:08	5:16	5:20	5:25	5:32	5:39
5:20	5:23	5:31	5:35	5:40	5:47	5:54
5:35	5:38	5:47	5:51	5:57	6:05	6:12
5:49	5:52	6:01	6:05	6:11	6:19	6:26
6:04	6:07	6:17	6:22	6:29	6:37	6:44
6:14	6:17	6:27	6:32	6:39	6:47	6:54
6:24	6:27	6:38	6:43	6:50	6:59	7:06
6:35	6:38	6:50	6:55	7:03	7:12	7:20
6:45	6:48	7:00	7:05	7:13	7:22	7:30
6:55	6:58	7:11	7:16	7:24	7:33	7:41
7:05	7:08	7:22	7:27	7:35	7:44	7:53
7:15	7:18	7:32	7:37	7:45	7:54	8:03
7:25	7:28	7:42	7:47	7:55	8:04	8:13
7:35	7:38	7:52	7:57	8:05	8:14	8:23
7:45	7:49	8:01	8:07	8:16	8:25	8:34
7:56	8:00	8:12	8:18	8:27	8:36	8:45
8:06	8:10	8:22	8:28	8:37	8:46	8:55
8:16	8:20	8:32	8:38	8:47	8:56	9:05
8:26	8:30	8:42	8:48	8:57	9:06	9:15
8:36	8:40	8:52	8:58	9:07	9:16	9:25
8:46	8:50	9:02	9:08	9:17	9:26	9:35
8:56	9:00	9:12	9:18	9:27	9:36	9:45
9:06	9:10	9:22	9:28	9:37	9:46	9:55
9:20	9:24	9:36	9:42	9:51	10:00	10:09
9:35	9:39	9:51	9:57	10:06	10:15	10:24
9:50	9:54	10:06	10:12	10:21	10:30	10:39
10:05	10:09	10:21	10:27	10:36	10:45	10:54
10:20	10:24	10:36	10:42	10:51	11:00	11:09
10:35	10:39	10:51	10:57	11:06	11:15	11:24
10:50	10:54	11:06	11:12	11:21	11:30	11:39
11:05	11:09	11:21	11:27	11:36	11:45	11:54
11:20	11:24	11:36	11:42	11:51	**12:00p**	**12:09p**
11:35	11:39	11:51	11:57	**12:06p**	**12:15**	**12:24**
11:50	11:54	**12:06p**	**12:12p**	**12:21**	**12:30**	**12:39**
12:05p	**12:09p**	**12:21**	**12:27**	**12:37**	**12:47**	**12:56**
12:20	**12:24**	**12:36**	**12:42**	**12:52**	**1:02**	**1:11**
12:35	**12:39**	**12:51**	**12:57**	**1:07**	**1:17**	**1:26**
12:50	**12:54**	**1:06**	**1:12**	**1:22**	**1:32**	**1:41**
1:05	**1:09**	**1:21**	**1:27**	**1:37**	**1:47**	**1:56**
1:20	**1:24**	**1:36**	**1:42**	**1:52**	**2:02**	**2:11**
1:35	**1:39**	**1:51**	**1:57**	**2:07**	**2:17**	**2:26**
1:50	**1:54**	**2:06**	**2:12**	**2:22**	**2:32**	**2:41**
2:05	**2:09**	**2:21**	**2:27**	**2:37**	**2:47**	**2:56**
2:17	**2:21**	**2:33**	**2:39**	**2:49**	**2:59**	**3:08**
2:27	**2:31**	**2:43**	**2:49**	**2:59**	**3:09**	**3:18**
2:37	**2:41**	**2:53**	**2:59**	**3:09**	**3:19**	**3:28**
2:47	**2:51**	**3:03**	**3:09**	**3:19**	**3:29**	**3:38**
2:57	**3:01**	**3:13**	**3:19**	**3:29**	**3:39**	**3:48**
3:07	**3:11**	**3:23**	**3:29**	**3:39**	**3:49**	**3:58**
3:17	**3:21**	**3:33**	**3:39**	**3:49**	**3:59**	**4:08**
3:27	**3:31**	**3:43**	**3:49**	**3:59**	**4:09**	**4:18**
3:37	**3:41**	**3:53**	**3:59**	**4:09**	**4:19**	**4:28**
3:47	**3:51**	**4:03**	**4:09**	**4:19**	**4:29**	**4:38**
3:57	**4:01**	**4:13**	**4:19**	**4:29**	**4:39**	**4:48**
4:07	**4:11**	**4:23**	**4:29**	**4:39**	**4:49**	**4:58**
4:17	**4:21**	**4:33**	**4:39**	**4:49**	**4:59**	**5:08**
4:27	**4:31**	**4:43**	**4:49**	**4:59**	**5:09**	**5:18**
4:37	**4:41**	**4:53**	**4:59**	**5:09**	**5:19**	**5:28**
4:47	**4:51**	**5:03**	**5:09**	**5:19**	**5:29**	**5:38**
4:57	**5:01**	**5:13**	**5:19**	**5:29**	**5:39**	**5:48**
5:07	**5:11**	**5:23**	**5:29**	**5:39**	**5:49**	**5:58**
5:17	**5:21**	**5:33**	**5:39**	**5:49**	**5:58**	**6:06**
5:27	**5:31**	**5:43**	**5:49**	**5:59**	**6:08**	**6:16**
5:37	**5:41**	**5:53**	**5:59**	**6:09**	**6:18**	**6:26**
5:47	**5:51**	**6:03**	**6:09**	**6:19**	**6:28**	**6:36**
5:57	**6:01**	**6:13**	**6:19**	**6:29**	**6:38**	**6:46**
6:07	**6:11**	**6:23**	**6:29**	**6:39**	**6:48**	**6:56**
6:17	**6:21**	**6:32**	**6:38**	**6:47**	**6:55**	**7:03**
6:27	**6:31**	**6:42**	**6:48**	**6:57**	**7:05**	**7:13**
6:40	**6:44**	**6:55**	**7:01**	**7:10**	**7:18**	**7:26**
6:55	**6:59**	**7:10**	**7:16**	**7:25**	**7:33**	**7:41**
7:10	**7:14**	**7:25**	**7:31**	**7:40**	**7:48**	**7:56**
7:25	**7:29**	**7:40**	**7:46**	**7:55**	**8:03**	**8:11**
7:40	**7:44**	**7:54**	**7:59**	**8:08**	**8:16**	**8:24**
7:55	**7:59**	**8:09**	**8:14**	**8:22**	**8:30**	**8:37**
8:10	**8:14**	**8:24**	**8:29**	**8:37**	**8:45**	**8:52**
8:25	**8:29**	**8:39**	**8:44**	**8:52**	**9:00**	**9:07**
8:40	**8:43**	**8:52**	**8:57**	**9:04**	**9:12**	**9:19**
8:56	**8:59**	**9:08**	**9:13**	**9:20**	**9:28**	**9:35**
9:21	**9:24**	**9:33**	**9:38**	**9:45**	**9:53**	**10:00**
9:51	**9:54**	**10:03**	**10:08**	**10:15**	**10:23**	**10:30**
10:21	**10:24**	**10:33**	**10:38**	**10:45**	**10:53**	**11:00**
10:51	**10:54**	**11:03**	**11:07**	**11:14**	**11:21**	**11:28**
11:21	**11:24**	**11:33**	**11:37**	**11:44**	**11:51**	**11:58**
11:51	**11:54**	12:03a	12:07a	12:14a	12:21a	12:28a
12:21a	12:24a	12:33	12:37	12:44	12:51	12:58
12:51	12:54	1:03	1:07	1:14	1:21	1:28

Downtown ➡ City Heights ➡ SDSU

Ⓖ Santa Fe Depot Transit Center **DEPART**	Ⓕ City College Transit Center (11th Av.)	Ⓔ Park Bl. & University Av.	Ⓓ El Cajon Bl. & 30th St.	Ⓒ El Cajon Bl. & I-15	Ⓑ El Cajon Bl. & College Av.	Ⓐ SDSU Transit Center **ARRIVE**
4:32a	4:40a	4:48a	4:53a	4:58a	5:07a	5:11a
5:02	5:10	5:18	5:23	5:28	5:37	5:41
5:17	5:25	5:33	5:38	5:43	5:52	5:56
5:32	5:40	5:48	5:53	5:58	6:07	6:11
5:47	5:55	6:03	6:08	6:13	6:22	6:26
6:02	6:10	6:18	6:24	6:29	6:39	6:43
6:17	6:25	6:33	6:39	6:44	6:55	7:00
6:31	6:39	6:48	6:54	6:59	7:10	7:15
6:41	6:49	6:58	7:04	7:09	7:20	7:25
6:51	6:59	7:08	7:14	7:19	7:30	7:35
6:59	7:08	7:17	7:24	7:30	7:41	7:46
7:09	7:18	7:27	7:34	7:40	7:51	7:56
7:19	7:28	7:37	7:44	7:50	8:01	8:06
7:29	7:38	7:47	7:54	8:00	8:11	8:16
7:39	7:48	7:57	8:04	8:10	8:21	8:26
7:49	7:58	8:07	8:14	8:20	8:31	8:36
7:59	8:08	8:17	8:24	8:30	8:41	8:46
8:09	8:18	8:27	8:34	8:40	8:51	8:56
8:20	8:29	8:38	8:45	8:51	9:02	9:07
8:32	8:41	8:50	8:57	9:03	9:14	9:19
8:47	8:56	9:05	9:12	9:18	9:29	9:34
9:02	9:11	9:20	9:27	9:33	9:44	9:49
9:17	9:26	9:35	9:42	9:48	9:59	10:04
9:32	9:41	9:50	9:57	10:03	10:14	10:19
9:47	9:56	10:05	10:13	10:19	10:31	10:36
10:02	10:11	10:20	10:28	10:34	10:46	10:51
10:17	10:26	10:35	10:43	10:49	11:01	11:06
10:32	10:41	10:50	10:58	11:04	11:16	11:21
10:47	10:56	11:05	11:13	11:19	11:31	11:36
11:02	11:11	11:20	11:28	11:34	11:46	11:51
11:17	11:26	11:35	11:43	11:49	**12:01p**	**12:06p**
11:32	11:41	11:50	11:58	**12:04p**	**12:16**	**12:21**
11:47	11:56	**12:05p**	**12:13p**	**12:19**	**12:31**	**12:36**
12:02p	**12:11p**	**12:20**	**12:28**	**12:34**	**12:46**	**12:51**
12:17	**12:26**	**12:35**	**12:43**	**12:49**	**1:01**	**1:06**
12:32	**12:41**	**12:50**	**12:58**	**1:04**	**1:16**	**1:21**
12:47	**12:56**	**1:05**	**1:13**	**1:19**	**1:31**	**1:36**
1:02	**1:11**	**1:20**	**1:28**	**1:34**	**1:46**	**1:51**
1:17	**1:26**	**1:35**	**1:43**	**1:49**	**2:01**	**2:06**
1:32	**1:41**	**1:50**	**1:58**	**2:04**	**2:16**	**2:21**
1:45	**1:54**	**2:03**	**2:11**	**2:17**	**2:29**	**2:34**
1:55	**2:04**	**2:13**	**2:21**	**2:27**	**2:39**	**2:44**
2:04	**2:14**	**2:23**	**2:31**	**2:37**	**2:50**	**2:55**
2:14	**2:24**	**2:33**	**2:41**	**2:47**	**3:00**	**3:05**
2:24	**2:34**	**2:43**	**2:51**	**2:57**	**3:10**	**3:15**
2:35	**2:45**	**2:54**	**3:02**	**3:08**	**3:21**	**3:26**
2:45	**2:55**	**3:04**	**3:12**	**3:18**	**3:31**	**3:36**
2:55	**3:05**	**3:14**	**3:22**	**3:28**	**3:41**	**3:46**
3:05	**3:15**	**3:24**	**3:32**	**3:38**	**3:51**	**3:56**
3:15	**3:25**	**3:34**	**3:42**	**3:48**	**4:01**	**4:06**
3:25	**3:35**	**3:44**	**3:52**	**3:58**	**4:11**	**4:16**
3:35	**3:45**	**3:54**	**4:02**	**4:08**	**4:21**	**4:26**
3:45	**3:55**	**4:04**	**4:12**	**4:18**	**4:31**	**4:36**
3:55	**4:05**	**4:14**	**4:22**	**4:28**	**4:41**	**4:46**
4:05	**4:15**	**4:24**	**4:32**	**4:38**	**4:51**	**4:56**
4:15	**4:25**	**4:34**	**4:42**	**4:48**	**5:01**	**5:06**
4:25	**4:35**	**4:44**	**4:52**	**4:58**	**5:11**	**5:16**
4:35	**4:45**	**4:54**	**5:02**	**5:08**	**5:21**	**5:26**
4:45	**4:55**	**5:04**	**5:12**	**5:18**	**5:31**	**5:36**
4:55	**5:05**	**5:14**	**5:22**	**5:28**	**5:41**	**5:46**
5:05	**5:15**	**5:24**	**5:32**	**5:38**	**5:51**	**5:56**
5:15	**5:25**	**5:34**	**5:42**	**5:48**	**6:01**	**6:06**
5:25	**5:35**	**5:44**	**5:52**	**5:58**	**6:11**	**6:16**
5:35	**5:45**	**5:54**	**6:02**	**6:08**	**6:21**	**6:26**
5:45	**5:55**	**6:04**	**6:12**	**6:18**	**6:31**	**6:36**
5:55	**6:05**	**6:14**	**6:22**	**6:28**	**6:41**	**6:46**
6:06	**6:15**	**6:24**	**6:32**	**6:38**	**6:50**	**6:55**
6:18	**6:27**	**6:36**	**6:44**	**6:50**	**7:02**	**7:07**
6:32	**6:41**	**6:50**	**6:58**	**7:04**	**7:16**	**7:21**
6:47	**6:56**	**7:05**	**7:13**	**7:19**	**7:31**	**7:36**
7:02	**7:11**	**7:20**	**7:28**	**7:34**	**7:46**	**7:51**
7:17	**7:26**	**7:35**	**7:43**	**7:49**	**8:01**	**8:06**
7:32	**7:41**	**7:50**	**7:58**	**8:04**	**8:16**	**8:21**
7:47	**7:56**	**8:04**	**8:11**	**8:17**	**8:28**	**8:33**
8:02	**8:11**	**8:19**	**8:26**	**8:32**	**8:43**	**8:48**
8:17	**8:26**	**8:34**	**8:41**	**8:47**	**8:58**	**9:03**
8:32	**8:41**	**8:49**	**8:56**	**9:02**	**9:13**	**9:18**
8:48	**8:56**	**9:04**	**9:11**	**9:16**	**9:26**	**9:30**
9:02	**9:10**	**9:18**	**9:25**	**9:30**	**9:40**	**9:44**
9:32	**9:40**	**9:48**	**9:55**	**10:00**	**10:10**	**10:14**
10:02	**10:10**	**10:18**	**10:24**	**10:29**	**10:38**	**10:42**
10:32	**10:40**	**10:48**	**10:54**	**10:59**	**11:08**	**11:12**
11:02	**11:10**	**11:18**	**11:24**	**11:29**	**11:38**	**11:42**
11:32	**11:40**	**11:48**	**11:54**	**11:59**	12:08a	12:12a
12:02a	12:10a	12:18a	12:24a	12:29a	12:38	12:42
12:32	12:40	12:48	12:54	12:59	1:08	1:12
1:02	1:10	1:18	1:24	1:29	1:38	1:42

A Saturday or Sunday schedule will be operated on the following holidays and observed holidays
Se operará con horario de sábado o domingo durante los siguientes días festivos y feriados observados >>> New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, Christmas



Route 215 – Saturday and Sunday / *sábado y domingo*

SDSU ➡ City Heights ➡ Downtown

Ⓐ SDSU Transit Center **DEPART**	Ⓑ El Cajon Bl. & College Av.	Ⓒ El Cajon Bl. & I-15	Ⓓ El Cajon Bl. & 30th St.	Ⓔ Park Bl. & University Av.	Ⓕ City College Transit Center (Park Bl.)	Ⓖ America Plaza Trolley Station **ARRIVE**
4:50a	4:53a	5:01a	5:05a	5:10a	5:17a	5:24a
5:20	5:23	5:31	5:35	5:40	5:47	5:54
5:50	5:53	6:02	6:06	6:12	6:20	6:27
6:05	6:08	6:18	6:23	6:29	6:37	6:44
6:20	6:23	6:33	6:38	6:44	6:52	6:59
6:35	6:38	6:48	6:53	7:00	7:08	7:16
6:51	6:54	7:04	7:09	7:16	7:24	7:32
7:06	7:09	7:19	7:24	7:31	7:39	7:47
7:21	7:24	7:34	7:39	7:46	7:54	8:02
7:36	7:39	7:50	7:55	8:03	8:12	8:20
7:50	7:53	8:04	8:09	8:17	8:26	8:34
8:05	8:08	8:19	8:24	8:32	8:41	8:49
8:20	8:23	8:34	8:39	8:47	8:56	9:04
8:35	8:38	8:50	8:56	9:04	9:14	9:22
8:50	8:53	9:05	9:11	9:19	9:29	9:37
9:05	9:08	9:20	9:26	9:34	9:44	9:52
9:20	9:23	9:35	9:41	9:49	9:59	10:07
9:35	9:38	9:50	9:56	10:04	10:14	10:22
9:50	9:53	10:05	10:11	10:19	10:29	10:37
10:05	10:08	10:20	10:26	10:34	10:44	10:52
10:20	10:23	10:35	10:41	10:49	10:59	11:07
10:35	10:38	10:50	10:56	11:04	11:14	11:22
10:50	10:53	11:05	11:11	11:19	11:29	11:37
11:05	11:09	11:21	11:27	11:36	11:47	11:55
11:20	11:24	11:36	11:42	11:51	**12:02p**	**12:10p**
11:35	11:39	11:51	11:57	**12:06p**	**12:17**	**12:25**
11:50	11:54	**12:06p**	**12:12p**	**12:21**	**12:32**	**12:40**
12:05p	**12:09p**	**12:21**	**12:27**	**12:36**	**12:47**	**12:55**
12:20	**12:24**	**12:36**	**12:42**	**12:51**	**1:02**	**1:10**
12:35	**12:39**	**12:51**	**12:57**	**1:06**	**1:17**	**1:25**
12:50	**12:54**	**1:06**	**1:12**	**1:21**	**1:32**	**1:40**
1:05	**1:09**	**1:21**	**1:27**	**1:36**	**1:47**	**1:55**
1:20	**1:24**	**1:36**	**1:42**	**1:51**	**2:02**	**2:10**
1:35	**1:39**	**1:51**	**1:57**	**2:06**	**2:17**	**2:25**
1:50	**1:54**	**2:06**	**2:12**	**2:21**	**2:32**	**2:40**
2:05	**2:09**	**2:21**	**2:27**	**2:36**	**2:47**	**2:55**
2:20	**2:24**	**2:36**	**2:42**	**2:51**	**3:02**	**3:10**
2:35	**2:39**	**2:51**	**2:57**	**3:06**	**3:17**	**3:25**
2:50	**2:54**	**3:06**	**3:12**	**3:21**	**3:32**	**3:40**
3:05	**3:09**	**3:21**	**3:27**	**3:36**	**3:47**	**3:55**
3:20	**3:24**	**3:36**	**3:42**	**3:51**	**4:02**	**4:10**
3:35	**3:39**	**3:51**	**3:57**	**4:06**	**4:17**	**4:25**
3:50	**3:54**	**4:06**	**4:12**	**4:21**	**4:32**	**4:40**
4:05	**4:09**	**4:21**	**4:27**	**4:36**	**4:47**	**4:55**
4:20	**4:24**	**4:36**	**4:42**	**4:51**	**5:02**	**5:10**
4:35	**4:39**	**4:51**	**4:57**	**5:06**	**5:17**	**5:25**
4:50	**4:54**	**5:06**	**5:12**	**5:21**	**5:32**	**5:40**
5:05	**5:09**	**5:21**	**5:27**	**5:36**	**5:47**	**5:55**
5:20	**5:24**	**5:36**	**5:42**	**5:51**	**6:02**	**6:10**
5:35	**5:39**	**5:50**	**5:56**	**6:05**	**6:15**	**6:23**
5:50	**5:54**	**6:05**	**6:11**	**6:20**	**6:30**	**6:38**
6:05	**6:09**	**6:20**	**6:26**	**6:35**	**6:45**	**6:53**
6:20	**6:23**	**6:34**	**6:39**	**6:47**	**6:57**	**7:05**
6:35	**6:38**	**6:49**	**6:54**	**7:02**	**7:12**	**7:20**
6:50	**6:53**	**7:04**	**7:09**	**7:17**	**7:27**	**7:35**
7:05	**7:08**	**7:19**	**7:24**	**7:32**	**7:42**	**7:50**
7:20	**7:23**	**7:34**	**7:39**	**7:47**	**7:57**	**8:05**
7:35	**7:38**	**7:48**	**7:53**	**8:01**	**8:10**	**8:17**
7:57	**8:00**	**8:10**	**8:15**	**8:23**	**8:32**	**8:39**
8:26	**8:29**	**8:39**	**8:44**	**8:52**	**9:01**	**9:08**
8:56	**8:59**	**9:08**	**9:13**	**9:20**	**9:28**	**9:35**
9:26	**9:29**	**9:38**	**9:43**	**9:50**	**9:58**	**10:05**
9:51	**9:54**	**10:03**	**10:08**	**10:15**	**10:23**	**10:30**
10:21	**10:24**	**10:33**	**10:38**	**10:45**	**10:53**	**11:00**
10:51	**10:54**	**11:03**	**11:07**	**11:14**	**11:21**	**11:28**
11:21	**11:24**	**11:33**	**11:37**	**11:44**	**11:51**	**11:58**
11:51	**11:54**	12:03a	12:07a	12:14a	12:21a	12:28a
12:21a	12:24a	12:33	12:37	12:44	12:51	12:58

Downtown ➡ City Heights ➡ SDSU

Ⓖ Santa Fe Depot Transit Center **DEPART**	Ⓕ City College Transit Center (11th Av.)	Ⓔ Park Bl. & University Av.	Ⓓ El Cajon Bl. & 30th St.	Ⓒ El Cajon Bl. & I-15	Ⓑ El Cajon Bl. & College Av.	Ⓐ SDSU Transit Center **ARRIVE**
5:02a	5:10a	5:18a	5:23a	5:28a	5:37a	5:41a
5:34	5:42	5:50	5:55	6:00	6:09	6:13
6:04	6:12	6:20	6:26	6:31	6:41	6:45
6:33	6:41	6:49	6:55	7:00	7:10	7:14
6:48	6:56	7:04	7:10	7:15	7:25	7:29
7:03	7:11	7:19	7:25	7:31	7:41	7:46
7:18	7:26	7:34	7:40	7:46	7:56	8:01
7:33	7:41	7:49	7:55	8:01	8:11	8:16
7:48	7:56	8:04	8:10	8:16	8:26	8:31
8:03	8:11	8:19	8:25	8:31	8:41	8:46
8:18	8:26	8:34	8:40	8:46	8:56	9:01
8:33	8:41	8:49	8:55	9:01	9:11	9:16
8:47	8:56	9:05	9:12	9:18	9:29	9:34
9:02	9:11	9:20	9:27	9:33	9:44	9:49
9:17	9:26	9:35	9:42	9:48	9:59	10:04
9:32	9:41	9:50	9:57	10:03	10:14	10:19
9:47	9:56	10:05	10:12	10:18	10:29	10:34
10:02	10:11	10:20	10:27	10:33	10:44	10:49
10:17	10:26	10:35	10:43	10:49	11:01	11:06
10:32	10:41	10:50	10:58	11:04	11:16	11:21
10:47	10:56	11:05	11:13	11:19	11:31	11:36
11:02	11:11	11:20	11:28	11:34	11:46	11:51
11:17	11:26	11:35	11:43	11:49	**12:01p**	**12:06p**
11:32	11:41	11:50	11:58	**12:04p**	**12:16**	**12:21**
11:47	11:56	**12:05p**	**12:13p**	**12:19**	**12:31**	**12:36**
12:02p	**12:11p**	**12:20**	**12:28**	**12:34**	**12:46**	**12:51**
12:17	**12:26**	**12:35**	**12:43**	**12:49**	**1:01**	**1:06**
12:32	**12:41**	**12:50**	**12:58**	**1:04**	**1:16**	**1:21**
12:47	**12:56**	**1:05**	**1:13**	**1:19**	**1:31**	**1:36**
1:02	**1:11**	**1:20**	**1:28**	**1:34**	**1:46**	**1:51**
1:17	**1:26**	**1:35**	**1:43**	**1:49**	**2:01**	**2:06**
1:32	**1:41**	**1:50**	**1:58**	**2:04**	**2:16**	**2:21**
1:47	**1:56**	**2:05**	**2:13**	**2:19**	**2:31**	**2:36**
2:02	**2:11**	**2:20**	**2:28**	**2:34**	**2:46**	**2:51**
2:17	**2:26**	**2:35**	**2:43**	**2:49**	**3:01**	**3:06**
2:32	**2:41**	**2:50**	**2:58**	**3:04**	**3:16**	**3:21**
2:47	**2:56**	**3:05**	**3:13**	**3:19**	**3:31**	**3:36**
3:02	**3:11**	**3:20**	**3:28**	**3:34**	**3:46**	**3:51**
3:17	**3:26**	**3:35**	**3:43**	**3:49**	**4:01**	**4:06**
3:32	**3:41**	**3:50**	**3:58**	**4:04**	**4:16**	**4:21**
3:47	**3:56**	**4:05**	**4:13**	**4:19**	**4:31**	**4:36**
4:02	**4:11**	**4:20**	**4:28**	**4:34**	**4:46**	**4:51**
4:17	**4:26**	**4:35**	**4:43**	**4:49**	**5:01**	**5:06**
4:32	**4:41**	**4:50**	**4:58**	**5:04**	**5:16**	**5:21**
4:47	**4:56**	**5:05**	**5:13**	**5:19**	**5:31**	**5:36**
5:02	**5:11**	**5:20**	**5:28**	**5:34**	**5:46**	**5:51**
5:17	**5:26**	**5:35**	**5:43**	**5:49**	**6:01**	**6:06**
5:32	**5:41**	**5:50**	**5:58**	**6:04**	**6:16**	**6:21**
5:47	**5:56**	**6:05**	**6:13**	**6:19**	**6:31**	**6:36**
6:02	**6:11**	**6:20**	**6:28**	**6:34**	**6:46**	**6:51**
6:17	**6:26**	**6:35**	**6:43**	**6:49**	**7:01**	**7:06**
6:33	**6:41**	**6:50**	**6:57**	**7:03**	**7:15**	**7:20**
6:48	**6:56**	**7:05**	**7:12**	**7:18**	**7:30**	**7:35**
7:03	**7:11**	**7:20**	**7:27**	**7:33**	**7:45**	**7:50**
7:18	**7:26**	**7:35**	**7:42**	**7:48**	**8:00**	**8:05**
7:33	**7:41**	**7:49**	**7:56**	**8:02**	**8:13**	**8:18**
7:48	**7:56**	**8:04**	**8:11**	**8:17**	**8:28**	**8:33**
8:03	**8:11**	**8:19**	**8:26**	**8:32**	**8:43**	**8:48**
8:32	**8:40**	**8:48**	**8:55**	**9:01**	**9:12**	**9:17**
9:02	**9:10**	**9:18**	**9:25**	**9:30**	**9:40**	**9:44**
9:32	**9:40**	**9:48**	**9:55**	**10:00**	**10:10**	**10:14**
10:02	**10:10**	**10:18**	**10:24**	**10:29**	**10:38**	**10:42**
10:32	**10:40**	**10:48**	**10:54**	**10:59**	**11:08**	**11:12**
11:02	**11:10**	**11:18**	**11:24**	**11:29**	**11:38**	**11:42**
11:32	**11:40**	**11:48**	**11:54**	**11:59**	12:08a	12:12a
12:02a	12:10a	12:18a	12:24a	12:29a	12:38	12:42
1:02	1:10	1:18	1:24	1:29	1:38	1:42

CASH FARES / *Tarifas en efectivo*

Exact fare, please / *Favor de pagar la cantidad exacta*	
Day Pass (Regional) / *Pase diario (Regional)* Compass Card required ($2) / *Se requiere un Compass Card ($2)*	$5.00
One-Way Fare / *Tarifa de una direccíon*	$2.25
Senior (60+)/Disabled/Medicare *Mayores de 60 años/Discapacitados/Medicare*	$1.10*
Children 5 & under / *Niños de 5 años o menos* Up to two children ride free per paying adult / *Máximo dos niños viajan gratis por cada adulto*	FREE / *GRATIS*

MONTHLY PASSES / *Pases mensual*

Adult / *Adulto*	$72.00
Senior (60+)/Disabled/Medicare *Mayores de 60 años/Discapacitados/Medicare*	$18.00*
Youths (18 and under) *Jóvenes (18 años o menos)*	$36.00*

*I.D. required for discount fare or pass.
**Se requiere identificación para tarifas o pases de descuento.*

DAY PASS (REGIONAL) / *Pase diario (Regional)*

All passes are sold on Compass Card, which can be reloaded and reused for up to five years. Compass Cards are available for $2 at select outlets. A $5 Day Pass requires a Compass Card. A paper Day Pass can be purchased on board buses for an additional $2 fee.

Todos los pases se venden en el Compass Card, el cual puede ser recargado y reutilizado por hasta cinco años. Compass Cards están disponibles por $2 en selectas sucursales. Un pase de un día por $5 requiere un Compass Card. Un pase de un día de papel se puede obtener a bordo los autobuses por un costo adicional de $2.

DIRECTORY / *Directorio*

Regional Transit Information *Información de transporte público regional*	511 or/ó (619) 233-3004
TTY/TDD (teletype for hearing impaired) *Teletipo para sordos*	(619) 234-5005 or/ó (888) 722-4889
InfoExpress (24-hour info via Touch-Tone phone) *Información las 24 horas (via teléfono de teclas)*	(619) 685-4900
Customer Service / Suggestions *Servicio al cliente / Sugerencias*	(619) 557-4555
SafeWatch	(619) 557-4500
Lost & Found *Objetos extraviados*	(619) 557-4555
Transit Store	(619) 234-1060 12th & Imperial Transit Center M–F 8am–5pm
For MTS online trip planning *Planificación de viajes por Internet*	sdmts.com

For more information on riding MTS services, pick up a Rider's Guide on a bus or at the Transit Store, or visit **sdmts.com.**

Para obtener más información sobre el uso de los servicios de MTS, recoja un 'Rider's Guide' en un autobús o en la Transit Store, o visita a ***sdmts.com.***

Thank you for riding MTS! ***¡Gracias por viajar con MTS!***

Effective SEPTEMBER 3, 2017

955

8th St. Transit Center – SDSU

via 43rd St. / Euclid Av. Transit Center/ 54th St.

DESTINATIONS

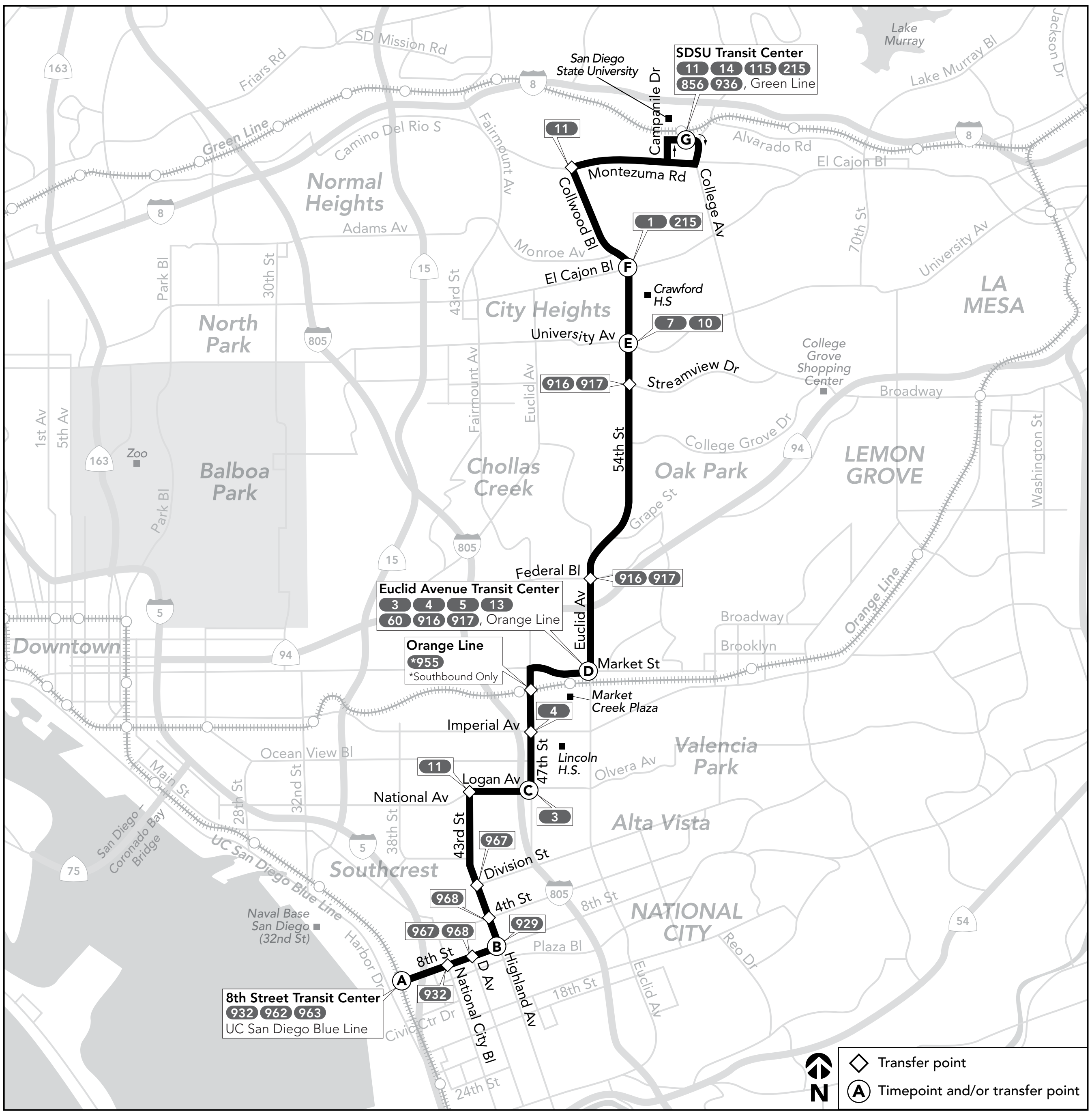
- 54th Street
- Crawford High School
- Euclid Av. Transit Center
- Lincoln High School
- Market Creek Plaza
- San Diego State University
- South 43rd Street

TROLLEY CONNECTIONS
8th St.
Euclid Av.
SDSU

Metropolitan Transit System

09/17

Alternative formats available upon request. Please call: (619) 557-4555 / *Formato alternativo disponible al preguntar. Favor de llamar: (619) 557-4555*



EASY FARES!

COMPASS CLOUD

Free mobile ticketing app.

Day Passes; 30-day Passes
Buy for your entire group on one phone.
Your phone is your ticket.

COMPASS CASH

Load money on your Compass Card

Great for One-Ways.
Follow prompts on machine to load value.
Just tap and ride!

Compass Service Center
(619) 595-5636
sdmts.com

The schedules and other information shown in this timetable are subject to change. MTS does not assume responsibility for errors in timetables nor for any inconvenience caused by delayed buses.

Los horarios e información que se indican en este inerario están sujetos a cambios. MTS no asume responsabilidad por errores en los itinerarios, ni por ningún perjuicio que se origine por los autobuses demorados.

Route 955 – Sunday / *domingo*

National City ➡ Oak Park ➡ SDSU

Ⓐ 8th St. Transit Center **DEPART**	Ⓑ Highland Av. & 8th St.	Ⓒ 47th St. & Logan Av.	Ⓓ Euclid Av. Transit Center	Ⓔ 54th St. & University Av.	Ⓕ 54th St. & El Cajon Bl.	Ⓖ SDSU Transit Center **ARRIVE**
—	—	—	6:05a	6:15a	6:18a	6:25a
6:35a	6:40a	6:49a	6:58	7:08	7:11	7:18
7:32	7:38	7:48	7:57	8:08	8:11	8:18
8:30	8:36	8:46	8:55	9:07	9:11	9:18
9:30	9:36	9:46	9:55	10:07	10:11	10:18
10:30	10:36	10:46	10:55	11:07	11:11	11:18
11:00	11:06	11:16	11:25	11:37	11:41	11:48
11:27	11:34	11:45	11:55	**12:07p**	**12:11p**	**12:19p**
11:57	**12:04p**	**12:15p**	**12:25p**	**12:37**	**12:41**	**12:49**
12:27p	**12:34**	**12:45**	**12:55**	**1:07**	**1:11**	**1:19**
12:57	**1:04**	**1:15**	**1:25**	**1:37**	**1:41**	**1:49**
1:27	**1:34**	**1:45**	**1:55**	**2:07**	**2:11**	**2:19**
1:57	**2:04**	**2:15**	**2:25**	**2:37**	**2:41**	**2:49**
2:27	**2:34**	**2:45**	**2:55**	**3:07**	**3:11**	**3:19**
2:57	**3:04**	**3:15**	**3:25**	**3:37**	**3:41**	**3:49**
3:27	**3:34**	**3:45**	**3:55**	**4:07**	**4:11**	**4:19**
3:57	**4:04**	**4:15**	**4:25**	**4:37**	**4:41**	**4:49**
4:27	**4:34**	**4:45**	**4:55**	**5:07**	**5:11**	**5:19**
4:57	**5:04**	**5:15**	**5:25**	**5:37**	**5:41**	**5:49**
5:27	**5:34**	**5:45**	**5:55**	**6:07**	**6:11**	**6:19**
6:13	**6:20**	**6:31**	**6:49 T**	**7:01**	**7:04**	**7:12**
7:16	**7:22**	**7:32**	**7:49 T**	**8:00**	**8:03**	**8:10**
8:16	**8:22**	**8:32**	**8:49 T**	**9:00**	**9:03**	**9:10**

SDSU ➡ Oak Park ➡ National City

Ⓖ SDSU Transit Center **DEPART**	Ⓕ 54th St. & El Cajon Bl.	Ⓔ 54th St. & University Av.	Ⓓ Euclid Av. Transit Center	Ⓒ Logan Av. & 47th St.	Ⓑ 8th St. & Highland Av.	Ⓐ 8th St. Transit Center **ARRIVE**
—	—	—	5:56a	6:02a	6:11a	6:16a
6:32a	6:39a	6:42a	6:54	7:00	7:09	7:14
7:30	7:38	7:41	7:54	8:00	8:10	8:15
8:29	8:37	8:40	8:54	9:01	9:11	9:16
9:29	9:37	9:40	9:54	10:01	10:11	10:16
9:58	10:07	10:10	10:24	10:32	10:43	10:48
10:28	10:37	10:40	10:54	11:02	11:13	11:18
10:58	11:07	11:10	11:24	11:32	11:43	11:48
11:28	11:37	11:40	11:54	**12:02p**	**12:13p**	**12:18p**
11:58	**12:07p**	**12:10p**	**12:24p**	**12:32**	**12:43**	**12:48**
12:28p	**12:37**	**12:40**	**12:54**	**1:02**	**1:13**	**1:18**
12:57	**1:06**	**1:10**	**1:24**	**1:32**	**1:43**	**1:49**
1:27	**1:36**	**1:40**	**1:54**	**2:02**	**2:13**	**2:19**
1:57	**2:06**	**2:10**	**2:24**	**2:32**	**2:43**	**2:49**
2:27	**2:36**	**2:40**	**2:54**	**3:02**	**3:13**	**3:19**
2:57	**3:06**	**3:10**	**3:24**	**3:32**	**3:43**	**3:49**
3:27	**3:36**	**3:40**	**3:54**	**4:02**	**4:13**	**4:19**
3:57	**4:06**	**4:10**	**4:24**	**4:32**	**4:43**	**4:49**
4:27	**4:36**	**4:40**	**4:54**	**5:02**	**5:13**	**5:19**
4:57	**5:06**	**5:10**	**5:24**	**5:32**	**5:43**	**5:49**
5:27	**5:36**	**5:40**	**5:54**	**6:02**	**6:13**	**6:19**
6:02	**6:10**	**6:13**	**6:34 T**	**6:42**	**6:53**	**6:59**
6:47	**6:55**	**6:58**	**7:19 T**	**7:26**	**7:36**	**7:41**
7:48	**7:56**	**7:59**	**8:19 T**	**8:26**	**8:35**	**8:40**
8:48	**8:56**	**8:59**	**9:19 T**	**9:25**	**9:33**	**9:38**

T = Trip arrives 8 minutes earlier / *Viaje llega 8 minutos antes*

A Saturday or Sunday schedule will be operated on the following holidays and observed holidays >>> New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, Christmas

Se operará con horario de sábado o domingo durante los siguientes días festivos y feriados observados

Route 955 – Monday through Friday / *lunes a viernes*

National City ➡ Oak Park ➡ SDSU

Ⓐ 8th St. Transit Center DEPART	Ⓑ Highland Av. & 8th St.	Ⓒ 47th St. & Logan Av.	Ⓓ Euclid Av. Transit Center	Ⓔ 54th St. & University Av.	Ⓕ 54th St. & El Cajon Bl.	Ⓖ SDSU Transit Center ARRIVE
4:45a	4:50a	4:59a	5:08a	5:18a	5:21a	5:28a
5:00	5:05	5:14	5:23	5:33	5:36	5:43
5:15	5:20	5:29	5:38	5:48	5:51	5:58
5:30	5:35	5:44	5:53	6:03	6:06	6:13
5:42	5:48	5:58	6:08	6:18	6:21	6:28
6:00	6:06	6:16	6:26	6:37	6:40	6:48
6:15	6:21	6:31	6:41	6:53	6:57	7:06
6:30	6:36	6:46	6:56	7:08	7:12	7:21
6:42	6:49	7:00	7:11	7:23	7:27	7:37
6:57	7:04	7:15	7:26	7:38	7:42	7:52
7:12	7:19	7:30	7:41	7:53	7:57	8:07
7:27	7:34	7:45	7:56	8:08	8:12	8:22
7:42	7:49	8:00	8:11	8:23	8:27	8:37
7:57	8:04	8:15	8:26	8:38	8:42	8:52
8:12	8:19	8:30	8:41	8:53	8:57	9:07
8:27	8:34	8:45	8:56	9:08	9:12	9:22
8:43	8:50	9:00	9:11	9:23	9:27	9:36
8:58	9:05	9:15	9:26	9:38	9:42	9:51
9:13	9:20	9:30	9:41	9:53	9:57	10:06
9:28	9:35	9:45	9:56	10:08	10:12	10:21
9:43	9:50	10:00	10:11	10:23	10:27	10:36
9:58	10:05	10:15	10:26	10:38	10:42	10:51
10:13	10:20	10:30	10:41	10:53	10:57	11:06
10:28	10:35	10:45	10:56	11:08	11:12	11:21
10:43	10:50	11:00	11:11	11:23	11:27	11:36
10:58	11:05	11:15	11:26	11:38	11:42	11:51
11:13	11:20	11:30	11:41	11:53	11:57	12:06p
11:28	11:35	11:45	11:56	12:08p	12:12p	12:21
11:43	11:50	12:00p	12:11p	12:23	12:27	12:36
11:58	12:05p	12:15	12:26	12:38	12:42	12:51
12:12p	12:19	12:30	12:41	12:53	12:57	1:06
12:27	12:34	12:45	12:56	1:08	1:12	1:21
12:42	12:49	1:00	1:11	1:23	1:27	1:36
12:57	1:04	1:15	1:26	1:38	1:42	1:51
1:11	1:18	1:29	1:40	1:52	1:56	2:05
1:26	1:33	1:44	1:55	2:07	2:11	2:20
1:41	1:48	1:59	2:10	2:22	2:26	2:35
1:56	2:03	2:14	2:25	2:37	2:41	2:50
2:11	2:18	2:29	2:40	2:52	2:56	3:05
2:26	2:33	2:44	2:55	3:07	3:11	3:20
2:40	2:48	2:59	3:10	3:23	3:27	3:36
2:56	3:04	3:15	3:26	3:39	3:43	3:52
3:11	3:19	3:30	3:41	3:54	3:58	4:07
3:26	3:34	3:45	3:56	4:09	4:13	4:22
3:41	3:49	4:00	4:11	4:24	4:28	4:37
3:56	4:04	4:15	4:26	4:39	4:43	4:52
4:11	4:19	4:30	4:41	4:54	4:58	5:07
4:26	4:34	4:45	4:56	5:09	5:13	5:22
4:41	4:49	5:00	5:11	5:24	5:28	5:37
4:56	5:04	5:15	5:26	5:39	5:43	5:52
5:11	5:19	5:30	5:41	5:54	5:58	6:07
5:26	5:34	5:45	5:56	6:09	6:13	6:22
5:49	5:57	6:08	6:19	6:31	6:35	6:43
6:21	6:28	6:39	6:49	7:00	7:04	7:11
6:51	6:58	7:09	7:19	7:30	7:34	7:41
7:24	7:30	7:40	7:50	8:01	8:04	8:11
7:54	8:00	8:10	8:20	8:31	8:34	8:41
8:24	8:30	8:40	8:50	9:01	9:04	9:11
8:57	9:02	9:11	9:20	9:30	9:33	9:40
9:27	9:32	9:41	9:50	10:00	10:03	10:10
9:57	10:02	10:11	10:20	10:30	10:33	10:40

SDSU ➡ Oak Park ➡ National City

Ⓖ SDSU Transit Center DEPART	Ⓕ 54th St. & El Cajon Bl.	Ⓔ 54th St. & University Av.	Ⓓ Euclid Av. Transit Center	Ⓒ Logan Av. & 47th St.	Ⓑ 8th St. & Highland Av.	Ⓐ 8th St. Transit Center ARRIVE
4:58a	5:05a	5:08a	5:21a	5:28a	5:37a	5:42a
5:28	5:35	5:38	5:51	5:58	6:07	6:12
5:43	5:50	5:53	6:06	6:13	6:22	6:27
5:58	6:05	6:08	6:21	6:28	6:38	6:44
6:12	6:20	6:23	6:36	6:44	6:54	7:00
6:27	6:35	6:38	6:51	6:59	7:09	7:15
6:42	6:50	6:53	7:06	7:15	7:25	7:31
6:52	7:01	7:05	7:19	7:28	7:38	7:44
7:07	7:16	7:20	7:34	7:43	7:53	7:59
7:22	7:31	7:35	7:49	7:58	8:09	8:15
7:37	7:46	7:50	8:04	8:13	8:24	8:30
7:52	8:01	8:05	8:19	8:28	8:39	8:45
8:07	8:16	8:20	8:34	8:43	8:54	9:00
8:22	8:31	8:35	8:49	8:58	9:09	9:15
8:37	8:46	8:50	9:04	9:13	9:24	9:30
8:52	9:01	9:05	9:19	9:28	9:39	9:45
9:08	9:17	9:20	9:34	9:42	9:53	9:58
9:23	9:32	9:35	9:49	9:57	10:08	10:13
9:38	9:47	9:50	10:04	10:12	10:23	10:28
9:53	10:02	10:05	10:19	10:27	10:38	10:43
10:08	10:17	10:20	10:34	10:42	10:53	10:58
10:23	10:32	10:35	10:49	10:57	11:08	11:13
10:38	10:47	10:50	11:04	11:12	11:23	11:28
10:53	11:02	11:05	11:19	11:27	11:38	11:43
11:08	11:17	11:20	11:34	11:42	11:53	11:58
11:23	11:32	11:35	11:49	11:57	12:08p	12:13p
11:38	11:47	11:50	12:04p	12:12p	12:23	12:28
11:53	12:02p	12:05p	12:19	12:27	12:38	12:43
12:08p	12:17	12:20	12:34	12:42	12:53	12:58
12:23	12:32	12:35	12:49	12:57	1:08	1:13
12:38	12:47	12:50	1:04	1:12	1:23	1:28
12:51	1:00	1:04	1:19	1:27	1:38	1:44
1:06	1:15	1:19	1:34	1:42	1:53	1:59
1:21	1:30	1:34	1:49	1:57	2:08	2:14
1:36	1:45	1:49	2:04	2:12	2:23	2:29
1:51	2:00	2:04	2:19	2:28	2:40	2:46
2:05	2:15	2:19	2:35	2:44	2:56	3:02
2:20	2:30	2:34	2:50	2:59	3:11	3:17
2:35	2:45	2:49	3:05	3:14	3:26	3:32
2:50	3:00	3:04	3:20	3:29	3:41	3:47
3:05	3:15	3:19	3:35	3:44	3:56	4:02
3:20	3:30	3:34	3:50	3:59	4:11	4:17
3:35	3:45	3:49	4:05	4:14	4:26	4:32
3:50	4:00	4:04	4:20	4:29	4:41	4:47
4:05	4:15	4:19	4:35	4:44	4:56	5:02
4:20	4:30	4:34	4:50	4:59	5:11	5:17
4:35	4:45	4:49	5:05	5:14	5:26	5:32
4:50	5:00	5:04	5:20	5:29	5:41	5:47
5:05	5:15	5:19	5:35	5:44	5:56	6:02
5:20	5:30	5:34	5:50	5:59	6:11	6:17
5:37	5:46	5:50	6:04	6:13	6:25	6:31
5:52	6:01	6:05	6:19	6:27	6:38	6:44
6:07	6:16	6:20	6:34	6:42	6:53	6:59
6:24	6:33	6:36	6:49	6:57	7:08	7:14
6:39	6:48	6:51	7:04	7:12	7:22	7:27
6:54	7:03	7:06	7:19	7:27	7:37	7:42
7:18	7:26	7:29	7:49 T	7:56	8:05	8:10
7:48	7:56	7:59	8:19 T	8:26	8:35	8:40
8:18	8:26	8:29	8:49 T	8:56	9:05	9:10
8:48	8:56	8:59	9:19 T	9:26	9:35	9:40
9:18	9:26	9:29	9:49 T	9:56	10:05	10:10
9:48	9:56	9:59	10:19 T	10:26	10:35	10:40
10:18	10:26	10:29	10:49 T	10:55	11:03	11:08
10:48	10:56	10:59	11:19 T	11:25	11:33	11:38

Route 955 – Saturday / *sábado*

National City ➡ Oak Park ➡ SDSU

Ⓐ 8th St. Transit Center DEPART	Ⓑ Highland Av. & 8th St.	Ⓒ 47th St. & Logan Av.	Ⓓ Euclid Av. Transit Center	Ⓔ 54th St. & University Av.	Ⓕ 54th St. & El Cajon Bl.	Ⓖ SDSU Transit Center ARRIVE
5:42a	5:47a	5:56a	6:05a	6:15a	6:18a	6:25a
6:12	6:17	6:26	6:35	6:45	6:48	6:55
6:42	6:47	6:56	7:05	7:15	7:18	7:25
7:12	7:18	7:28	7:37	7:48	7:51	7:58
7:42	7:48	7:58	8:07	8:18	8:21	8:28
8:05	8:11	8:21	8:30	8:41	8:44	8:51
8:25	8:31	8:41	8:50	9:01	9:04	9:11
8:45	8:51	9:01	9:10	9:22	9:26	9:33
9:05	9:11	9:21	9:30	9:42	9:46	9:53
9:25	9:31	9:41	9:50	10:02	10:06	10:13
9:45	9:51	10:01	10:10	10:22	10:26	10:33
10:05	10:11	10:21	10:30	10:42	10:46	10:53
10:25	10:31	10:41	10:50	11:02	11:06	11:13
10:45	10:51	11:01	11:10	11:22	11:26	11:33
11:02	11:09	11:20	11:30	11:41	11:45	11:52
11:22	11:29	11:40	11:50	12:02p	12:06p	12:14p
11:42	11:49	12:00p	12:10p	12:22	12:26	12:34
12:02p	12:09p	12:20	12:30	12:42	12:46	12:54
12:22	12:29	12:40	12:50	1:02	1:06	1:14
12:42	12:49	1:00	1:10	1:22	1:26	1:34
1:02	1:09	1:20	1:30	1:42	1:46	1:54
1:22	1:29	1:40	1:50	2:02	2:06	2:14
1:42	1:49	2:00	2:10	2:22	2:26	2:34
2:02	2:09	2:20	2:30	2:42	2:46	2:54
2:22	2:29	2:40	2:50	3:02	3:06	3:14
2:42	2:49	3:00	3:10	3:22	3:26	3:34
3:02	3:09	3:20	3:30	3:42	3:46	3:54
3:22	3:29	3:40	3:50	4:02	4:06	4:14
3:42	3:49	4:00	4:10	4:22	4:26	4:34
4:02	4:09	4:20	4:30	4:42	4:46	4:54
4:22	4:29	4:40	4:50	5:02	5:06	5:14
4:42	4:49	5:00	5:10	5:22	5:26	5:34
5:02	5:09	5:20	5:30	5:42	5:46	5:54
5:22	5:29	5:40	5:50	6:02	6:06	6:14
5:42	5:49	6:00	6:10	6:21	6:25	6:32
6:02	6:09	6:20	6:30	6:41	6:45	6:52
6:25	6:31	6:41	6:50	7:01	7:04	7:11
6:55	7:01	7:11	7:20	7:31	7:34	7:41
7:25	7:31	7:41	7:50	8:01	8:04	8:11
7:55	8:01	8:11	8:20	8:31	8:34	8:41
8:25	8:31	8:41	8:50	9:01	9:04	9:11
8:57	9:02	9:11	9:20	9:30	9:33	9:40
9:57	10:02	10:11	10:20	10:30	10:33	10:40

SDSU ➡ Oak Park ➡ National City

Ⓖ SDSU Transit Center DEPART	Ⓕ 54th St. & El Cajon Bl.	Ⓔ 54th St. & University Av.	Ⓓ Euclid Av. Transit Center	Ⓒ Logan Av. & 47th St.	Ⓑ 8th St. & Highland Av.	Ⓐ 8th St. Transit Center ARRIVE
5:34a	5:41a	5:44a	5:56a	6:02a	6:11a	6:16a
6:04	6:11	6:14	6:26	6:32	6:41	6:46
6:34	6:41	6:44	6:56	7:02	7:11	7:16
7:02	7:10	7:13	7:26	7:32	7:42	7:47
7:32	7:40	7:43	7:56	8:02	8:12	8:17
8:00	8:08	8:11	8:24	8:30	8:40	8:45
8:29	8:37	8:40	8:54	9:01	9:11	9:16
8:59	9:07	9:10	9:24	9:31	9:41	9:46
9:29	9:37	9:40	9:54	10:01	10:11	10:16
9:53	10:02	10:05	10:19	10:27	10:38	10:43
10:13	10:22	10:25	10:39	10:47	10:58	11:03
10:33	10:42	10:45	10:59	11:07	11:18	11:23
10:53	11:02	11:05	11:19	11:27	11:38	11:43
11:13	11:22	11:25	11:39	11:47	11:58	12:03p
11:33	11:42	11:45	11:59	12:07p	12:18p	12:23
11:53	12:02p	12:05p	12:19p	12:27	12:38	12:43
12:13p	12:22	12:25	12:39	12:47	12:58	1:03
12:33	12:42	12:45	12:59	1:07	1:18	1:23
12:52	1:01	1:05	1:19	1:27	1:38	1:44
1:12	1:21	1:25	1:39	1:47	1:58	2:04
1:32	1:41	1:45	1:59	2:07	2:18	2:24
1:52	2:01	2:05	2:19	2:27	2:38	2:44
2:12	2:21	2:25	2:39	2:47	2:58	3:04
2:32	2:41	2:45	2:59	3:07	3:18	3:24
2:52	3:01	3:05	3:19	3:27	3:38	3:44
3:12	3:21	3:25	3:39	3:47	3:58	4:04
3:32	3:41	3:45	3:59	4:07	4:18	4:24
3:52	4:01	4:05	4:19	4:27	4:38	4:44
4:12	4:21	4:25	4:39	4:47	4:58	5:04
4:32	4:41	4:45	4:59	5:07	5:18	5:24
4:52	5:01	5:05	5:19	5:27	5:38	5:44
5:12	5:21	5:25	5:39	5:47	5:58	6:04
5:32	5:41	5:45	5:59	6:07	6:18	6:24
5:52	6:01	6:05	6:19	6:27	6:38	6:44
6:17	6:25	6:28	6:49 T	6:56	7:06	7:11
6:47	6:55	6:58	7:19 T	7:26	7:36	7:41
7:18	7:26	7:29	7:49 T	7:56	8:05	8:10
7:48	7:56	7:59	8:19 T	8:26	8:35	8:40
8:18	8:26	8:29	8:49 T	8:55	9:03	9:08
8:48	8:56	8:59	9:19 T	9:25	9:33	9:38
9:18	9:26	9:29	9:49 T	9:55	10:03	10:08
9:48	9:56	9:59	10:19 T	10:25	10:33	10:38
10:48	10:56	10:59	11:19 T	11:25	11:33	11:38

T = Trip arrives 8 minutes earlier / *Viaje llega 8 minutos antes*

Appendix E

City of San Diego *Bicycle Master Plan* and Community Plan Excerpts

City of San Diego Bicycle Master Plan

San Diego, California

FINAL – Deceber 2013

PREPARED BY:
Alta Planning + Design
PREPARED FOR:
The City of San Diego

City of San Diego Bicycle Master Plan, December 2013

Existing Bicycle Routes

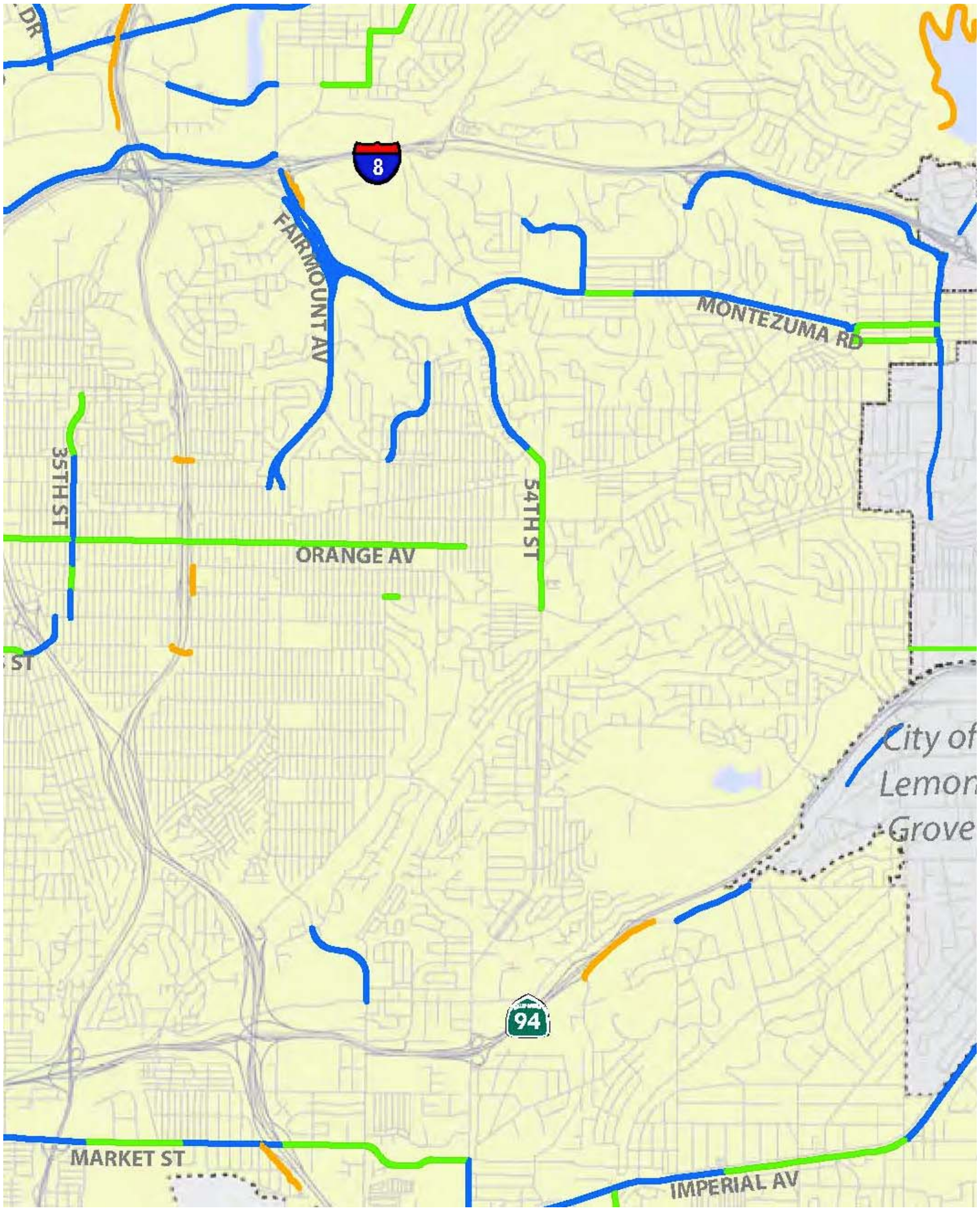
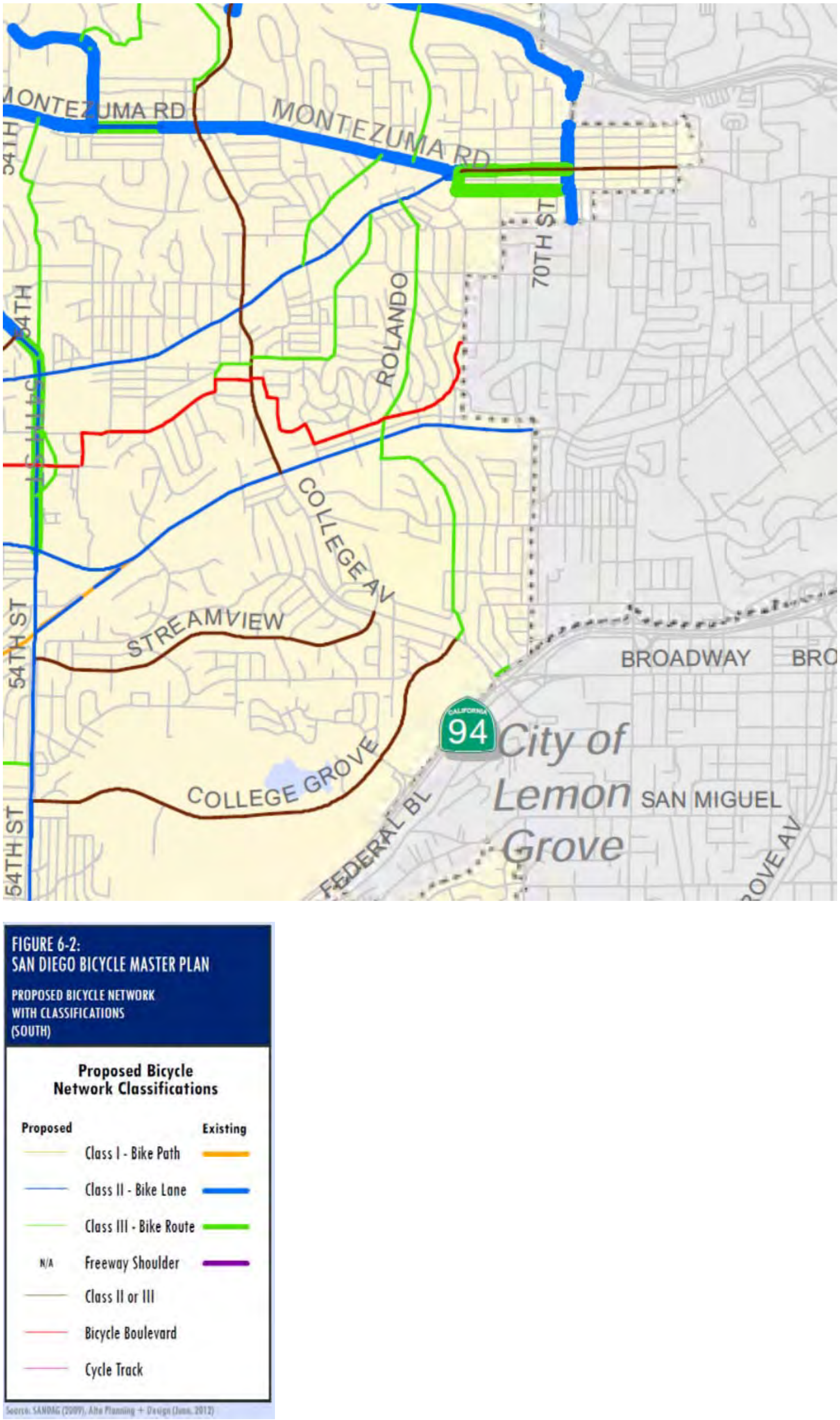


Figure 3-4:
San Diego Existing Bikeways (South)

City of San Diego Bicycle Master Plan, December 2013

Proposed Bicycle Routes



Mid-City Communities Plan

FINAL

AUGUST 4, 1998

- Provide direct pedestrian access from sidewalks to storefronts and residential units where feasible.
- Provide a pedestrian orientation in commercial areas with storefronts and display windows close to sidewalk.
- To the extent possible, encourage implementation of traffic calming programs to reduce vehicle speeds through residential neighborhoods.
- Systematically upgrade deteriorating sidewalks, curbs, and gutters.
- Historic scoring patterns and ID stamps should be retained or duplicated when sidewalks are replaced.

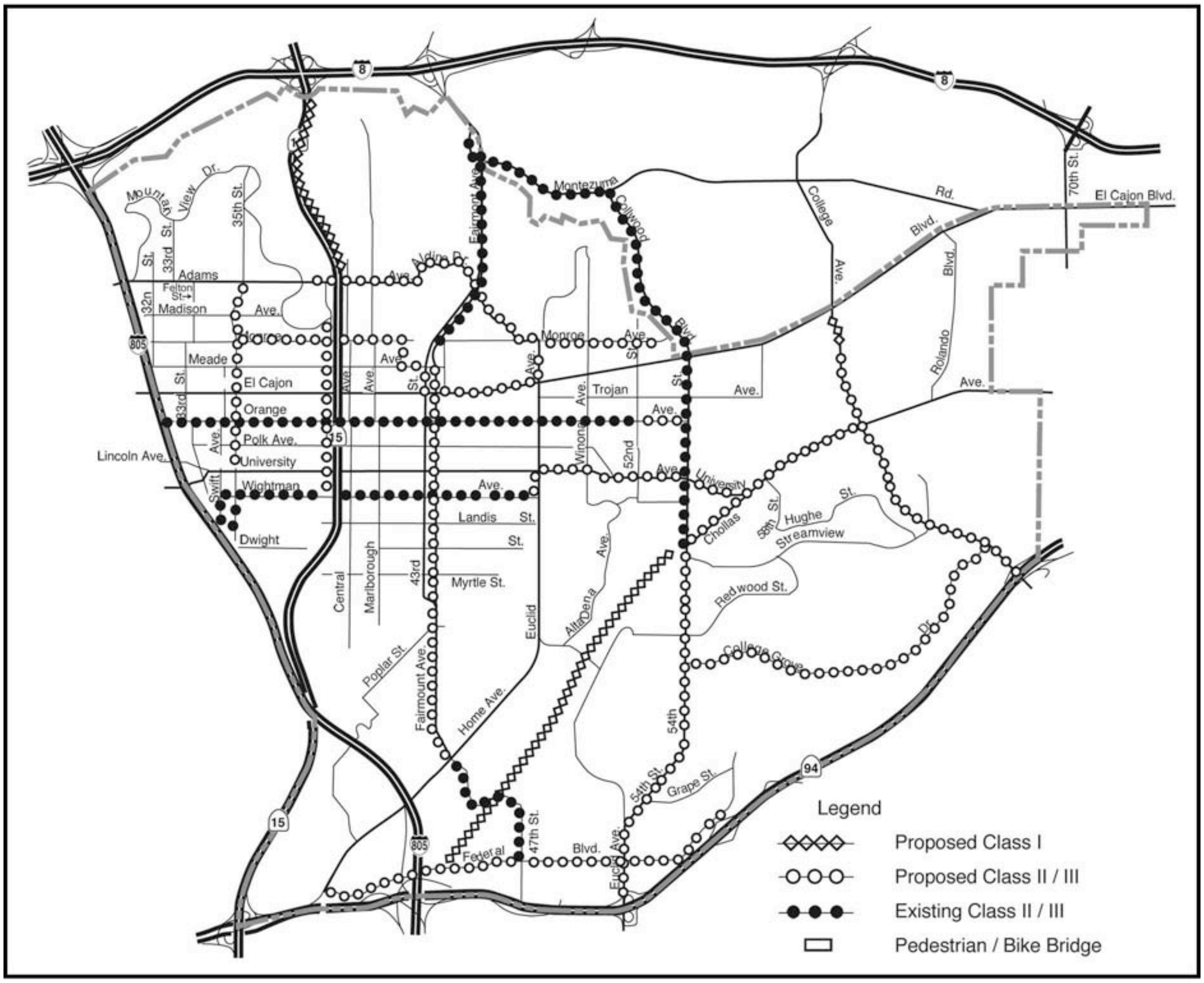
BICYCLE SYSTEM

The existing and proposed bicycle system within the Mid-City Community Plan area is shown in **Figure 29**.

The City has three classifications of bikeways.

The bikeway types and bicycle facilities classifications are shown in **Appendix B**. The pedestrian/bikeway bridge over SR-15 at Monroe Avenue should be a minimum of 12 feet wide.

Figure 29
Bikeways



Appendix F

Existing LOS Calculations

AM Existing
1: Aragon Dr & University Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱			✥	
Traffic Volume (veh/h)	1	492	31	31	609	34	70	97	73	7	20	7
Future Volume (veh/h)	1	492	31	31	609	34	70	97	73	7	20	7
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	0.98		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	1	607	38	37	734	41	77	107	80	8	24	8
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.81	0.81	0.81	0.83	0.83	0.83	0.91	0.91	0.91	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	2	1462	91	48	1561	87	596	369	276	142	405	125
Arrive On Green	0.00	0.43	0.43	0.03	0.46	0.46	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	1774	3376	211	1774	3402	190	1346	975	729	247	1070	329
Grp Volume(v), veh/h	1	318	327	37	382	393	77	0	187	40	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1817	1774	1770	1822	1346	0	1704	1646	0	0
Q Serve(g_s), s	0.1	11.2	11.2	1.9	13.4	13.4	1.7	0.0	6.9	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	11.2	11.2	1.9	13.4	13.4	3.0	0.0	6.9	1.3	0.0	0.0
Prop In Lane	1.00		0.12	1.00		0.10	1.00		0.43	0.20		0.20
Lane Grp Cap(c), veh/h	2	767	787	48	812	836	596	0	646	672	0	0
V/C Ratio(X)	0.51	0.41	0.42	0.78	0.47	0.47	0.13	0.00	0.29	0.06	0.00	0.00
Avail Cap(c_a), veh/h	91	767	787	150	812	836	596	0	646	672	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.82	0.82	0.82	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	44.9	17.6	17.6	43.5	16.8	16.8	18.2	0.0	19.5	17.8	0.0	0.0
Incr Delay (d2), s/veh	59.5	1.7	1.6	8.1	1.6	1.6	0.4	0.0	1.1	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	5.8	6.0	1.0	6.8	7.0	1.3	0.0	3.4	0.7	0.0	0.0
LnGrp Delay(d),s/veh	104.4	19.3	19.3	51.6	18.4	18.4	18.7	0.0	20.6	17.9	0.0	0.0
LnGrp LOS	F	B	B	D	B	B	B		C	B		
Approach Vol, veh/h		646			812			264			40	
Approach Delay, s/veh		19.4			19.9			20.1			17.9	
Approach LOS		B			B			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.8	44.2		39.0	4.5	46.5		39.0				
Change Period (Y+Rc), s	4.4	* 5.2		4.9	4.4	5.2		4.9				
Max Green Setting (Gmax), s	7.6	* 34		34.1	4.6	36.8		34.1				
Max Q Clear Time (g_c+I1), s	3.9	13.2		3.3	2.1	15.4		8.9				
Green Ext Time (p_c), s	0.0	6.8		0.1	0.0	6.1		0.7				
Intersection Summary												
HCM 2010 Ctrl Delay			19.7									
HCM 2010 LOS			B									
Notes												

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	↰	↱
Traffic Volume (veh/h)	506	32	37	665	30	13
Future Volume (veh/h)	506	32	37	665	30	13
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.96	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	602	38	46	821	39	17
Adj No. of Lanes	2	0	1	2	1	1
Peak Hour Factor	0.84	0.84	0.81	0.81	0.77	0.77
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	930	59	67	1431	734	655
Arrive On Green	0.28	0.28	0.04	0.40	0.41	0.41
Sat Flow, veh/h	3466	213	1774	3632	1774	1583
Grp Volume(v), veh/h	315	325	46	821	39	17
Grp Sat Flow(s),veh/h/ln	1770	1816	1774	1770	1774	1583
Q Serve(g_s), s	7.8	7.8	1.3	8.9	0.7	0.3
Cycle Q Clear(g_c), s	7.8	7.8	1.3	8.9	0.7	0.3
Prop In Lane		0.12	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	488	501	67	1431	734	655
V/C Ratio(X)	0.65	0.65	0.68	0.57	0.05	0.03
Avail Cap(c_a), veh/h	1518	1558	484	4323	734	655
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.8	15.8	23.5	11.4	8.7	8.6
Incr Delay (d2), s/veh	1.4	1.4	11.6	0.4	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.0	4.1	0.8	4.4	0.3	0.2
LnGrp Delay(d),s/veh	17.3	17.2	35.2	11.8	8.8	8.7
LnGrp LOS	B	B	D	B	A	A
Approach Vol, veh/h	640			867	56	
Approach Delay, s/veh	17.2			13.0	8.8	
Approach LOS	B			B	A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	6.4	18.2				24.5		25.0
Change Period (Y+Rc), s	4.5	4.5				4.5		4.5
Max Green Setting (Gmax), s	13.5	42.5				60.5		20.5
Max Q Clear Time (g_c+I1), s	3.3	9.8				10.9		2.7
Green Ext Time (p_c), s	0.0	3.8				6.1		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	14.6
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑		↱
Traffic Vol, veh/h	510	9	0	0	0	15
Future Vol, veh/h	510	9	0	0	0	15
Conflicting Peds, #/hr	0	5	0	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	92	92	63	63
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	622	11	0	0	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	327
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	669
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	663
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	663	-	-	-
HCM Lane V/C Ratio	0.036	-	-	-
HCM Control Delay (s)	10.6	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↑	↱	↰	↑↱		↰	↰↑	↱
Traffic Volume (veh/h)	178	356	18	12	512	602	27	141	19	259	63	203
Future Volume (veh/h)	178	356	18	12	512	602	27	141	19	259	63	203
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	193	387	20	14	602	708	35	181	24	179	223	226
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.85	0.85	0.85	0.78	0.78	0.78	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	205	1526	79	35	1240	821	252	228	30	321	337	462
Arrive On Green	0.12	0.45	0.45	0.02	0.35	0.35	0.14	0.14	0.14	0.18	0.18	0.18
Sat Flow, veh/h	1774	3419	176	1774	3539	1526	1774	1605	213	1774	1863	1542
Grp Volume(v), veh/h	193	200	207	14	602	708	35	0	205	179	223	226
Grp Sat Flow(s),veh/h/ln	1774	1770	1825	1774	1770	1526	1774	0	1817	1774	1863	1542
Q Serve(g_s), s	9.9	6.5	6.5	0.7	12.2	32.1	1.6	0.0	10.0	8.4	10.2	11.1
Cycle Q Clear(g_c), s	9.9	6.5	6.5	0.7	12.2	32.1	1.6	0.0	10.0	8.4	10.2	11.1
Prop In Lane	1.00		0.10	1.00		1.00	1.00		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	205	790	815	35	1240	821	252	0	259	321	337	462
V/C Ratio(X)	0.94	0.25	0.25	0.40	0.49	0.86	0.14	0.00	0.79	0.56	0.66	0.49
Avail Cap(c_a), veh/h	205	790	815	116	1240	821	658	0	674	658	691	755
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.2	15.8	15.8	44.4	23.3	17.6	34.4	0.0	38.0	34.2	34.9	26.5
Incr Delay (d2), s/veh	46.1	0.2	0.2	7.3	0.3	9.3	0.2	0.0	5.4	1.5	2.2	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.5	3.2	3.3	0.4	6.0	19.8	0.8	0.0	5.4	4.3	5.5	4.8
LnGrp Delay(d),s/veh	86.3	16.0	16.0	51.7	23.6	26.9	34.6	0.0	43.4	35.7	37.1	27.3
LnGrp LOS	F	B	B	D	C	C	C		D	D	D	C
Approach Vol, veh/h		600			1324			240			628	
Approach Delay, s/veh		38.6			25.7			42.2			33.2	
Approach LOS		D			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.2	45.9		21.5	15.0	37.1		18.0
Change Period (Y+Rc), s	4.4	* 5		4.9	4.4	5.0		5.0
Max Green Setting (Gmax), s	6.0	* 37		34.0	10.6	32.1		34.0
Max Q Clear Time (g_c+I1), s	2.7	8.5		13.1	11.9	34.1		12.0
Green Ext Time (p_c), s	0.0	2.2		2.4	0.0	0.0		1.1

Intersection Summary	
HCM 2010 Ctrl Delay	31.6
HCM 2010 LOS	C

Notes

PM Existing
1: Aragon Dr & University Ave

HCM 2010 Signalized Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱			✥	
Traffic Volume (veh/h)	10	654	47	42	508	20	29	29	42	10	41	9
Future Volume (veh/h)	10	654	47	42	508	20	29	29	42	10	41	9
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	0.99		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	11	703	51	45	540	21	30	30	44	13	52	11
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.93	0.93	0.93	0.94	0.94	0.94	0.96	0.96	0.96	0.79	0.79	0.79
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	19	1642	119	57	1781	69	520	222	325	111	418	82
Arrive On Green	0.01	0.49	0.49	0.03	0.51	0.51	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1774	3339	242	1774	3469	135	1315	670	982	208	1263	249
Grp Volume(v), veh/h	11	372	382	45	275	286	30	0	74	76	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1812	1774	1770	1834	1315	0	1652	1720	0	0
Q Serve(g_s), s	0.6	13.5	13.6	2.5	9.0	9.0	0.0	0.0	3.1	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.6	13.5	13.6	2.5	9.0	9.0	1.2	0.0	3.1	2.9	0.0	0.0
Prop In Lane	1.00		0.13	1.00		0.07	1.00		0.59	0.17		0.14
Lane Grp Cap(c), veh/h	19	870	891	57	909	942	520	0	547	611	0	0
V/C Ratio(X)	0.59	0.43	0.43	0.78	0.30	0.30	0.06	0.00	0.14	0.12	0.00	0.00
Avail Cap(c_a), veh/h	117	870	891	170	909	942	520	0	547	611	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.94	0.94	0.94	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	49.3	16.4	16.4	48.0	14.0	14.0	22.8	0.0	23.4	23.4	0.0	0.0
Incr Delay (d2), s/veh	10.5	1.5	1.5	7.9	0.8	0.8	0.2	0.0	0.5	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	7.0	7.2	1.4	4.6	4.7	0.6	0.0	1.5	1.5	0.0	0.0
LnGrp Delay(d),s/veh	59.7	17.9	17.9	56.0	14.8	14.8	23.0	0.0	23.9	23.8	0.0	0.0
LnGrp LOS	E	B	B	E	B	B	C		C	C		
Approach Vol, veh/h		765			606			104			76	
Approach Delay, s/veh		18.5			17.9			23.7			23.8	
Approach LOS		B			B			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.6	54.4		38.0	5.5	56.5		38.0				
Change Period (Y+Rc), s	4.4	* 5.2		4.9	4.4	5.2		4.9				
Max Green Setting (Gmax), s	9.6	* 43		33.1	6.6	45.8		33.1				
Max Q Clear Time (g_c+I1), s	4.5	15.6		4.9	2.6	11.0		5.1				
Green Ext Time (p_c), s	0.0	9.3		0.2	0.0	4.7		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay			18.9									
HCM 2010 LOS			B									
Notes												

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	↰	↱
Traffic Volume (veh/h)	654	41	59	547	50	22
Future Volume (veh/h)	654	41	59	547	50	22
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.96	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	688	43	69	636	64	28
Adj No. of Lanes	2	0	1	2	1	1
Peak Hour Factor	0.95	0.95	0.86	0.86	0.78	0.78
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1017	63	88	1546	694	620
Arrive On Green	0.30	0.30	0.05	0.44	0.39	0.39
Sat Flow, veh/h	3468	211	1774	3632	1774	1583
Grp Volume(v), veh/h	360	371	69	636	64	28
Grp Sat Flow(s),veh/h/ln	1770	1816	1774	1770	1774	1583
Q Serve(g_s), s	9.4	9.4	2.0	6.5	1.2	0.6
Cycle Q Clear(g_c), s	9.4	9.4	2.0	6.5	1.2	0.6
Prop In Lane		0.12	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	533	547	88	1546	694	620
V/C Ratio(X)	0.68	0.68	0.78	0.41	0.09	0.05
Avail Cap(c_a), veh/h	1402	1439	491	4089	694	620
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.1	16.1	24.6	10.1	10.1	9.9
Incr Delay (d2), s/veh	1.5	1.5	14.1	0.2	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	4.9	1.3	3.1	0.6	0.3
LnGrp Delay(d),s/veh	17.6	17.5	38.7	10.3	10.3	10.0
LnGrp LOS	B	B	D	B	B	B
Approach Vol, veh/h	731			705	92	
Approach Delay, s/veh	17.6			13.1	10.2	
Approach LOS	B			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	7.1	20.3				27.4		25.0
Change Period (Y+Rc), s	4.5	4.5				4.5		4.5
Max Green Setting (Gmax), s	14.5	41.5				60.5		20.5
Max Q Clear Time (g_c+I1), s	4.0	11.4				8.5		3.2
Green Ext Time (p_c), s	0.1	4.4				4.4		0.2

Intersection Summary			
HCM 2010 Ctrl Delay			15.1
HCM 2010 LOS			B

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑		↱
Traffic Vol, veh/h	685	9	0	0	0	49
Future Vol, veh/h	685	9	0	0	0	49
Conflicting Peds, #/hr	0	5	0	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	92	92	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	770	10	0	0	0	75

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	400
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	600
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	595
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	595	-	-	-
HCM Lane V/C Ratio	0.127	-	-	-
HCM Control Delay (s)	11.9	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.4	-	-	-

PM Existing
4: Lois St/70th St & University Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↱		↰	↰	↱
Traffic Volume (veh/h)	222	542	33	17	393	323	14	102	9	441	142	244
Future Volume (veh/h)	222	542	33	17	393	323	14	102	9	441	142	244
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.95	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	236	577	35	19	437	359	17	124	11	306	369	257
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.90	0.90	0.90	0.82	0.82	0.82	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	239	1229	74	46	899	800	180	171	15	467	491	622
Arrive On Green	0.13	0.36	0.36	0.03	0.25	0.25	0.10	0.10	0.10	0.26	0.26	0.26
Sat Flow, veh/h	1774	3383	205	1774	3539	1507	1774	1683	149	1774	1863	1549
Grp Volume(v), veh/h	236	301	311	19	437	359	17	0	135	306	369	257
Grp Sat Flow(s),veh/h/ln	1774	1770	1819	1774	1770	1507	1774	0	1832	1774	1863	1549
Q Serve(g_s), s	10.4	10.3	10.3	0.8	8.3	11.8	0.7	0.0	5.6	12.1	14.3	9.4
Cycle Q Clear(g_c), s	10.4	10.3	10.3	0.8	8.3	11.8	0.7	0.0	5.6	12.1	14.3	9.4
Prop In Lane	1.00		0.11	1.00		1.00	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	239	643	660	46	899	800	180	0	186	467	491	622
V/C Ratio(X)	0.99	0.47	0.47	0.41	0.49	0.45	0.09	0.00	0.73	0.65	0.75	0.41
Avail Cap(c_a), veh/h	239	829	852	136	1447	1033	768	0	793	768	807	884
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.9	19.2	19.2	37.7	24.9	12.0	32.0	0.0	34.2	25.7	26.6	17.0
Incr Delay (d2), s/veh	53.9	0.5	0.5	5.8	0.4	0.4	0.2	0.0	5.3	1.6	2.3	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.6	5.1	5.3	0.5	4.1	7.7	0.3	0.0	3.1	6.1	7.6	4.1
LnGrp Delay(d),s/veh	87.8	19.7	19.7	43.5	25.3	12.4	32.2	0.0	39.5	27.3	28.9	17.5
LnGrp LOS	F	B	B	D	C	B	C		D	C	C	B
Approach Vol, veh/h		848			815			152			932	
Approach Delay, s/veh		38.7			20.1			38.7			25.2	
Approach LOS		D			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.4	33.5		25.6	15.0	25.0		13.0
Change Period (Y+Rc), s	4.4	* 5		4.9	4.4	5.0		5.0
Max Green Setting (Gmax), s	6.0	* 37		34.0	10.6	32.1		34.0
Max Q Clear Time (g_c+I1), s	2.8	12.3		16.3	12.4	13.8		7.6
Green Ext Time (p_c), s	0.0	3.4		3.6	0.0	3.8		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	28.6
HCM 2010 LOS	C

Notes

Appendix G

Original Traffic Study Trip Generation

TABLE 3

PROJECT TRAFFIC GENERATION

USE	SIZE (square feet)	DAILY TRIP ENDS (ADT)		AM PEAK HOUR					PM PEAK HOUR				
		RATE	VOLUME	% OF ADT	IN: OUT SPLIT		VOLUME		% OF ADT	IN: OUT SPLIT		VOLUME	
							IN	OUT				IN	OUT
Recreational Community Center	182,288	30	5,470	4%	60%	40%	130	90	9%	60%	40%	295	200

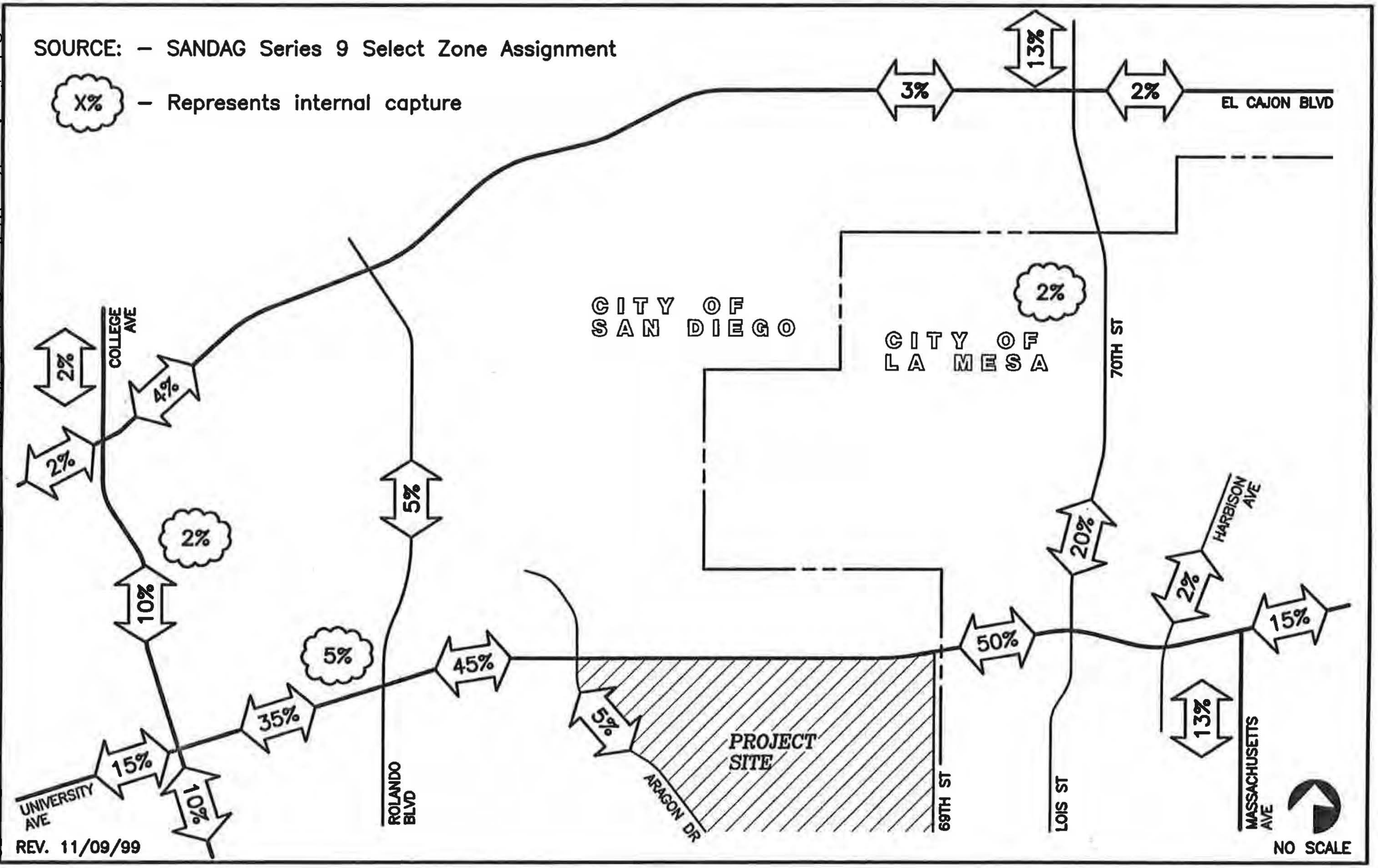
SOURCE: ITE rate for a recreational community center is 22.88 trip ends per 1,000 square feet. Per conversation with City staff, a more conservative trip rate of 30 trip ends per 1,000 square feet was utilized.

- Trip ends are one-way traffic movements, entering or leaving.
- ADT's are rounded to the nearest 10, peak hour to the nearest 5.

Tab3.894
7/30/99

Appendix H

Original Traffic Study Distribution



SOURCE: – SANDAG Series 9 Select Zone Assignment

X% – Represents internal capture

REV. 11/09/99

LLG894.DWG

Figure 9

REGIONAL DISTRIBUTION PERCENTAGES

SALVATION ARMY COMMUNITY CENTER

LINSCOTT
LAW &
GREENSPAN
ENGINEERS

Appendix I

Existing with Project LOS Calculations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱			✥	
Traffic Volume (veh/h)	1	508	31	32	622	34	70	97	75	7	20	7
Future Volume (veh/h)	1	508	31	32	622	34	70	97	75	7	20	7
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	0.98		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	1	627	38	39	749	41	77	107	82	8	24	8
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.81	0.81	0.81	0.83	0.83	0.83	0.91	0.91	0.91	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	2	1463	89	49	1563	86	596	365	280	142	405	125
Arrive On Green	0.00	0.43	0.43	0.03	0.46	0.46	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	1774	3383	205	1774	3406	186	1346	963	738	247	1069	329
Grp Volume(v), veh/h	1	328	337	39	389	401	77	0	189	40	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1818	1774	1770	1823	1346	0	1702	1646	0	0
Q Serve(g_s), s	0.1	11.6	11.6	2.0	13.7	13.7	1.7	0.0	7.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	11.6	11.6	2.0	13.7	13.7	3.0	0.0	7.0	1.3	0.0	0.0
Prop In Lane	1.00		0.11	1.00		0.10	1.00		0.43	0.20		0.20
Lane Grp Cap(c), veh/h	2	765	786	49	812	837	596	0	645	672	0	0
V/C Ratio(X)	0.51	0.43	0.43	0.79	0.48	0.48	0.13	0.00	0.29	0.06	0.00	0.00
Avail Cap(c_a), veh/h	91	765	786	150	812	837	596	0	645	672	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.86	0.86	0.86	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	44.9	17.8	17.8	43.5	16.9	16.9	18.2	0.0	19.5	17.8	0.0	0.0
Incr Delay (d2), s/veh	59.5	1.8	1.7	8.9	1.7	1.7	0.4	0.0	1.2	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	6.0	6.2	1.1	7.1	7.3	1.3	0.0	3.5	0.7	0.0	0.0
LnGrp Delay(d),s/veh	104.4	19.5	19.5	52.4	18.6	18.6	18.7	0.0	20.7	17.9	0.0	0.0
LnGrp LOS	F	B	B	D	B	B	B		C	B		
Approach Vol, veh/h		666			829			266			40	
Approach Delay, s/veh		19.7			20.2			20.1			17.9	
Approach LOS		B			C			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.9	44.1		39.0	4.5	46.5		39.0
Change Period (Y+Rc), s	4.4	* 5.2		4.9	4.4	5.2		4.9
Max Green Setting (Gmax), s	7.6	* 34		34.1	4.6	36.8		34.1
Max Q Clear Time (g_c+I1), s	4.0	13.6		3.3	2.1	15.7		9.0
Green Ext Time (p_c), s	0.0	7.0		0.1	0.0	6.2		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	19.9
HCM 2010 LOS	B

Notes

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	↰	↱
Traffic Volume (veh/h)	508	48	55	665	45	14
Future Volume (veh/h)	508	48	55	665	45	14
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.96	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	605	57	68	821	58	18
Adj No. of Lanes	2	0	1	2	1	1
Peak Hour Factor	0.84	0.84	0.81	0.81	0.77	0.77
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	919	86	86	1484	716	639
Arrive On Green	0.28	0.28	0.05	0.42	0.40	0.40
Sat Flow, veh/h	3352	306	1774	3632	1774	1583
Grp Volume(v), veh/h	328	334	68	821	58	18
Grp Sat Flow(s),veh/h/ln	1770	1796	1774	1770	1774	1583
Q Serve(g_s), s	8.3	8.3	1.9	8.9	1.0	0.3
Cycle Q Clear(g_c), s	8.3	8.3	1.9	8.9	1.0	0.3
Prop In Lane		0.17	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	499	506	86	1484	716	639
V/C Ratio(X)	0.66	0.66	0.79	0.55	0.08	0.03
Avail Cap(c_a), veh/h	1481	1502	472	4215	716	639
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.1	16.1	23.9	11.2	9.3	9.1
Incr Delay (d2), s/veh	1.5	1.5	14.6	0.3	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.2	4.3	1.3	4.4	0.5	0.2
LnGrp Delay(d),s/veh	17.5	17.6	38.5	11.5	9.6	9.2
LnGrp LOS	B	B	D	B	A	A
Approach Vol, veh/h	662			889	76	
Approach Delay, s/veh	17.6			13.5	9.5	
Approach LOS	B			B	A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	7.0	18.8				25.8		25.0
Change Period (Y+Rc), s	4.5	4.5				4.5		4.5
Max Green Setting (Gmax), s	13.5	42.5				60.5		20.5
Max Q Clear Time (g_c+I1), s	3.9	10.3				10.9		3.0
Green Ext Time (p_c), s	0.1	3.9				6.1		0.1

Intersection Summary			
HCM 2010 Ctrl Delay			15.0
HCM 2010 LOS			B

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑		↱
Traffic Vol, veh/h	511	11	0	0	0	28
Future Vol, veh/h	511	11	0	0	0	28
Conflicting Peds, #/hr	0	5	0	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	92	92	63	63
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	623	13	0	0	0	44

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	328
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	668
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	662
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	662	-	-	-
HCM Lane V/C Ratio	0.067	-	-	-
HCM Control Delay (s)	10.8	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↱		↰	↰	↱
Traffic Volume (veh/h)	184	365	18	12	523	602	27	141	19	259	63	210
Future Volume (veh/h)	184	365	18	12	523	602	27	141	19	259	63	210
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	200	397	20	14	615	708	35	181	24	179	223	233
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.85	0.85	0.85	0.78	0.78	0.78	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	204	1520	76	35	1234	824	252	228	30	328	344	467
Arrive On Green	0.12	0.44	0.44	0.02	0.35	0.35	0.14	0.14	0.14	0.18	0.18	0.18
Sat Flow, veh/h	1774	3424	172	1774	3539	1526	1774	1605	213	1774	1863	1542
Grp Volume(v), veh/h	200	205	212	14	615	708	35	0	205	179	223	233
Grp Sat Flow(s),veh/h/ln	1774	1770	1826	1774	1770	1526	1774	0	1817	1774	1863	1542
Q Serve(g_s), s	10.4	6.7	6.7	0.7	12.6	32.1	1.6	0.0	10.0	8.4	10.2	11.5
Cycle Q Clear(g_c), s	10.4	6.7	6.7	0.7	12.6	32.1	1.6	0.0	10.0	8.4	10.2	11.5
Prop In Lane	1.00		0.09	1.00		1.00	1.00		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	204	786	811	35	1234	824	252	0	258	328	344	467
V/C Ratio(X)	0.98	0.26	0.26	0.40	0.50	0.86	0.14	0.00	0.79	0.55	0.65	0.50
Avail Cap(c_a), veh/h	204	786	811	116	1234	824	655	0	671	655	688	752
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.6	16.1	16.1	44.6	23.6	17.5	34.6	0.0	38.2	34.0	34.8	26.6
Incr Delay (d2), s/veh	56.9	0.2	0.2	7.3	0.3	9.1	0.2	0.0	5.5	1.4	2.1	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.3	3.3	3.4	0.4	6.2	20.0	0.8	0.0	5.5	4.3	5.5	5.0
LnGrp Delay(d),s/veh	97.5	16.3	16.3	51.9	24.0	26.6	34.8	0.0	43.7	35.5	36.8	27.4
LnGrp LOS	F	B	B	D	C	C	C		D	D	D	C
Approach Vol, veh/h		617			1337			240			635	
Approach Delay, s/veh		42.6			25.7			42.4			33.0	
Approach LOS		D			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.2	45.9		21.9	15.0	37.1		18.1
Change Period (Y+Rc), s	4.4	* 5		4.9	4.4	5.0		5.0
Max Green Setting (Gmax), s	6.0	* 37		34.0	10.6	32.1		34.0
Max Q Clear Time (g_c+I1), s	2.7	8.7		13.5	12.4	34.1		12.0
Green Ext Time (p_c), s	0.0	2.2		2.4	0.0	0.0		1.1

Intersection Summary	
HCM 2010 Ctrl Delay	32.4
HCM 2010 LOS	C

Notes

1: Aragon Dr & University Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱			✥	
Traffic Volume (veh/h)	10	683	47	44	529	20	29	29	45	10	41	9
Future Volume (veh/h)	10	683	47	44	529	20	29	29	45	10	41	9
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	0.99		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	11	734	51	47	563	21	30	30	47	13	52	11
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.93	0.93	0.93	0.94	0.94	0.94	0.96	0.96	0.96	0.79	0.79	0.79
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	19	1642	114	60	1785	66	520	212	333	111	418	82
Arrive On Green	0.01	0.49	0.49	0.03	0.51	0.51	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1774	3351	233	1774	3476	129	1315	642	1005	208	1263	249
Grp Volume(v), veh/h	11	387	398	47	286	298	30	0	77	76	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1814	1774	1770	1835	1315	0	1647	1719	0	0
Q Serve(g_s), s	0.6	14.3	14.3	2.6	9.4	9.4	0.0	0.0	3.3	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.6	14.3	14.3	2.6	9.4	9.4	1.2	0.0	3.3	2.9	0.0	0.0
Prop In Lane	1.00		0.13	1.00		0.07	1.00		0.61	0.17		0.14
Lane Grp Cap(c), veh/h	19	867	889	60	909	942	520	0	545	611	0	0
V/C Ratio(X)	0.59	0.45	0.45	0.78	0.32	0.32	0.06	0.00	0.14	0.12	0.00	0.00
Avail Cap(c_a), veh/h	117	867	889	170	909	942	520	0	545	611	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.95	0.95	0.95	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	49.3	16.6	16.6	47.9	14.1	14.1	22.8	0.0	23.5	23.4	0.0	0.0
Incr Delay (d2), s/veh	10.5	1.7	1.6	7.7	0.9	0.8	0.2	0.0	0.5	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	7.4	7.6	1.4	4.8	4.9	0.6	0.0	1.6	1.5	0.0	0.0
LnGrp Delay(d),s/veh	59.7	18.3	18.3	55.6	15.0	15.0	23.0	0.0	24.0	23.8	0.0	0.0
LnGrp LOS	E	B	B	E	B	B	C		C	C		
Approach Vol, veh/h		796			631			107			76	
Approach Delay, s/veh		18.9			18.0			23.7			23.8	
Approach LOS		B			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.8	54.2		38.0	5.5	56.5		38.0
Change Period (Y+Rc), s	4.4	* 5.2		4.9	4.4	5.2		4.9
Max Green Setting (Gmax), s	9.6	* 43		33.1	6.6	45.8		33.1
Max Q Clear Time (g_c+I1), s	4.6	16.3		4.9	2.6	11.4		5.3
Green Ext Time (p_c), s	0.0	9.6		0.2	0.0	4.9		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	19.1
HCM 2010 LOS	B

Notes

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	↰	↱
Traffic Volume (veh/h)	657	70	91	547	73	24
Future Volume (veh/h)	657	70	91	547	73	24
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.96	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	692	74	106	636	94	31
Adj No. of Lanes	2	0	1	2	1	1
Peak Hour Factor	0.95	0.95	0.86	0.86	0.78	0.78
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	995	106	139	1659	655	585
Arrive On Green	0.31	0.31	0.08	0.47	0.37	0.37
Sat Flow, veh/h	3306	343	1774	3632	1774	1583
Grp Volume(v), veh/h	381	385	106	636	94	31
Grp Sat Flow(s),veh/h/ln	1770	1787	1774	1770	1774	1583
Q Serve(g_s), s	10.5	10.5	3.3	6.5	2.0	0.7
Cycle Q Clear(g_c), s	10.5	10.5	3.3	6.5	2.0	0.7
Prop In Lane		0.19	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	548	553	139	1659	655	585
V/C Ratio(X)	0.70	0.70	0.76	0.38	0.14	0.05
Avail Cap(c_a), veh/h	1322	1335	463	3856	655	585
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.9	16.9	25.1	9.6	11.7	11.3
Incr Delay (d2), s/veh	1.6	1.6	8.4	0.1	0.5	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	5.4	1.9	3.1	1.0	0.3
LnGrp Delay(d),s/veh	18.5	18.5	33.5	9.7	12.1	11.4
LnGrp LOS	B	B	C	A	B	B
Approach Vol, veh/h	766			742	125	
Approach Delay, s/veh	18.5			13.1	12.0	
Approach LOS	B			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	8.8	21.7				30.5		25.0
Change Period (Y+Rc), s	4.5	4.5				4.5		4.5
Max Green Setting (Gmax), s	14.5	41.5				60.5		20.5
Max Q Clear Time (g_c+I1), s	5.3	12.5				8.5		4.0
Green Ext Time (p_c), s	0.1	4.7				4.4		0.3

Intersection Summary			
HCM 2010 Ctrl Delay			15.5
HCM 2010 LOS			B

PM Existing + Project
3: Kroc E. UnSig Dwy & University Ave

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑		↱
Traffic Vol, veh/h	687	12	0	0	0	71
Future Vol, veh/h	687	12	0	0	0	71
Conflicting Peds, #/hr	0	5	0	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	92	92	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	772	13	0	0	0	109

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	403
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	597
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	592
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB		WB		NB
HCM Control Delay, s	0		0		12.5
HCM LOS					B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	592	-	-	-
HCM Lane V/C Ratio	0.185	-	-	-
HCM Control Delay (s)	12.5	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.7	-	-	-

PM Existing + Project
4: Lois St/70th St & University Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↱		↰	↰	↱
Traffic Volume (veh/h)	231	556	33	17	412	323	14	102	9	441	142	257
Future Volume (veh/h)	231	556	33	17	412	323	14	102	9	441	142	257
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.95	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	246	591	35	19	458	359	17	124	11	306	369	271
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.90	0.90	0.90	0.82	0.82	0.82	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	239	1232	73	46	902	802	180	171	15	468	491	622
Arrive On Green	0.13	0.36	0.36	0.03	0.25	0.25	0.10	0.10	0.10	0.26	0.26	0.26
Sat Flow, veh/h	1774	3389	200	1774	3539	1507	1774	1683	149	1774	1863	1549
Grp Volume(v), veh/h	246	308	318	19	458	359	17	0	135	306	369	271
Grp Sat Flow(s),veh/h/ln	1774	1770	1820	1774	1770	1507	1774	0	1832	1774	1863	1549
Q Serve(g_s), s	10.6	10.6	10.6	0.8	8.7	11.9	0.7	0.0	5.6	12.1	14.3	10.0
Cycle Q Clear(g_c), s	10.6	10.6	10.6	0.8	8.7	11.9	0.7	0.0	5.6	12.1	14.3	10.0
Prop In Lane	1.00		0.11	1.00		1.00	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	239	643	662	46	902	802	180	0	186	468	491	622
V/C Ratio(X)	1.03	0.48	0.48	0.41	0.51	0.45	0.09	0.00	0.73	0.65	0.75	0.44
Avail Cap(c_a), veh/h	239	827	850	135	1443	1032	766	0	791	766	804	882
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.1	19.3	19.3	37.8	25.1	12.0	32.1	0.0	34.3	25.8	26.6	17.3
Incr Delay (d2), s/veh	66.3	0.6	0.5	5.8	0.4	0.4	0.2	0.0	5.3	1.6	2.3	0.5
Initial Q Delay(d3),s/veh	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.5	5.2	5.4	0.5	4.3	7.7	0.3	0.0	3.1	6.1	7.7	4.3
LnGrp Delay(d),s/veh	100.4	19.9	19.9	43.6	25.6	12.4	32.3	0.0	39.6	27.3	28.9	17.8
LnGrp LOS	F	B	B	D	C	B	C		D	C	C	B
Approach Vol, veh/h		872			836			152			946	
Approach Delay, s/veh		42.6			20.3			38.8			25.2	
Approach LOS		D			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.4	33.6		25.7	15.0	25.1		13.0
Change Period (Y+Rc), s	4.4	* 5		4.9	4.4	5.0		5.0
Max Green Setting (Gmax), s	6.0	* 37		34.0	10.6	32.1		34.0
Max Q Clear Time (g_c+I1), s	2.8	12.6		16.3	12.6	13.9		7.6
Green Ext Time (p_c), s	0.0	3.5		3.7	0.0	3.9		0.7

Intersection Summary			
HCM 2010 Ctrl Delay			29.9
HCM 2010 LOS			C

Notes

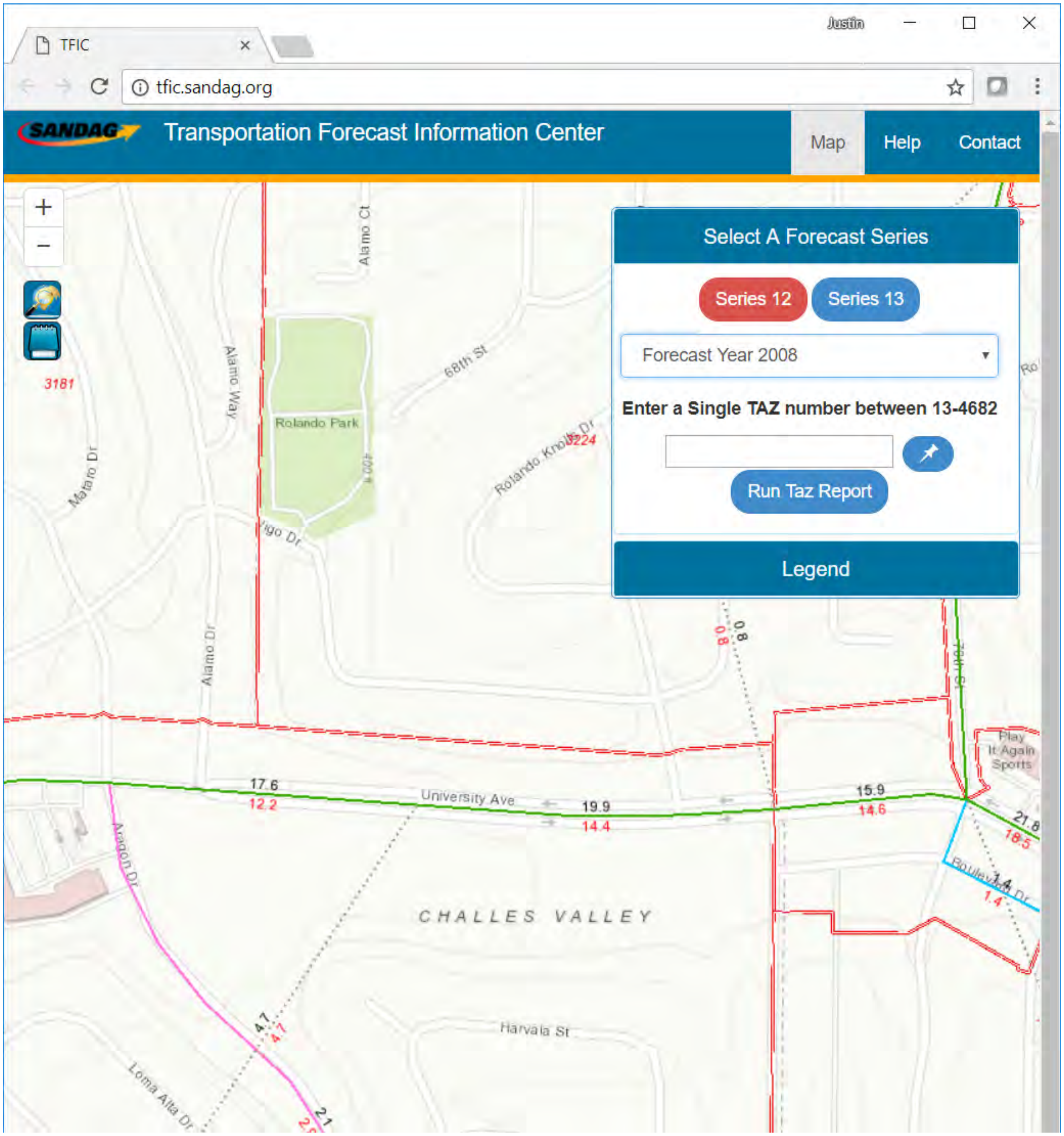
Appendix J

SANDAG 2035 ADTs and Growth Factor Calculations

Traffic Volume Growth Factor

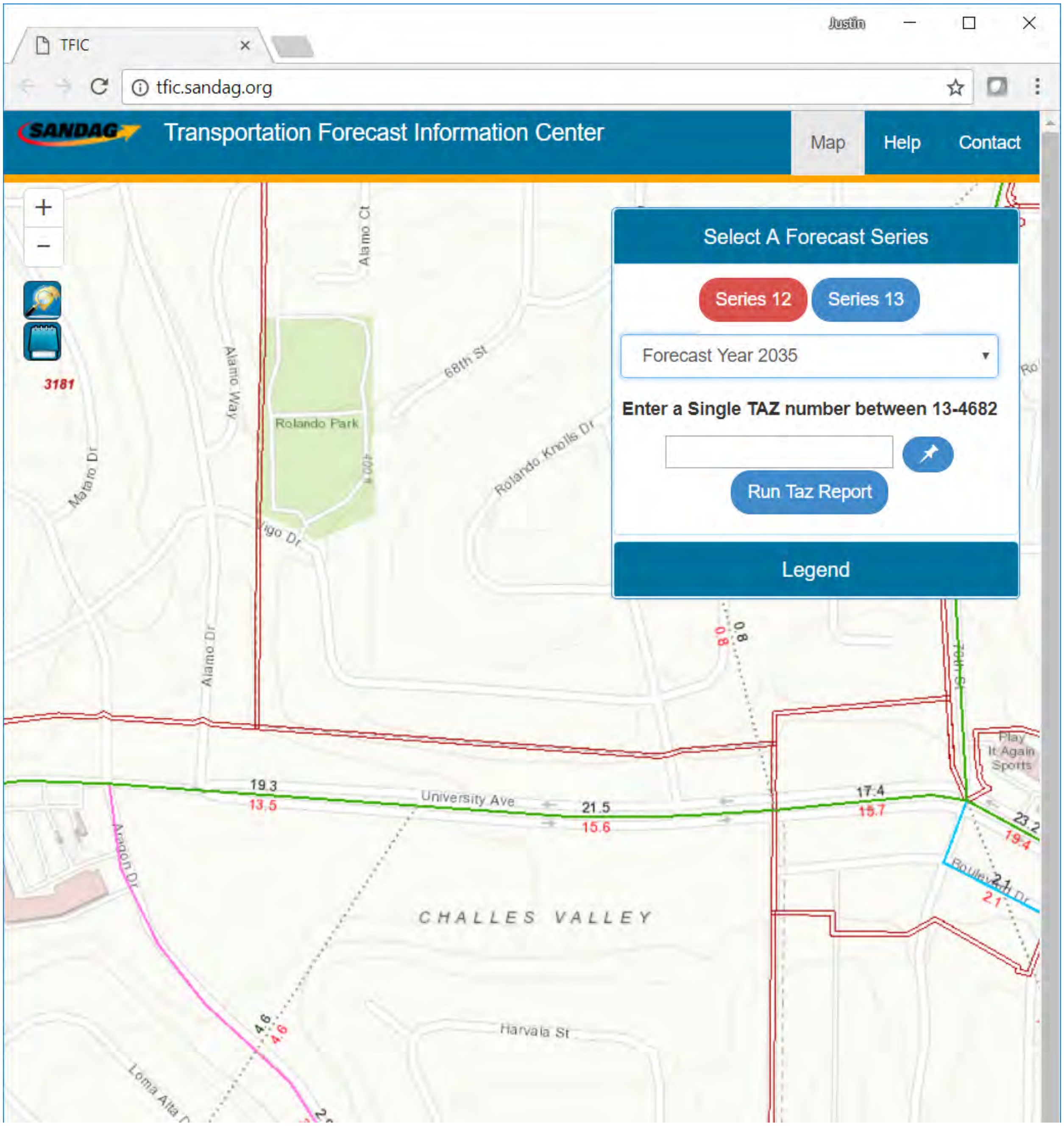
Roadway Segment	Existing Year 2017 Volume	SANDAG S12 Yr 2008 Volume	SANDAG S12 Yr 2035 Volume	Annual Growth Rate over 27 yrs (2035-2008 = 27)	Forecasted Year 2035 (2035-2017=18)	Adjustments (rounded)
University Avenue						
Aragon Dr to Kroc Center Main Driveway	15,981	17,600	19,300	0.34%	16,994	17,000
Kroc Center Main Driveway to 69th Street	16,108	19,900	21,500	0.29%	16,960	17,000
			Average Annual Growth:	**0.31%**		
			Growth Factor to year 2035:	**1.058**		

Annual growth rate = ((SANDAG Series 12 Yr 2035 ADT / SANDAG S12 Yr 2008 ADT) raised 1/27) - 1.
Example growth rate calc for University btw Aragon and Kroc Dwy: (19,300/17,600) to the power of 1/27 all less 1 = 0.34%
Example forecast for University btw Aragon and Kroc: Power (1.0034 growth%, 18 years)x15,981 year 2017 ADT=16,994



Forecast Year 2008

Enter a Single TAZ number between 13-4682


TFIC
Justin
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SANDAG
Transportation Forecast Information Center
Map
Help
Contact
Select A Forecast Series
Series 12
Series 13
Forecast Year 2035
Enter a Single TAZ number between 13-4682
Run Taz Report
Legend
3181
Alamo Ct
Alamo Way
Rolando Park
68th St
Rolando Knolls Dr
Mataro Dr
Vigo Dr
Alamo Dr
70th St
Play It Again Sports
0.8
0.8
19.3
13.5
University Ave
21.5
15.6
17.4
15.7
23.2
19.4
2.1
2.1
Boulevard Dr
Aragon Dr
CHALLES VALLEY
Harvala St
4.6
4.6
Loma Alta Dr

Appendix K

Near Term LOS Calculations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱			✣	
Traffic Volume (veh/h)	1	497	31	31	615	34	71	98	74	7	20	7
Future Volume (veh/h)	1	497	31	31	615	34	71	98	74	7	20	7
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	0.98		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	1	614	38	37	741	41	78	108	81	8	24	8
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.81	0.81	0.81	0.83	0.83	0.83	0.91	0.91	0.91	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	2	1463	90	48	1562	86	596	369	277	142	405	125
Arrive On Green	0.00	0.43	0.43	0.03	0.46	0.46	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	1774	3378	209	1774	3404	188	1346	973	730	247	1069	329
Grp Volume(v), veh/h	1	321	331	37	385	397	78	0	189	40	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1817	1774	1770	1823	1346	0	1703	1646	0	0
Q Serve(g_s), s	0.1	11.3	11.4	1.9	13.5	13.6	1.8	0.0	7.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	11.3	11.4	1.9	13.5	13.6	3.0	0.0	7.0	1.3	0.0	0.0
Prop In Lane	1.00		0.11	1.00		0.10	1.00		0.43	0.20		0.20
Lane Grp Cap(c), veh/h	2	767	787	48	812	836	596	0	645	672	0	0
V/C Ratio(X)	0.51	0.42	0.42	0.78	0.47	0.47	0.13	0.00	0.29	0.06	0.00	0.00
Avail Cap(c_a), veh/h	91	767	787	150	812	836	596	0	645	672	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.82	0.82	0.82	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	44.9	17.7	17.7	43.5	16.8	16.8	18.2	0.0	19.5	17.8	0.0	0.0
Incr Delay (d2), s/veh	59.5	1.7	1.6	8.1	1.6	1.6	0.5	0.0	1.2	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	5.9	6.1	1.0	6.9	7.1	1.3	0.0	3.5	0.7	0.0	0.0
LnGrp Delay(d),s/veh	104.4	19.3	19.3	51.6	18.5	18.4	18.7	0.0	20.7	17.9	0.0	0.0
LnGrp LOS	F	B	B	D	B	B	B		C	B		
Approach Vol, veh/h		653			819			267			40	
Approach Delay, s/veh		19.5			19.9			20.1			17.9	
Approach LOS		B			B			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.8	44.2		39.0	4.5	46.5		39.0
Change Period (Y+Rc), s	4.4	* 5.2		4.9	4.4	5.2		4.9
Max Green Setting (Gmax), s	7.6	* 34		34.1	4.6	36.8		34.1
Max Q Clear Time (g_c+I1), s	3.9	13.4		3.3	2.1	15.6		9.0
Green Ext Time (p_c), s	0.0	6.9		0.1	0.0	6.1		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	19.7
HCM 2010 LOS	B

Notes

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	↰	↱
Traffic Volume (veh/h)	511	32	37	672	30	13
Future Volume (veh/h)	511	32	37	672	30	13
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.96	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	608	38	46	830	39	17
Adj No. of Lanes	2	0	1	2	1	1
Peak Hour Factor	0.84	0.84	0.81	0.81	0.77	0.77
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	937	58	67	1437	732	654
Arrive On Green	0.28	0.28	0.04	0.41	0.41	0.41
Sat Flow, veh/h	3469	211	1774	3632	1774	1583
Grp Volume(v), veh/h	318	328	46	830	39	17
Grp Sat Flow(s),veh/h/ln	1770	1816	1774	1770	1774	1583
Q Serve(g_s), s	7.9	7.9	1.3	9.0	0.7	0.3
Cycle Q Clear(g_c), s	7.9	7.9	1.3	9.0	0.7	0.3
Prop In Lane		0.12	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	491	504	67	1437	732	654
V/C Ratio(X)	0.65	0.65	0.69	0.58	0.05	0.03
Avail Cap(c_a), veh/h	1515	1555	482	4312	732	654
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.8	15.8	23.6	11.4	8.8	8.7
Incr Delay (d2), s/veh	1.4	1.4	11.6	0.4	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.0	4.1	0.8	4.5	0.3	0.2
LnGrp Delay(d),s/veh	17.3	17.2	35.2	11.8	8.9	8.7
LnGrp LOS	B	B	D	B	A	A
Approach Vol, veh/h	646			876	56	
Approach Delay, s/veh	17.2			13.0	8.8	
Approach LOS	B			B	A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	6.4	18.3				24.7		25.0
Change Period (Y+Rc), s	4.5	4.5				4.5		4.5
Max Green Setting (Gmax), s	13.5	42.5				60.5		20.5
Max Q Clear Time (g_c+I1), s	3.3	9.9				11.0		2.7
Green Ext Time (p_c), s	0.0	3.8				6.2		0.1

Intersection Summary			
HCM 2010 Ctrl Delay			14.6
HCM 2010 LOS			B

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑		↱
Traffic Vol, veh/h	515	9	0	0	0	15
Future Vol, veh/h	515	9	0	0	0	15
Conflicting Peds, #/hr	0	5	0	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	92	92	63	63
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	628	11	0	0	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	330
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	666
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	660
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	660	-	-	-
HCM Lane V/C Ratio	0.036	-	-	-
HCM Control Delay (s)	10.7	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

AM Near Term
4: Lois St/70th St & University Ave

HCM 2010 Signalized Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↑	↱	↰	↑↱		↰	↰↑	↱
Traffic Volume (veh/h)	180	360	18	12	517	608	27	142	19	262	64	205
Future Volume (veh/h)	180	360	18	12	517	608	27	142	19	262	64	205
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	196	391	20	14	608	715	35	182	24	181	225	228
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.85	0.85	0.85	0.78	0.78	0.78	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	205	1523	78	35	1237	822	253	229	30	323	339	464
Arrive On Green	0.12	0.45	0.45	0.02	0.35	0.35	0.14	0.14	0.14	0.18	0.18	0.18
Sat Flow, veh/h	1774	3421	174	1774	3539	1526	1774	1606	212	1774	1863	1542
Grp Volume(v), veh/h	196	202	209	14	608	715	35	0	206	181	225	228
Grp Sat Flow(s),veh/h/ln	1774	1770	1826	1774	1770	1526	1774	0	1818	1774	1863	1542
Q Serve(g_s), s	10.1	6.6	6.6	0.7	12.4	32.1	1.6	0.0	10.1	8.5	10.3	11.2
Cycle Q Clear(g_c), s	10.1	6.6	6.6	0.7	12.4	32.1	1.6	0.0	10.1	8.5	10.3	11.2
Prop In Lane	1.00		0.10	1.00		1.00	1.00		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	205	788	813	35	1237	822	253	0	259	323	339	464
V/C Ratio(X)	0.96	0.26	0.26	0.40	0.49	0.87	0.14	0.00	0.79	0.56	0.66	0.49
Avail Cap(c_a), veh/h	205	788	813	116	1237	822	657	0	673	657	690	754
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.4	16.0	16.0	44.5	23.5	17.6	34.4	0.0	38.1	34.2	34.9	26.6
Incr Delay (d2), s/veh	50.6	0.2	0.2	7.3	0.3	10.0	0.2	0.0	5.5	1.5	2.2	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.8	3.2	3.4	0.4	6.0	20.2	0.8	0.0	5.4	4.3	5.5	4.9
LnGrp Delay(d),s/veh	91.0	16.1	16.1	51.8	23.8	27.6	34.7	0.0	43.5	35.7	37.2	27.4
LnGrp LOS	F	B	B	D	C	C	C		D	D	D	C
Approach Vol, veh/h		607			1337			241			634	
Approach Delay, s/veh		40.3			26.1			42.2			33.2	
Approach LOS		D			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.2	45.9		21.6	15.0	37.1		18.1
Change Period (Y+Rc), s	4.4	* 5		4.9	4.4	5.0		5.0
Max Green Setting (Gmax), s	6.0	* 37		34.0	10.6	32.1		34.0
Max Q Clear Time (g_c+I1), s	2.7	8.6		13.2	12.1	34.1		12.1
Green Ext Time (p_c), s	0.0	2.2		2.4	0.0	0.0		1.1

Intersection Summary	
HCM 2010 Ctrl Delay	32.1
HCM 2010 LOS	C

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱			✣	
Traffic Volume (veh/h)	10	661	47	42	513	20	29	29	42	10	41	9
Future Volume (veh/h)	10	661	47	42	513	20	29	29	42	10	41	9
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	0.99		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	11	711	51	45	546	21	30	30	44	13	52	11
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.93	0.93	0.93	0.94	0.94	0.94	0.96	0.96	0.96	0.79	0.79	0.79
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	19	1643	118	57	1782	68	520	222	325	111	418	82
Arrive On Green	0.01	0.49	0.49	0.03	0.51	0.51	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1774	3342	240	1774	3471	133	1315	670	982	208	1263	249
Grp Volume(v), veh/h	11	376	386	45	278	289	30	0	74	76	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1812	1774	1770	1835	1315	0	1652	1720	0	0
Q Serve(g_s), s	0.6	13.7	13.7	2.5	9.1	9.1	0.0	0.0	3.1	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.6	13.7	13.7	2.5	9.1	9.1	1.2	0.0	3.1	2.9	0.0	0.0
Prop In Lane	1.00		0.13	1.00		0.07	1.00		0.59	0.17		0.14
Lane Grp Cap(c), veh/h	19	870	891	57	909	942	520	0	547	611	0	0
V/C Ratio(X)	0.59	0.43	0.43	0.78	0.31	0.31	0.06	0.00	0.14	0.12	0.00	0.00
Avail Cap(c_a), veh/h	117	870	891	170	909	942	520	0	547	611	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.94	0.94	0.94	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	49.3	16.4	16.4	48.0	14.0	14.0	22.8	0.0	23.4	23.4	0.0	0.0
Incr Delay (d2), s/veh	10.5	1.6	1.5	7.9	0.8	0.8	0.2	0.0	0.5	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	7.1	7.2	1.4	4.6	4.8	0.6	0.0	1.5	1.5	0.0	0.0
LnGrp Delay(d),s/veh	59.7	18.0	17.9	56.0	14.9	14.8	23.0	0.0	23.9	23.8	0.0	0.0
LnGrp LOS	E	B	B	E	B	B	C		C	C		
Approach Vol, veh/h		773			612			104			76	
Approach Delay, s/veh		18.6			17.9			23.7			23.8	
Approach LOS		B			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.6	54.4		38.0	5.5	56.5		38.0
Change Period (Y+Rc), s	4.4	* 5.2		4.9	4.4	5.2		4.9
Max Green Setting (Gmax), s	9.6	* 43		33.1	6.6	45.8		33.1
Max Q Clear Time (g_c+I1), s	4.5	15.7		4.9	2.6	11.1		5.1
Green Ext Time (p_c), s	0.0	9.3		0.2	0.0	4.7		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	18.9
HCM 2010 LOS	B

Notes

PM Near Term
2: Kroc Center Sig Dwy & University Ave

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	↰	↱
Traffic Volume (veh/h)	661	41	60	552	51	22
Future Volume (veh/h)	661	41	60	552	51	22
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.96	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	696	43	70	642	65	28
Adj No. of Lanes	2	0	1	2	1	1
Peak Hour Factor	0.95	0.95	0.86	0.86	0.78	0.78
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1025	63	89	1555	691	617
Arrive On Green	0.30	0.30	0.05	0.44	0.39	0.39
Sat Flow, veh/h	3471	209	1774	3632	1774	1583
Grp Volume(v), veh/h	364	375	70	642	65	28
Grp Sat Flow(s),veh/h/ln	1770	1816	1774	1770	1774	1583
Q Serve(g_s), s	9.5	9.5	2.1	6.5	1.2	0.6
Cycle Q Clear(g_c), s	9.5	9.5	2.1	6.5	1.2	0.6
Prop In Lane		0.11	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	537	551	89	1555	691	617
V/C Ratio(X)	0.68	0.68	0.78	0.41	0.09	0.05
Avail Cap(c_a), veh/h	1396	1433	489	4070	691	617
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.1	16.1	24.7	10.1	10.2	10.0
Incr Delay (d2), s/veh	1.5	1.5	13.8	0.2	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.8	4.9	1.3	3.2	0.6	0.3
LnGrp Delay(d),s/veh	17.6	17.6	38.5	10.3	10.4	10.1
LnGrp LOS	B	B	D	B	B	B
Approach Vol, veh/h	739			712	93	
Approach Delay, s/veh	17.6			13.1	10.3	
Approach LOS	B			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	7.1	20.5				27.6		25.0
Change Period (Y+Rc), s	4.5	4.5				4.5		4.5
Max Green Setting (Gmax), s	14.5	41.5				60.5		20.5
Max Q Clear Time (g_c+I1), s	4.1	11.5				8.5		3.2
Green Ext Time (p_c), s	0.1	4.4				4.5		0.2

Intersection Summary			
HCM 2010 Ctrl Delay			15.1
HCM 2010 LOS			B

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑		↱
Traffic Vol, veh/h	692	9	0	0	0	49
Future Vol, veh/h	692	9	0	0	0	49
Conflicting Peds, #/hr	0	5	0	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	92	92	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	778	10	0	0	0	75

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	404
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	596
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	591
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	12
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	591	-	-	-
HCM Lane V/C Ratio	0.128	-	-	-
HCM Control Delay (s)	12	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.4	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↱		↰	↰	↱
Traffic Volume (veh/h)	224	547	33	17	397	326	14	103	9	445	143	246
Future Volume (veh/h)	224	547	33	17	397	326	14	103	9	445	143	246
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.95	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	238	582	35	19	441	362	17	126	11	310	373	259
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.90	0.90	0.90	0.82	0.82	0.82	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	238	1227	74	46	900	803	182	173	15	470	494	623
Arrive On Green	0.13	0.36	0.36	0.03	0.25	0.25	0.10	0.10	0.10	0.27	0.27	0.27
Sat Flow, veh/h	1774	3385	203	1774	3539	1507	1774	1686	147	1774	1863	1549
Grp Volume(v), veh/h	238	304	313	19	441	362	17	0	137	310	373	259
Grp Sat Flow(s),veh/h/ln	1774	1770	1819	1774	1770	1507	1774	0	1833	1774	1863	1549
Q Serve(g_s), s	10.6	10.5	10.5	0.8	8.4	12.0	0.7	0.0	5.7	12.3	14.6	9.6
Cycle Q Clear(g_c), s	10.6	10.5	10.5	0.8	8.4	12.0	0.7	0.0	5.7	12.3	14.6	9.6
Prop In Lane	1.00		0.11	1.00		1.00	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	238	641	659	46	900	803	182	0	188	470	494	623
V/C Ratio(X)	1.00	0.47	0.48	0.41	0.49	0.45	0.09	0.00	0.73	0.66	0.76	0.42
Avail Cap(c_a), veh/h	238	823	846	134	1435	1031	762	0	787	762	800	877
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.3	19.4	19.4	38.0	25.1	12.0	32.2	0.0	34.4	25.9	26.7	17.2
Incr Delay (d2), s/veh	58.9	0.5	0.5	5.8	0.4	0.4	0.2	0.0	5.3	1.6	2.4	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.0	5.2	5.3	0.5	4.2	7.8	0.3	0.0	3.2	6.2	7.8	4.1
LnGrp Delay(d),s/veh	93.2	20.0	20.0	43.8	25.5	12.4	32.4	0.0	39.7	27.5	29.1	17.6
LnGrp LOS	F	B	B	D	C	B	C		D	C	C	B
Approach Vol, veh/h		855			822			154			942	
Approach Delay, s/veh		40.3			20.2			38.9			25.4	
Approach LOS		D			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.4	33.7		25.9	15.0	25.1		13.1
Change Period (Y+Rc), s	4.4	* 5		4.9	4.4	5.0		5.0
Max Green Setting (Gmax), s	6.0	* 37		34.0	10.6	32.1		34.0
Max Q Clear Time (g_c+I1), s	2.8	12.5		16.6	12.6	14.0		7.7
Green Ext Time (p_c), s	0.0	3.4		3.7	0.0	3.8		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	29.2
HCM 2010 LOS	C

Notes

Appendix L

Near Term with Project LOS Calculations

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱			✥	
Traffic Volume (veh/h)	1	513	31	32	628	34	71	98	76	7	20	7
Future Volume (veh/h)	1	513	31	32	628	34	71	98	76	7	20	7
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	0.98		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	1	633	38	39	757	41	78	108	84	8	24	8
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.81	0.81	0.81	0.83	0.83	0.83	0.91	0.91	0.91	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	2	1464	88	49	1564	85	596	362	282	142	405	125
Arrive On Green	0.00	0.43	0.43	0.03	0.46	0.46	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	1774	3385	203	1774	3409	185	1346	956	744	247	1069	329
Grp Volume(v), veh/h	1	331	340	39	393	405	78	0	192	40	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1819	1774	1770	1824	1346	0	1700	1645	0	0
Q Serve(g_s), s	0.1	11.7	11.8	2.0	13.9	13.9	1.8	0.0	7.1	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	11.7	11.8	2.0	13.9	13.9	3.0	0.0	7.1	1.3	0.0	0.0
Prop In Lane	1.00		0.11	1.00		0.10	1.00		0.44	0.20		0.20
Lane Grp Cap(c), veh/h	2	765	786	49	812	837	596	0	644	671	0	0
V/C Ratio(X)	0.51	0.43	0.43	0.79	0.48	0.48	0.13	0.00	0.30	0.06	0.00	0.00
Avail Cap(c_a), veh/h	91	765	786	150	812	837	596	0	644	671	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.86	0.86	0.86	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	44.9	17.8	17.8	43.5	16.9	16.9	18.2	0.0	19.6	17.8	0.0	0.0
Incr Delay (d2), s/veh	59.5	1.8	1.7	8.9	1.8	1.7	0.5	0.0	1.2	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	6.1	6.2	1.1	7.2	7.4	1.3	0.0	3.5	0.7	0.0	0.0
LnGrp Delay(d),s/veh	104.4	19.6	19.6	52.4	18.7	18.7	18.7	0.0	20.8	17.9	0.0	0.0
LnGrp LOS	F	B	B	D	B	B	B		C	B		
Approach Vol, veh/h		672			837			270			40	
Approach Delay, s/veh		19.7			20.3			20.2			17.9	
Approach LOS		B			C			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.9	44.1		39.0	4.5	46.5		39.0
Change Period (Y+Rc), s	4.4	* 5.2		4.9	4.4	5.2		4.9
Max Green Setting (Gmax), s	7.6	* 34		34.1	4.6	36.8		34.1
Max Q Clear Time (g_c+I1), s	4.0	13.8		3.3	2.1	15.9		9.1
Green Ext Time (p_c), s	0.0	7.0		0.1	0.0	6.3		0.7

Intersection Summary			
HCM 2010 Ctrl Delay			20.0
HCM 2010 LOS			B

Notes

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	↰	↱
Traffic Volume (veh/h)	513	48	55	672	45	14
Future Volume (veh/h)	513	48	55	672	45	14
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.96	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	611	57	68	830	58	18
Adj No. of Lanes	2	0	1	2	1	1
Peak Hour Factor	0.84	0.84	0.81	0.81	0.77	0.77
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	926	86	86	1489	714	637
Arrive On Green	0.28	0.28	0.05	0.42	0.40	0.40
Sat Flow, veh/h	3355	304	1774	3632	1774	1583
Grp Volume(v), veh/h	331	337	68	830	58	18
Grp Sat Flow(s),veh/h/ln	1770	1796	1774	1770	1774	1583
Q Serve(g_s), s	8.4	8.4	1.9	9.0	1.0	0.3
Cycle Q Clear(g_c), s	8.4	8.4	1.9	9.0	1.0	0.3
Prop In Lane		0.17	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	502	510	86	1489	714	637
V/C Ratio(X)	0.66	0.66	0.79	0.56	0.08	0.03
Avail Cap(c_a), veh/h	1477	1499	470	4204	714	637
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.1	16.1	24.0	11.2	9.4	9.2
Incr Delay (d2), s/veh	1.5	1.5	14.6	0.3	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	4.3	1.3	4.4	0.5	0.2
LnGrp Delay(d),s/veh	17.5	17.6	38.6	11.5	9.6	9.3
LnGrp LOS	B	B	D	B	A	A
Approach Vol, veh/h	668			898	76	
Approach Delay, s/veh	17.6			13.5	9.5	
Approach LOS	B			B	A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	7.0	19.0				25.9		25.0
Change Period (Y+Rc), s	4.5	4.5				4.5		4.5
Max Green Setting (Gmax), s	13.5	42.5				60.5		20.5
Max Q Clear Time (g_c+I1), s	3.9	10.4				11.0		3.0
Green Ext Time (p_c), s	0.1	4.0				6.2		0.1

Intersection Summary		
HCM 2010 Ctrl Delay		15.0
HCM 2010 LOS		B

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑		↱
Traffic Vol, veh/h	516	11	0	0	0	28
Future Vol, veh/h	516	11	0	0	0	28
Conflicting Peds, #/hr	0	5	0	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	92	92	63	63
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	629	13	0	0	0	44

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	331
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	665
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	659
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	659	-	-	-
HCM Lane V/C Ratio	0.067	-	-	-
HCM Control Delay (s)	10.9	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↱		↰	↰	↱
Traffic Volume (veh/h)	186	369	18	12	528	608	27	142	19	262	64	212
Future Volume (veh/h)	186	369	18	12	528	608	27	142	19	262	64	212
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	202	401	20	14	621	715	35	182	24	181	225	236
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.85	0.85	0.85	0.78	0.78	0.78	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	204	1516	75	35	1230	825	253	229	30	330	347	469
Arrive On Green	0.11	0.44	0.44	0.02	0.35	0.35	0.14	0.14	0.14	0.19	0.19	0.19
Sat Flow, veh/h	1774	3426	170	1774	3539	1525	1774	1606	212	1774	1863	1543
Grp Volume(v), veh/h	202	207	214	14	621	715	35	0	206	181	225	236
Grp Sat Flow(s),veh/h/ln	1774	1770	1827	1774	1770	1525	1774	0	1818	1774	1863	1543
Q Serve(g_s), s	10.5	6.8	6.9	0.7	12.8	32.1	1.6	0.0	10.1	8.5	10.3	11.7
Cycle Q Clear(g_c), s	10.5	6.8	6.9	0.7	12.8	32.1	1.6	0.0	10.1	8.5	10.3	11.7
Prop In Lane	1.00		0.09	1.00		1.00	1.00		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	204	783	808	35	1230	825	253	0	259	330	347	469
V/C Ratio(X)	0.99	0.26	0.27	0.40	0.50	0.87	0.14	0.00	0.79	0.55	0.65	0.50
Avail Cap(c_a), veh/h	204	783	808	115	1230	825	653	0	669	653	686	749
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.8	16.2	16.3	44.7	23.9	17.5	34.6	0.0	38.3	34.1	34.8	26.6
Incr Delay (d2), s/veh	60.7	0.2	0.2	7.3	0.3	9.7	0.2	0.0	5.5	1.4	2.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.5	3.4	3.5	0.4	6.3	20.3	0.8	0.0	5.5	4.3	5.5	5.1
LnGrp Delay(d),s/veh	101.6	16.4	16.4	52.1	24.2	27.2	34.9	0.0	43.8	35.5	36.8	27.5
LnGrp LOS	F	B	B	D	C	C	C		D	D	D	C
Approach Vol, veh/h		623			1350			241			642	
Approach Delay, s/veh		44.0			26.1			42.5			33.0	
Approach LOS		D			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.2	45.9		22.1	15.0	37.1		18.2
Change Period (Y+Rc), s	4.4	* 5		4.9	4.4	5.0		5.0
Max Green Setting (Gmax), s	6.0	* 37		34.0	10.6	32.1		34.0
Max Q Clear Time (g_c+I1), s	2.7	8.9		13.7	12.5	34.1		12.1
Green Ext Time (p_c), s	0.0	2.3		2.4	0.0	0.0		1.1

Intersection Summary	
HCM 2010 Ctrl Delay	32.9
HCM 2010 LOS	C

Notes

PM Near Term + Project
1: Aragon Dr & University Ave

HCM 2010 Signalized Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱			✥	
Traffic Volume (veh/h)	10	690	47	44	534	20	29	29	45	10	41	9
Future Volume (veh/h)	10	690	47	44	534	20	29	29	45	10	41	9
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	0.99		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	11	742	51	47	568	21	30	30	47	13	52	11
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.93	0.93	0.93	0.94	0.94	0.94	0.96	0.96	0.96	0.79	0.79	0.79
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	19	1644	113	60	1785	66	520	212	333	111	418	82
Arrive On Green	0.01	0.49	0.49	0.03	0.51	0.51	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1774	3353	230	1774	3477	128	1315	642	1005	208	1263	249
Grp Volume(v), veh/h	11	391	402	47	289	300	30	0	77	76	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1814	1774	1770	1836	1315	0	1647	1719	0	0
Q Serve(g_s), s	0.6	14.5	14.5	2.6	9.5	9.5	0.0	0.0	3.3	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.6	14.5	14.5	2.6	9.5	9.5	1.2	0.0	3.3	2.9	0.0	0.0
Prop In Lane	1.00		0.13	1.00		0.07	1.00		0.61	0.17		0.14
Lane Grp Cap(c), veh/h	19	867	889	60	909	943	520	0	545	611	0	0
V/C Ratio(X)	0.59	0.45	0.45	0.78	0.32	0.32	0.06	0.00	0.14	0.12	0.00	0.00
Avail Cap(c_a), veh/h	117	867	889	170	909	943	520	0	545	611	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.95	0.95	0.95	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	49.3	16.7	16.7	47.9	14.1	14.1	22.8	0.0	23.5	23.4	0.0	0.0
Incr Delay (d2), s/veh	10.5	1.7	1.7	7.7	0.9	0.8	0.2	0.0	0.5	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	7.5	7.7	1.4	4.9	5.1	0.6	0.0	1.6	1.5	0.0	0.0
LnGrp Delay(d),s/veh	59.7	18.4	18.3	55.6	15.0	15.0	23.0	0.0	24.0	23.8	0.0	0.0
LnGrp LOS	E	B	B	E	B	B	C		C	C		
Approach Vol, veh/h		804			636			107			76	
Approach Delay, s/veh		18.9			18.0			23.7			23.8	
Approach LOS		B			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.8	54.2		38.0	5.5	56.5		38.0
Change Period (Y+Rc), s	4.4	* 5.2		4.9	4.4	5.2		4.9
Max Green Setting (Gmax), s	9.6	* 43		33.1	6.6	45.8		33.1
Max Q Clear Time (g_c+I1), s	4.6	16.5		4.9	2.6	11.5		5.3
Green Ext Time (p_c), s	0.0	9.7		0.2	0.0	5.0		0.3

Intersection Summary			
HCM 2010 Ctrl Delay			19.1
HCM 2010 LOS			B

Notes

PM Near Term + Project
2: Kroc Center Sig Dwy & University Ave

HCM 2010 Signalized Intersection Summary

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	↰	↱
Traffic Volume (veh/h)	664	70	92	552	74	24
Future Volume (veh/h)	664	70	92	552	74	24
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.96	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	699	74	107	642	95	31
Adj No. of Lanes	2	0	1	2	1	1
Peak Hour Factor	0.95	0.95	0.86	0.86	0.78	0.78
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1002	106	140	1667	652	582
Arrive On Green	0.31	0.31	0.08	0.47	0.37	0.37
Sat Flow, veh/h	3310	340	1774	3632	1774	1583
Grp Volume(v), veh/h	384	389	107	642	95	31
Grp Sat Flow(s),veh/h/ln	1770	1787	1774	1770	1774	1583
Q Serve(g_s), s	10.7	10.7	3.3	6.5	2.0	0.7
Cycle Q Clear(g_c), s	10.7	10.7	3.3	6.5	2.0	0.7
Prop In Lane		0.19	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	551	557	140	1667	652	582
V/C Ratio(X)	0.70	0.70	0.76	0.39	0.15	0.05
Avail Cap(c_a), veh/h	1317	1330	461	3839	652	582
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.9	16.9	25.2	9.5	11.8	11.4
Incr Delay (d2), s/veh	1.6	1.6	8.3	0.1	0.5	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.4	5.4	1.9	3.2	1.1	0.3
LnGrp Delay(d),s/veh	18.5	18.5	33.5	9.7	12.3	11.6
LnGrp LOS	B	B	C	A	B	B
Approach Vol, veh/h	773			749	126	
Approach Delay, s/veh	18.5			13.1	12.1	
Approach LOS	B			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	8.9	21.9				30.8		25.0
Change Period (Y+Rc), s	4.5	4.5				4.5		4.5
Max Green Setting (Gmax), s	14.5	41.5				60.5		20.5
Max Q Clear Time (g_c+I1), s	5.3	12.7				8.5		4.0
Green Ext Time (p_c), s	0.1	4.7				4.5		0.3

Intersection Summary		
HCM 2010 Ctrl Delay		15.5
HCM 2010 LOS		B

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑		↱
Traffic Vol, veh/h	694	12	0	0	0	71
Future Vol, veh/h	694	12	0	0	0	71
Conflicting Peds, #/hr	0	5	0	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	92	92	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	780	13	0	0	0	109

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	407
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	593
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	588
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	12.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	588	-	-	-
HCM Lane V/C Ratio	0.186	-	-	-
HCM Control Delay (s)	12.5	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.7	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↱		↰	↰	↱
Traffic Volume (veh/h)	233	561	33	17	416	326	14	103	9	445	143	259
Future Volume (veh/h)	233	561	33	17	416	326	14	103	9	445	143	259
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.95	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	248	597	35	19	462	362	17	126	11	310	373	273
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.90	0.90	0.90	0.82	0.82	0.82	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	237	1231	72	46	903	805	182	173	15	471	494	623
Arrive On Green	0.13	0.36	0.36	0.03	0.26	0.26	0.10	0.10	0.10	0.27	0.27	0.27
Sat Flow, veh/h	1774	3391	199	1774	3539	1507	1774	1686	147	1774	1863	1549
Grp Volume(v), veh/h	248	311	321	19	462	362	17	0	137	310	373	273
Grp Sat Flow(s),veh/h/ln	1774	1770	1820	1774	1770	1507	1774	0	1833	1774	1863	1549
Q Serve(g_s), s	10.6	10.8	10.8	0.8	8.9	12.0	0.7	0.0	5.8	12.3	14.6	10.2
Cycle Q Clear(g_c), s	10.6	10.8	10.8	0.8	8.9	12.0	0.7	0.0	5.8	12.3	14.6	10.2
Prop In Lane	1.00		0.11	1.00		1.00	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	237	642	660	46	903	805	182	0	188	471	494	623
V/C Ratio(X)	1.05	0.48	0.49	0.41	0.51	0.45	0.09	0.00	0.73	0.66	0.75	0.44
Avail Cap(c_a), veh/h	237	820	844	134	1431	1030	760	0	785	760	798	875
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.4	19.5	19.6	38.1	25.3	12.0	32.3	0.0	34.5	26.0	26.8	17.4
Incr Delay (d2), s/veh	71.3	0.6	0.6	5.9	0.4	0.4	0.2	0.0	5.3	1.6	2.4	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.8	5.4	5.5	0.5	4.4	7.8	0.3	0.0	3.2	6.2	7.8	4.4
LnGrp Delay(d),s/veh	105.7	20.1	20.1	43.9	25.8	12.4	32.5	0.0	39.8	27.5	29.1	17.9
LnGrp LOS	F	C	C	D	C	B	C		D	C	C	B
Approach Vol, veh/h		880			843			154			956	
Approach Delay, s/veh		44.2			20.4			39.0			25.4	
Approach LOS		D			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.5	33.8		26.0	15.0	25.3		13.2
Change Period (Y+Rc), s	4.4	* 5		4.9	4.4	5.0		5.0
Max Green Setting (Gmax), s	6.0	* 37		34.0	10.6	32.1		34.0
Max Q Clear Time (g_c+I1), s	2.8	12.8		16.6	12.6	14.0		7.8
Green Ext Time (p_c), s	0.0	3.5		3.7	0.0	3.9		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	30.5
HCM 2010 LOS	C

Notes

Appendix M

Horizon Year LOS Calculations

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱			✣	
Traffic Volume (veh/h)	0	530	30	30	650	40	80	100	80	10	20	10
Future Volume (veh/h)	0	530	30	30	650	40	80	100	80	10	20	10
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	0.98		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	0	654	37	36	783	48	88	110	88	12	24	12
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.81	0.81	0.81	0.83	0.83	0.83	0.91	0.91	0.91	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	2	1474	83	47	1721	105	563	357	286	165	317	144
Arrive On Green	0.00	0.43	0.43	0.03	0.51	0.51	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	1774	3399	192	1774	3381	207	1345	943	755	303	837	380
Grp Volume(v), veh/h	0	340	351	36	410	421	88	0	198	48	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1821	1774	1770	1819	1345	0	1698	1520	0	0
Q Serve(g_s), s	0.0	12.1	12.2	1.8	13.3	13.3	0.0	0.0	7.4	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	12.1	12.2	1.8	13.3	13.3	5.3	0.0	7.4	7.4	0.0	0.0
Prop In Lane	1.00		0.11	1.00		0.11	1.00		0.44	0.25		0.25
Lane Grp Cap(c), veh/h	2	767	790	47	901	926	563	0	643	626	0	0
V/C Ratio(X)	0.00	0.44	0.44	0.77	0.45	0.46	0.16	0.00	0.31	0.08	0.00	0.00
Avail Cap(c_a), veh/h	81	767	790	150	901	926	563	0	643	626	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.83	0.83	0.83	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	17.9	17.9	43.5	14.1	14.1	19.0	0.0	19.7	17.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.9	1.8	8.0	1.4	1.3	0.6	0.0	1.2	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	6.3	6.4	1.0	6.8	7.0	1.6	0.0	3.7	0.8	0.0	0.0
LnGrp Delay(d),s/veh	0.0	19.7	19.7	51.5	15.5	15.5	19.6	0.0	20.9	18.1	0.0	0.0
LnGrp LOS		B	B	D	B	B	B		C	B		
Approach Vol, veh/h		691			867			286			48	
Approach Delay, s/veh		19.7			17.0			20.5			18.1	
Approach LOS		B			B			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.8	44.2		39.0	0.0	51.0		39.0				
Change Period (Y+Rc), s	4.4	* 5.2		4.9	4.4	5.2		4.9				
Max Green Setting (Gmax), s	7.6	* 34		34.1	4.1	37.3		34.1				
Max Q Clear Time (g_c+I1), s	3.8	14.2		9.4	0.0	15.3		9.4				
Green Ext Time (p_c), s	0.0	7.2		0.1	0.0	6.7		0.8				
Intersection Summary												
HCM 2010 Ctrl Delay			18.5									
HCM 2010 LOS			B									
Notes												

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	↰	↱
Traffic Volume (veh/h)	540	30	40	710	30	10
Future Volume (veh/h)	540	30	40	710	30	10
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.97	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	643	36	49	877	39	13
Adj No. of Lanes	2	0	1	2	1	1
Peak Hour Factor	0.84	0.84	0.81	0.81	0.77	0.77
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	976	55	70	1471	721	643
Arrive On Green	0.29	0.29	0.04	0.42	0.41	0.41
Sat Flow, veh/h	3494	190	1774	3632	1774	1583
Grp Volume(v), veh/h	334	345	49	877	39	13
Grp Sat Flow(s),veh/h/ln	1770	1821	1774	1770	1774	1583
Q Serve(g_s), s	8.4	8.4	1.4	9.7	0.7	0.2
Cycle Q Clear(g_c), s	8.4	8.4	1.4	9.7	0.7	0.2
Prop In Lane		0.10	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	508	523	70	1471	721	643
V/C Ratio(X)	0.66	0.66	0.70	0.60	0.05	0.02
Avail Cap(c_a), veh/h	1490	1533	474	4242	721	643
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.8	15.8	23.9	11.5	9.1	9.0
Incr Delay (d2), s/veh	1.5	1.4	12.0	0.4	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	4.4	0.9	4.7	0.4	0.1
LnGrp Delay(d),s/veh	17.3	17.3	36.0	11.9	9.2	9.0
LnGrp LOS	B	B	D	B	A	A
Approach Vol, veh/h	679			926	52	
Approach Delay, s/veh	17.3			13.1	9.2	
Approach LOS	B			B	A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	6.5	19.0				25.5		25.0
Change Period (Y+Rc), s	4.5	4.5				4.5		4.5
Max Green Setting (Gmax), s	13.5	42.5				60.5		20.5
Max Q Clear Time (g_c+I1), s	3.4	10.4				11.7		2.7
Green Ext Time (p_c), s	0.0	4.0				6.7		0.1

Intersection Summary		
HCM 2010 Ctrl Delay		14.7
HCM 2010 LOS		B

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑		↱
Traffic Vol, veh/h	540	10	0	0	0	20
Future Vol, veh/h	540	10	0	0	0	20
Conflicting Peds, #/hr	0	5	0	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	92	92	63	63
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	659	12	0	0	0	32

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	346
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	650
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	645
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	645	-	-	-
HCM Lane V/C Ratio	0.049	-	-	-
HCM Control Delay (s)	10.9	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↱		↰	↰	↱
Traffic Volume (veh/h)	190	380	20	10	550	640	30	150	20	280	70	220
Future Volume (veh/h)	190	380	20	10	550	640	30	150	20	280	70	220
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	207	413	22	12	647	753	38	192	26	194	241	244
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.85	0.85	0.85	0.78	0.78	0.78	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	237	1604	85	30	1250	828	259	234	32	324	341	493
Arrive On Green	0.13	0.47	0.47	0.02	0.35	0.35	0.15	0.15	0.15	0.18	0.18	0.18
Sat Flow, veh/h	1774	3413	181	1774	3539	1526	1774	1600	217	1774	1863	1542
Grp Volume(v), veh/h	207	213	222	12	647	753	38	0	218	194	241	244
Grp Sat Flow(s),veh/h/ln	1774	1770	1824	1774	1770	1526	1774	0	1817	1774	1863	1542
Q Serve(g_s), s	12.0	7.6	7.7	0.7	15.2	37.0	2.0	0.0	12.2	10.5	12.7	13.5
Cycle Q Clear(g_c), s	12.0	7.6	7.7	0.7	15.2	37.0	2.0	0.0	12.2	10.5	12.7	13.5
Prop In Lane	1.00		0.10	1.00		1.00	1.00		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	237	832	857	30	1250	828	259	0	265	324	341	493
V/C Ratio(X)	0.87	0.26	0.26	0.40	0.52	0.91	0.15	0.00	0.82	0.60	0.71	0.49
Avail Cap(c_a), veh/h	247	832	857	102	1250	828	576	0	590	594	624	728
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.5	16.7	16.8	51.0	26.8	19.9	39.0	0.0	43.4	39.3	40.2	29.1
Incr Delay (d2), s/veh	26.6	0.2	0.2	8.4	0.4	13.9	0.3	0.0	6.2	1.8	2.7	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.6	3.8	3.9	0.4	7.4	24.7	1.0	0.0	6.6	5.3	6.8	5.8
LnGrp Delay(d),s/veh	71.1	16.9	16.9	59.4	27.2	33.7	39.3	0.0	49.6	41.0	42.9	29.8
LnGrp LOS	E	B	B	E	C	C	D		D	D	D	C
Approach Vol, veh/h		642			1412			256			679	
Approach Delay, s/veh		34.4			31.0			48.1			37.7	
Approach LOS		C			C			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.2	54.2		24.1	18.4	42.0		20.3
Change Period (Y+Rc), s	4.4	* 5		4.9	4.4	5.0		5.0
Max Green Setting (Gmax), s	6.0	* 46		35.1	14.6	37.0		34.0
Max Q Clear Time (g_c+I1), s	2.7	9.7		15.5	14.0	39.0		14.2
Green Ext Time (p_c), s	0.0	2.4		2.5	0.0	0.0		1.1

Intersection Summary	
HCM 2010 Ctrl Delay	34.7
HCM 2010 LOS	C

Notes

PM Horizon Year
1: Aragon Dr & University Ave

HCM 2010 Signalized Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱			✥	
Traffic Volume (veh/h)	10	700	50	40	540	20	30	30	40	10	40	10
Future Volume (veh/h)	10	700	50	40	540	20	30	30	40	10	40	10
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	0.99		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	11	753	54	43	574	21	31	31	42	13	51	13
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.93	0.93	0.93	0.94	0.94	0.94	0.96	0.96	0.96	0.79	0.79	0.79
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	19	1648	118	55	1786	65	520	233	316	109	404	96
Arrive On Green	0.01	0.49	0.49	0.03	0.51	0.51	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1774	3342	240	1774	3478	127	1314	704	954	203	1221	289
Grp Volume(v), veh/h	11	399	408	43	292	303	31	0	73	77	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1812	1774	1770	1836	1314	0	1658	1713	0	0
Q Serve(g_s), s	0.6	14.7	14.7	2.4	9.6	9.6	0.0	0.0	3.1	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.6	14.7	14.7	2.4	9.6	9.6	1.2	0.0	3.1	3.0	0.0	0.0
Prop In Lane	1.00		0.13	1.00		0.07	1.00		0.58	0.17		0.17
Lane Grp Cap(c), veh/h	19	873	894	55	909	943	520	0	549	609	0	0
V/C Ratio(X)	0.59	0.46	0.46	0.79	0.32	0.32	0.06	0.00	0.13	0.13	0.00	0.00
Avail Cap(c_a), veh/h	117	873	894	170	909	943	520	0	549	609	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.93	0.93	0.93	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	49.3	16.6	16.6	48.1	14.2	14.2	22.8	0.0	23.4	23.4	0.0	0.0
Incr Delay (d2), s/veh	10.5	1.7	1.7	8.4	0.9	0.8	0.2	0.0	0.5	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	7.6	7.8	1.3	4.9	5.1	0.6	0.0	1.5	1.5	0.0	0.0
LnGrp Delay(d),s/veh	59.7	18.3	18.3	56.5	15.0	15.0	23.0	0.0	23.9	23.8	0.0	0.0
LnGrp LOS	E	B	B	E	B	B	C		C	C		
Approach Vol, veh/h		818			638			104			77	
Approach Delay, s/veh		18.8			17.8			23.6			23.8	
Approach LOS		B			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.5	54.5		38.0	5.5	56.5		38.0
Change Period (Y+Rc), s	4.4	* 5.2		4.9	4.4	5.2		4.9
Max Green Setting (Gmax), s	9.6	* 43		33.1	6.6	45.8		33.1
Max Q Clear Time (g_c+I1), s	4.4	16.7		5.0	2.6	11.6		5.1
Green Ext Time (p_c), s	0.0	9.8		0.2	0.0	5.0		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	19.0
HCM 2010 LOS	B

Notes

PM Horizon Year

2: Kroc Center Sig Dwy & University Ave

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	↰	↱
Traffic Volume (veh/h)	700	40	60	580	50	20
Future Volume (veh/h)	700	40	60	580	50	20
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.96	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	737	42	70	674	64	26
Adj No. of Lanes	2	0	1	2	1	1
Peak Hour Factor	0.95	0.95	0.86	0.86	0.78	0.78
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1071	61	89	1591	678	606
Arrive On Green	0.32	0.32	0.05	0.45	0.38	0.38
Sat Flow, veh/h	3489	193	1774	3632	1774	1583
Grp Volume(v), veh/h	384	395	70	674	64	26
Grp Sat Flow(s),veh/h/ln	1770	1820	1774	1770	1774	1583
Q Serve(g_s), s	10.2	10.2	2.1	6.9	1.2	0.6
Cycle Q Clear(g_c), s	10.2	10.2	2.1	6.9	1.2	0.6
Prop In Lane		0.11	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	558	574	89	1591	678	606
V/C Ratio(X)	0.69	0.69	0.78	0.42	0.09	0.04
Avail Cap(c_a), veh/h	1370	1409	480	3995	678	606
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.0	16.0	25.2	10.0	10.6	10.4
Incr Delay (d2), s/veh	1.5	1.5	13.7	0.2	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.1	5.3	1.4	3.4	0.7	0.3
LnGrp Delay(d),s/veh	17.6	17.5	38.9	10.2	10.9	10.5
LnGrp LOS	B	B	D	B	B	B
Approach Vol, veh/h	779			744	90	
Approach Delay, s/veh	17.5			12.9	10.8	
Approach LOS	B			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	7.2	21.4				28.6		25.0
Change Period (Y+Rc), s	4.5	4.5				4.5		4.5
Max Green Setting (Gmax), s	14.5	41.5				60.5		20.5
Max Q Clear Time (g_c+I1), s	4.1	12.2				8.9		3.2
Green Ext Time (p_c), s	0.1	4.7				4.8		0.2

Intersection Summary			
HCM 2010 Ctrl Delay			15.0
HCM 2010 LOS			B

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑		↱
Traffic Vol, veh/h	730	10	0	0	0	50
Future Vol, veh/h	730	10	0	0	0	50
Conflicting Peds, #/hr	0	5	0	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	92	92	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	820	11	0	0	0	77

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	426
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	577
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	572
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	12.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	572	-	-	-
HCM Lane V/C Ratio	0.134	-	-	-
HCM Control Delay (s)	12.3	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.5	-	-	-

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↱		↰	↰	↱
Traffic Volume (veh/h)	240	580	30	20	420	340	10	110	10	470	150	260
Future Volume (veh/h)	240	580	30	20	420	340	10	110	10	470	150	260
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.95	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	255	617	32	22	467	378	12	134	12	326	394	274
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.90	0.90	0.90	0.82	0.82	0.82	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	290	1316	68	50	885	799	187	177	16	473	497	672
Arrive On Green	0.16	0.39	0.39	0.03	0.25	0.25	0.11	0.11	0.11	0.27	0.27	0.27
Sat Flow, veh/h	1774	3417	177	1774	3539	1506	1774	1682	151	1774	1863	1549
Grp Volume(v), veh/h	255	319	330	22	467	378	12	0	146	326	394	274
Grp Sat Flow(s),veh/h/ln	1774	1770	1825	1774	1770	1506	1774	0	1832	1774	1863	1549
Q Serve(g_s), s	12.6	12.2	12.2	1.1	10.3	14.6	0.5	0.0	7.0	14.9	17.7	11.0
Cycle Q Clear(g_c), s	12.6	12.2	12.2	1.1	10.3	14.6	0.5	0.0	7.0	14.9	17.7	11.0
Prop In Lane	1.00		0.10	1.00		1.00	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	290	682	703	50	885	799	187	0	193	473	497	672
V/C Ratio(X)	0.88	0.47	0.47	0.44	0.53	0.47	0.06	0.00	0.76	0.69	0.79	0.41
Avail Cap(c_a), veh/h	307	822	847	118	1262	959	670	0	692	670	703	843
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.8	20.8	20.8	43.0	29.2	14.0	36.3	0.0	39.1	29.6	30.7	17.8
Incr Delay (d2), s/veh	23.4	0.5	0.5	6.0	0.5	0.4	0.1	0.0	5.9	1.8	4.1	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.0	6.0	6.2	0.6	5.1	9.4	0.3	0.0	3.8	7.5	9.7	4.7
LnGrp Delay(d),s/veh	60.2	21.3	21.3	49.0	29.6	14.5	36.4	0.0	45.1	31.4	34.8	18.2
LnGrp LOS	E	C	C	D	C	B	D		D	C	C	B
Approach Vol, veh/h		904			867			158			994	
Approach Delay, s/veh		32.2			23.5			44.4			29.1	
Approach LOS		C			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.9	39.7		28.9	19.1	27.5		14.5
Change Period (Y+Rc), s	4.4	* 5		4.9	4.4	5.0		5.0
Max Green Setting (Gmax), s	6.0	* 42		34.0	15.6	32.1		34.0
Max Q Clear Time (g_c+I1), s	3.1	14.2		19.7	14.6	16.6		9.0
Green Ext Time (p_c), s	0.0	3.7		3.7	0.1	3.8		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	29.3
HCM 2010 LOS	C

Notes

Appendix N

Horizon Year with Project LOS Calculations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱			✣	
Traffic Volume (veh/h)	0	546	30	31	663	40	80	100	82	10	20	10
Future Volume (veh/h)	0	546	30	31	663	40	80	100	82	10	20	10
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	0.98		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	0	674	37	37	799	48	88	110	90	12	24	12
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.81	0.81	0.81	0.83	0.83	0.83	0.91	0.91	0.91	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	2	1475	81	48	1723	103	562	353	289	164	316	144
Arrive On Green	0.00	0.43	0.43	0.03	0.51	0.51	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	1774	3405	187	1774	3386	203	1345	933	763	302	835	379
Grp Volume(v), veh/h	0	350	361	37	417	430	88	0	200	48	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1822	1774	1770	1820	1345	0	1696	1515	0	0
Q Serve(g_s), s	0.0	12.6	12.6	1.9	13.6	13.7	0.0	0.0	7.5	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	12.6	12.6	1.9	13.6	13.7	5.3	0.0	7.5	7.5	0.0	0.0
Prop In Lane	1.00		0.10	1.00		0.11	1.00		0.45	0.25		0.25
Lane Grp Cap(c), veh/h	2	767	789	48	901	926	562	0	643	624	0	0
V/C Ratio(X)	0.00	0.46	0.46	0.78	0.46	0.46	0.16	0.00	0.31	0.08	0.00	0.00
Avail Cap(c_a), veh/h	81	767	789	150	901	926	562	0	643	624	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.85	0.85	0.85	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	18.0	18.0	43.5	14.2	14.2	19.0	0.0	19.7	17.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	2.0	1.9	8.3	1.5	1.4	0.6	0.0	1.3	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	6.5	6.7	1.0	7.0	7.2	1.6	0.0	3.7	0.8	0.0	0.0
LnGrp Delay(d),s/veh	0.0	20.0	19.9	51.8	15.7	15.6	19.6	0.0	20.9	18.1	0.0	0.0
LnGrp LOS		B	B	D	B	B	B		C	B		
Approach Vol, veh/h		711			884			288			48	
Approach Delay, s/veh		20.0			17.2			20.5			18.1	
Approach LOS		B			B			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.8	44.2		39.0	0.0	51.0		39.0
Change Period (Y+Rc), s	4.4	* 5.2		4.9	4.4	5.2		4.9
Max Green Setting (Gmax), s	7.6	* 34		34.1	4.1	37.3		34.1
Max Q Clear Time (g_c+I1), s	3.9	14.6		9.5	0.0	15.7		9.5
Green Ext Time (p_c), s	0.0	7.3		0.1	0.0	6.8		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	18.7
HCM 2010 LOS	B

Notes

AM Horizon Year + Project
2: Kroc Center Sig Dwy & University Ave

HCM 2010 Signalized Intersection Summary

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	↰	↱
Traffic Volume (veh/h)	542	46	58	710	45	11
Future Volume (veh/h)	542	46	58	710	45	11
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.97	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	645	55	72	877	58	14
Adj No. of Lanes	2	0	1	2	1	1
Peak Hour Factor	0.84	0.84	0.81	0.81	0.77	0.77
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	963	82	92	1526	701	626
Arrive On Green	0.29	0.29	0.05	0.43	0.40	0.40
Sat Flow, veh/h	3384	280	1774	3632	1774	1583
Grp Volume(v), veh/h	346	354	72	877	58	14
Grp Sat Flow(s),veh/h/ln	1770	1801	1774	1770	1774	1583
Q Serve(g_s), s	8.9	9.0	2.1	9.7	1.1	0.3
Cycle Q Clear(g_c), s	8.9	9.0	2.1	9.7	1.1	0.3
Prop In Lane		0.16	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	518	527	92	1526	701	626
V/C Ratio(X)	0.67	0.67	0.78	0.57	0.08	0.02
Avail Cap(c_a), veh/h	1450	1476	462	4128	701	626
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.1	16.1	24.3	11.2	9.8	9.6
Incr Delay (d2), s/veh	1.5	1.5	13.5	0.3	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.5	4.6	1.3	4.8	0.6	0.1
LnGrp Delay(d),s/veh	17.6	17.6	37.8	11.5	10.0	9.6
LnGrp LOS	B	B	D	B	B	A
Approach Vol, veh/h	700			949	72	
Approach Delay, s/veh	17.6			13.5	10.0	
Approach LOS	B			B	A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	7.2	19.7				26.9		25.0
Change Period (Y+Rc), s	4.5	4.5				4.5		4.5
Max Green Setting (Gmax), s	13.5	42.5				60.5		20.5
Max Q Clear Time (g_c+I1), s	4.1	11.0				11.7		3.1
Green Ext Time (p_c), s	0.1	4.2				6.7		0.1

Intersection Summary			
HCM 2010 Ctrl Delay			15.0
HCM 2010 LOS			B

AM Horizon Year + Project
3: Kroc E. UnSig Dwy & University Ave

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑		↱
Traffic Vol, veh/h	541	12	0	0	0	33
Future Vol, veh/h	541	12	0	0	0	33
Conflicting Peds, #/hr	0	5	0	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	92	92	63	63
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	660	15	0	0	0	52

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	348
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	648
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	643
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		0		11.1	
HCM LOS					B	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	643	-	-	-
HCM Lane V/C Ratio	0.081	-	-	-
HCM Control Delay (s)	11.1	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↱		↰	↰	↱
Traffic Volume (veh/h)	196	389	20	10	561	640	30	150	20	280	70	227
Future Volume (veh/h)	196	389	20	10	561	640	30	150	20	280	70	227
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	213	423	22	12	660	753	38	192	26	194	241	252
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.85	0.85	0.85	0.78	0.78	0.78	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	242	1603	83	30	1237	828	259	233	32	330	346	503
Arrive On Green	0.14	0.47	0.47	0.02	0.35	0.35	0.15	0.15	0.15	0.19	0.19	0.19
Sat Flow, veh/h	1774	3418	177	1774	3539	1526	1774	1600	217	1774	1863	1542
Grp Volume(v), veh/h	213	218	227	12	660	753	38	0	218	194	241	252
Grp Sat Flow(s),veh/h/ln	1774	1770	1825	1774	1770	1526	1774	0	1817	1774	1863	1542
Q Serve(g_s), s	12.5	7.9	8.0	0.7	15.8	37.0	2.0	0.0	12.3	10.6	12.8	14.0
Cycle Q Clear(g_c), s	12.5	7.9	8.0	0.7	15.8	37.0	2.0	0.0	12.3	10.6	12.8	14.0
Prop In Lane	1.00		0.10	1.00		1.00	1.00		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	242	830	856	30	1237	828	259	0	265	330	346	503
V/C Ratio(X)	0.88	0.26	0.26	0.40	0.53	0.91	0.15	0.00	0.82	0.59	0.70	0.50
Avail Cap(c_a), veh/h	245	830	856	101	1237	828	570	0	583	588	618	727
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.9	17.0	17.0	51.5	27.5	20.0	39.5	0.0	43.9	39.4	40.3	29.0
Incr Delay (d2), s/veh	28.4	0.2	0.2	8.5	0.4	14.0	0.3	0.0	6.3	1.7	2.5	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.0	3.9	4.1	0.4	7.8	25.0	1.0	0.0	6.6	5.3	6.8	6.0
LnGrp Delay(d),s/veh	73.2	17.2	17.2	60.0	28.0	34.0	39.7	0.0	50.2	41.1	42.8	29.8
LnGrp LOS	E	B	B	E	C	C	D		D	D	D	C
Approach Vol, veh/h		658			1425			256			687	
Approach Delay, s/veh		35.3			31.5			48.7			37.6	
Approach LOS		D			C			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.2	54.7		24.6	18.9	42.0		20.4
Change Period (Y+Rc), s	4.4	* 5		4.9	4.4	5.0		5.0
Max Green Setting (Gmax), s	6.0	* 46		35.1	14.6	37.0		34.0
Max Q Clear Time (g_c+I1), s	2.7	10.0		16.0	14.5	39.0		14.3
Green Ext Time (p_c), s	0.0	2.5		2.6	0.0	0.0		1.1

Intersection Summary	
HCM 2010 Ctrl Delay	35.1
HCM 2010 LOS	D

Notes

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱			✥	
Traffic Volume (veh/h)	10	729	50	42	561	20	30	30	43	10	40	10
Future Volume (veh/h)	10	729	50	42	561	20	30	30	43	10	40	10
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	0.99		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	11	784	54	45	597	21	31	31	45	13	51	13
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.93	0.93	0.93	0.94	0.94	0.94	0.96	0.96	0.96	0.79	0.79	0.79
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	19	1648	114	57	1789	63	520	223	324	109	404	96
Arrive On Green	0.01	0.49	0.49	0.03	0.51	0.51	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1774	3353	231	1774	3484	122	1314	674	979	203	1220	289
Grp Volume(v), veh/h	11	414	424	45	303	315	31	0	76	77	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1814	1774	1770	1837	1314	0	1653	1713	0	0
Q Serve(g_s), s	0.6	15.5	15.5	2.5	10.0	10.1	0.0	0.0	3.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.6	15.5	15.5	2.5	10.0	10.1	1.2	0.0	3.2	3.0	0.0	0.0
Prop In Lane	1.00		0.13	1.00		0.07	1.00		0.59	0.17		0.17
Lane Grp Cap(c), veh/h	19	870	892	57	909	943	520	0	547	609	0	0
V/C Ratio(X)	0.59	0.48	0.48	0.78	0.33	0.33	0.06	0.00	0.14	0.13	0.00	0.00
Avail Cap(c_a), veh/h	117	870	892	170	909	943	520	0	547	609	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.95	0.95	0.95	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	49.3	16.9	16.9	48.0	14.3	14.3	22.8	0.0	23.5	23.4	0.0	0.0
Incr Delay (d2), s/veh	10.5	1.9	1.8	8.0	0.9	0.9	0.2	0.0	0.5	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	8.0	8.2	1.4	5.1	5.3	0.6	0.0	1.6	1.5	0.0	0.0
LnGrp Delay(d),s/veh	59.7	18.7	18.7	56.1	15.2	15.2	23.0	0.0	24.0	23.8	0.0	0.0
LnGrp LOS	E	B	B	E	B	B	C		C	C		
Approach Vol, veh/h		849			663			107			77	
Approach Delay, s/veh		19.2			18.0			23.7			23.8	
Approach LOS		B			B			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.6	54.4		38.0	5.5	56.5		38.0				
Change Period (Y+Rc), s	4.4	* 5.2		4.9	4.4	5.2		4.9				
Max Green Setting (Gmax), s	9.6	* 43		33.1	6.6	45.8		33.1				
Max Q Clear Time (g_c+I1), s	4.5	17.5		5.0	2.6	12.1		5.2				
Green Ext Time (p_c), s	0.0	10.1		0.2	0.0	5.2		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay			19.2									
HCM 2010 LOS			B									
Notes												

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↰	↑↑	↰	↱
Traffic Volume (veh/h)	703	69	92	580	73	22
Future Volume (veh/h)	703	69	92	580	73	22
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.96	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	740	73	107	674	94	28
Adj No. of Lanes	2	0	1	2	1	1
Peak Hour Factor	0.95	0.95	0.86	0.86	0.78	0.78
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1048	103	140	1703	640	571
Arrive On Green	0.32	0.32	0.08	0.48	0.36	0.36
Sat Flow, veh/h	3335	320	1774	3632	1774	1583
Grp Volume(v), veh/h	404	409	107	674	94	28
Grp Sat Flow(s),veh/h/ln	1770	1792	1774	1770	1774	1583
Q Serve(g_s), s	11.4	11.4	3.4	6.9	2.0	0.7
Cycle Q Clear(g_c), s	11.4	11.4	3.4	6.9	2.0	0.7
Prop In Lane		0.18	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	572	579	140	1703	640	571
V/C Ratio(X)	0.71	0.71	0.76	0.40	0.15	0.05
Avail Cap(c_a), veh/h	1292	1308	452	3766	640	571
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.9	16.9	25.7	9.5	12.3	11.8
Incr Delay (d2), s/veh	1.6	1.6	8.3	0.1	0.5	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.8	5.8	2.0	3.4	1.1	0.3
LnGrp Delay(d),s/veh	18.5	18.5	34.0	9.6	12.8	12.0
LnGrp LOS	B	B	C	A	B	B
Approach Vol, veh/h	813			781	122	
Approach Delay, s/veh	18.5			12.9	12.6	
Approach LOS	B			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	9.0	22.9				31.9		25.0
Change Period (Y+Rc), s	4.5	4.5				4.5		4.5
Max Green Setting (Gmax), s	14.5	41.5				60.5		20.5
Max Q Clear Time (g_c+I1), s	5.4	13.4				8.9		4.0
Green Ext Time (p_c), s	0.1	5.0				4.8		0.2

Intersection Summary			
HCM 2010 Ctrl Delay			15.5
HCM 2010 LOS			B

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑		↱
Traffic Vol, veh/h	732	13	0	0	0	72
Future Vol, veh/h	732	13	0	0	0	72
Conflicting Peds, #/hr	0	5	0	0	5	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	92	92	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	822	15	0	0	0	111

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	429
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	574
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	569
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB		WB		NB
HCM Control Delay, s	0		0		12.9
HCM LOS					B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	569	-	-	-
HCM Lane V/C Ratio	0.195	-	-	-
HCM Control Delay (s)	12.9	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.7	-	-	-

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↱		↰	↰	↱
Traffic Volume (veh/h)	249	594	30	20	439	340	10	110	10	470	150	273
Future Volume (veh/h)	249	594	30	20	439	340	10	110	10	470	150	273
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.95	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	265	632	32	22	488	378	12	134	12	326	394	287
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.90	0.90	0.90	0.82	0.82	0.82	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	298	1341	68	50	891	796	187	177	16	467	490	674
Arrive On Green	0.17	0.39	0.39	0.03	0.25	0.25	0.11	0.11	0.11	0.26	0.26	0.26
Sat Flow, veh/h	1774	3422	173	1774	3539	1506	1774	1681	151	1774	1863	1549
Grp Volume(v), veh/h	265	326	338	22	488	378	12	0	146	326	394	287
Grp Sat Flow(s),veh/h/ln	1774	1770	1826	1774	1770	1506	1774	0	1832	1774	1863	1549
Q Serve(g_s), s	13.3	12.5	12.6	1.1	10.9	14.8	0.6	0.0	7.1	15.1	18.0	11.8
Cycle Q Clear(g_c), s	13.3	12.5	12.6	1.1	10.9	14.8	0.6	0.0	7.1	15.1	18.0	11.8
Prop In Lane	1.00		0.09	1.00		1.00	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	298	693	715	50	891	796	187	0	193	467	490	674
V/C Ratio(X)	0.89	0.47	0.47	0.44	0.55	0.47	0.06	0.00	0.76	0.70	0.80	0.43
Avail Cap(c_a), veh/h	303	848	875	117	1319	978	661	0	683	624	656	811
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.1	20.7	20.7	43.6	29.6	14.3	36.8	0.0	39.7	30.3	31.4	18.1
Incr Delay (d2), s/veh	25.6	0.5	0.5	6.0	0.5	0.4	0.1	0.0	6.0	2.2	5.3	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.7	6.2	6.4	0.6	5.4	9.5	0.3	0.0	3.9	7.7	9.9	5.1
LnGrp Delay(d),s/veh	62.7	21.2	21.2	49.6	30.1	14.8	36.9	0.0	45.7	32.5	36.7	18.5
LnGrp LOS	E	C	C	D	C	B	D		D	C	D	B
Approach Vol, veh/h		929			888			158			1007	
Approach Delay, s/veh		33.0			24.1			45.0			30.2	
Approach LOS		C			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.0	40.7		28.9	19.7	28.0		14.6
Change Period (Y+Rc), s	4.4	* 5		4.9	4.4	5.0		5.0
Max Green Setting (Gmax), s	6.0	* 44		32.1	15.6	34.0		34.0
Max Q Clear Time (g_c+I1), s	3.1	14.6		20.0	15.3	16.8		9.1
Green Ext Time (p_c), s	0.0	3.9		3.5	0.0	4.1		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	30.0
HCM 2010 LOS	C

Notes

WASTE MANAGEMENT PLAN
FOR
THE SALVATION ARMY
RAY & JOAN KROC COMMUNITY CENTER
SPORTS AND WELLNESS CENTER PROJECT

JANUARY 15, 2018

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1.0 PURPOSE

The purpose of this Waste Management Plan is to assure that the overall waste produced as part of the Salvation Army Ray & Joan Kroc Community Center Sports and Wellness Center Project (Kroc Sports and Wellness Project) is reduced sufficiently to comply with established waste reduction targets.

On July 1, 2008, the City of San Diego Construction and Demolition Debris Deposit Ordinance took effect. The ordinance requires that the majority of construction, demolition and remodeling projects requiring building, combination and demolition permits pay a refundable Construction and Demolition Debris Recycling Deposit and divert at least 50 percent of their debris by recycling, reusing or donating usable materials. The City of San Diego Construction and Demolition Debris Deposit Ordinance is designed to keep Construction and Demolition (C&D) materials out of local landfills and ensure they get recycled. Additionally, the California Public Resources Code requires each city in the state to divert at least 50 percent of its solid waste from landfill disposal through source reduction, recycling, composting, and transformation and sets a statewide goal of 75% waste reduction. AB 1826 was signed into law on April 28, 2014, and requires commercial generators to subscribe to composting or anaerobic digestion service for their organic wastes, such as yard trimmings or food scraps. The new City of San Diego C&D debris diversion requirement is 65% by weight of total C&D debris generated by the project.

The City of San Diego California Environmental Quality Act Significance Determination Thresholds (July 2016) require the preparation of a Waste Management Plan for any projects that would result in a direct or cumulative solid waste impact, as defined in Table 1. The Kroc Sports and Wellness Project would include the construction, demolition, and/or renovation of 40,000 square feet or more of building space and is expected to generate more than 60 tons of waste. Therefore, the project would result in a significant cumulative impact on solid waste facilities. To reduce any potentially significant impacts to a level below significance, the following Waste Management Plan has been prepared in accordance with the City of San Diego California Environmental Quality Act Significance Determination Thresholds. This document provides a conceptual overview of potential solid wastes that may be generated during demolition, construction and operation phases. Prior to construction, the project contractor will be required to complete a City of San Diego Waste Management Form, which will provide a more refined estimate of C&D debris estimates.

TABLE 1. CITY OF SAN DIEGO SOLID WASTE IMPACT THRESHOLDS

Impact	Threshold
Direct	Projects that include the construction, demolition, or renovation of 1,000,000 square feet or more of building space may generate approximately 1,500 tons of waste or more and are considered to have direct impacts on solid waste facilities. • Direct impacts result from the generation of large amounts of waste which stresses existing facilities. Waste management planning is based on a steady rate of waste generation and doesn't assume increased waste generation due to growth. • While all projects are required to comply with the City's waste management ordinances, direct and cumulative impacts are mitigated by the implementation of project-specific Waste Management Plans which may reduce solid waste impacts to below a level of significance. • For projects over 1,000,000 square feet, a significant direct and cumulative solid waste impact would result if the compliance with the City's ordinances and the Waste Management Plan fail to reduce the impacts of such projects to below a level of significance and/or if a Waste Management Plan for the project is not prepared and conceptually approved by the Environmental Services Department prior to distribution of the draft environmental document for public review.
Cumulative	Projects that include the construction, demolition, and/or renovation of 40,000 square feet or more of building space may generate approximately 60 tons of waste or more, and are considered to have cumulative impacts on solid waste facilities. • While all projects are required to comply with the City's waste management ordinances, cumulative impacts are mitigated by the implementation of a project specific Waste Management Plan which reduces solid waste impacts to below a level of significance.
Source: City of San Diego California Environmental Quality Act Significance Determination Thresholds (July 2016)	

2.0 PROJECT DESCRIPTION

The project site is located within the City of San Diego Mid-City Communities Plan Eastern Area within a 12 acre site along University Avenue, near Argon Drive (Figures 1 and 2). The Salvation Army Kroc Center Sports and Wellness Center would construct a 2 story, 73,409 square foot (s.f.) recreational, Type II-B Concrete tilt-up building and all site improvements, including the construction of 4,097 s.f. lobby/playcare; 46,372 s.f. of covered parking; 22,940 s.f. fitness and 26,751 s.f. soccer deck (Figure 3). Building height would be 33'-8". Total disturbed area would be 1.35 gross acres with a proposed building footprint of 48,995 s.f.; 4,370 s.f. landscaping; and 34,931 s.f. of pavement. The project would also result in the construction of the following elements: 26' foot private driveway, modular wetland, planter box, driveway cross gutter; piping; storm drain inlets; subterranean drainage vault; sidewalk; stairway; culvert; ADA accessible ramp, area drain and French drain. Earthwork includes the excavation of 3,910 c.y. of soils, with 310 c.y. used for fill and 3,600 c.y. of soils exported.

The project will comply with the 2013 Edition of the California Building Code, 2013 California Electrical Code, 2013 California Mechanical Code, 2013 California Plumbing Code, 2013 California Fire Code, in addition to all their respective 2013 California Amendments and the current edition of the California Energy Efficiency Standards. The project requires a Planned Development Permit and Grading Permit from the City of San Diego.

3.0 WASTE TO BE GENERATED

The Kroc Sports and Wellness Project has the potential to generate solid waste during demolition, construction and occupancy phases. Table 2 identifies the different solid waste generation phases, their estimated timeline and required agency actions.

TABLE 2. SOLID WASTE GENERATION PHASES

Construction Phase	Timeline	Required Agency Actions
1. Demolition	6 months	Issuance of demolition permit. Issuance of foundation/excavation permits. Preconstruction meeting. Inspections/permit sign off.
2. Construction	15 months	Issuance of permit. Inspections/permit sign off.
3. Occupancy	To begin upon completion of building construction.	Issuance of a certificate of occupancy.

DEMOLITION PHASE

The demolition phase of the project would cover approximately 69,290 sf, including the removal of the existing soccer field and associated infrastructure. The grading phase of the project would be minimal due to the fact that the site is a re-development project. Solid waste generated during the demolition and grading phase of construction is anticipated to total approximately 104 tons and may include materials such as green waste, concrete, steel rebar, wood, drywall, flooring, piping, electrical materials and mixed construction and demolition debris.

Solid waste generated during the demolition phase of construction would either be reused onsite or transported to an approved resource recovery / recycling facility or landfill, as shown in Table 3. In an effort to reduce solid waste generated during demolition, excess dirt will be reused onsite in facilities such as planters or landscaping. To the extent feasible, all dirt that requires exportation off-site will be directed to a usable site near the project site for reuse. Any dirt from grading that cannot be reused on a nearby site will be sent to the Vulcan Carol Canyon Landfill and Recycle Site which has a 100% diversion rate for clean fill dirt. The project site does not include the demolition of any buildings. Therefore, it is not expected that significant amounts of tiles, cabinets, doors, fixtures, windows, cardboard, carpet, padding, foam, ceiling tiles, dirt, drywall, or roofing materials would be generated during the demolition phase. A negligible amount of trash may be generated from the contractors working onsite. Any trash would be placed in a dumpster, to be handled by an authorized, licensed waste handler for disposal in a licensed facility.

During the demolition phase of construction, approximately 104 tons of solid waste would be generated. As shown in Table 3, approximately 80 tons, or 77%, of this solid waste would be diverted from landfills. Approximately 24 tons of solid waste would require disposal in a landfill. The proposed project's diversion rate of 77% for demolition and grading exceeds the City's waste reduction goal.

TABLE 3. DEMOLITION PHASE – WASTE GENERATION / MANAGEMENT

Material Type	Estimated Amount*	Handling Method	Diverted	Disposed
Clean Fill Dirt	20% (20.8 tons)	Reuse onsite or transport for local reuse, if possible. Vulcan Carol Canyon Landfill and Recycle Site	90% (18.72 tons)	10% (2.08 tons)
Asphalt/Concrete	20% (20.8 tons)	Vulcan Carol Canyon Landfill and Recycle Site	75% (15.6 tons)	25% (5.2 tons)
Clean Wood/Green Waste	20% (20.8 tons)	Miramar Greenery	90% (18.72 tons)	10% (2.08 tons)
Brick/Block/Rock	10% (10.4 tons)	Vulcan Carol Canyon Landfill and Recycle Site	75% (7.8 tons)	25% (2.6 tons)
Metal	10% (10.4 tons)	SANDCO Resource Recovery & Buy Back Center	60% (6.24 tons)	40% (4.16 tons)
Mixed Inerts	10% (10.4 tons)	Vulcan Carol Canyon Landfill and Recycle Site	60% (6.24 tons)	40% (4.16 tons)
Mixed C&D	10% (10.4 tons)	SANDCO Resource Recovery & Buy Back Center	60% (6.24 tons)	40% (4.16 tons)
Total	**104 tons**		**77% (79.56 tons)**	**23% (24.44 tons)**

* Total solid waste generation tonnage was estimated based upon the City's guidelines of 0.0015 tons of solid waste generated per square foot. Actual tonnage and percentages for each material type were estimated based on existing site conditions and construction documents. The disposal locations and estimated disposal numbers contained in this WMP are estimated and subject to change.

CONSTRUCTION PHASE

The construction phase of the project includes constructing a 73,409 square foot (s.f.) recreational, Type II-B Concrete tilt-up building and all site improvements. Solid waste generated during the construction phase of the project is anticipated to total 110 tons and would include materials such as concrete, steel rebar, wood, drywall, flooring, piping, electrical materials, mixed construction and demolition debris, tile and trash. Solid waste generated during the construction phase would be transported, and reused or disposed of in the manner outlined within Table 4. As shown in Table 4, approximately 88.61 tons, or 80%, of the total solid waste generated during the construction phase of the project would be diverted from landfills. Approximately 21.39 tons of solid waste generated during project construction would require disposal in a landfill. The proposed project's diversion rate of 80% for construction phasing exceeds the City's waste reduction goal.

TABLE 4. CONSTRUCTION PHASE – WASTE GENERATION AND MANAGEMENT

Material Type	**Estimated Amount***	**Handling Method**	**Diverted****	**Disposed**
Asphalt/Concrete	30% (33 tons)	Vulcan Carol Canyon Landfill and Recycle Site	85% (28.05 tons)	15% (4.95 tons)
Metal	2% (2.2 tons)	SANCO Resource Recovery & Buy Back Center	50% (1.1 tons)	50% (1.1 tons)
Clean Wood/Greenwaste	3% (3.3 tons)	Miramar Greenery	50% (1.65 tons)	50% (1.65 tons)
Drywall	2.5% (2.75 tons)	EDCO Station Transfer Station and Buy Back Center	50% (1.38 tons)	50% (1.37 tons)
Carpet and Carpet Padding	0.5% (0.55 tons)	DFS Flooring	50% (0.28 tons)	50% (0.27 tons)
Lamps/Light Fixtures	1% (1.1 tons)	Lamp Disposal Solutions	50% (0.55 tons)	50% (0.55 tons)
Mixed C&D (other than Asphalt/Concrete)	43% (47.3 tons)	SANDCO Resource Recovery & Buy Back Center	85% (40.2 tons)	15% (7.1 tons)
Clean Fill Dirt	5% (5.5 tons)	Reuse onsite or transport for local reuse, ifpossible. Vulcan Carol Canyon Landfill and Recycle Site	50% (2.75 tons)	50% (2.75 tons)
Brick/Block/Rock	2% (2.2 tons)	Vulcan Carol Canyon Landfill and Recycle Site	85% (1.87 tons)	15% (0.33 tons)
Building Materials for Reuse	2% (2.2 tons)	Habitat for Humanity ReStore	100% (2.2 tons)	0% (0 tons)
Cardboard	2% (2.2 tons)	SANCO Resource Recovery & Buy Back Center	100% (2.2 tons)	0% (0 tons)
Ceiling Tile	2% (2.2 tons)	AMS	80% (1.76 tons)	20% (0.44 tons)
Ceramic Tile/Porcelain	1% (1.1 tons)	Enniss Incorporated	100% (1.1 tons)	0% (0 tons)
Mixed Inerts	2% (2.2 tons)	Vulcan Carol Canyon Landfill and Recycle Site	80% (1.76 tons)	20% (0.44 tons)
Styrofoam Blocks	1% (1.1 tons)	Cactus Recycling	80% (0.88 tons)	20% (0.22 tons)
Industrial Plastics	1% (1.1 tons)	Cactus Recycling	80% (0.88 tons)	20% (0.22 tons)
Total	**110 tons**		**88.61 tons (80%)**	**21.39 tons (20%)**

* Total solid waste generation tonnage was estimated based upon the City's guidelines of 0.0015 tons (3 lbs) of solid waste generated per square foot of new commercial construction. Actual tonnage and percentages for each material type are estimates and the numbers contained in this Waste Management Plan are estimated and subject to change.

** Diversion rates are based upon the City of San Diego 2018 Certified Construction and Demolition Recycling Facility Directory. Numbers may not add up due to rounding.

OCCUPANCY

Upon completion, the project will provide a recreational facility with a lobby/playcare, covered parking, fitness areas and soccer deck. It is expected that the ongoing use of the facility will result in the generation of paper, packaging, food waste, polystyrene, plastic, bimetal cans, bulky items, landscape debris and electronic waste. As discussed above, the project will be fully compliant with the 2013 Edition of the California Building Code, 2013 California Electrical Code, 2013 California Mechanical Code, 2013 California Plumbing Code, 2013 California Fire Code, in addition to all their respective 2013 California Amendments and the current edition of the California Energy Efficiency Standards. Compliance with these regulations will reduce solid waste generation during occupancy. Additionally, the project is required to implement WMP Verification Measures #1 through #3. The project is not anticipated to generate sufficient food waste to participate in the City's food waste collection and composting program.

Solid waste generated during the occupancy phase of the project is anticipated to total 110 tons per year and would include materials such as plastic, glass, paper, green waste, food and trash. Solid waste generated during the occupancy phase of the project would be transported to the EDCO, Miramar Landfill or Miramar Greenery. As shown in Table 5, approximately 86 tons, or 78%, of the total solid waste generated annually during occupancy would be diverted from landfills. Approximately 24 tons of solid waste generated annually during project occupancy would require disposal in a landfill. The proposed project's diversion rate of 78% for occupancy exceeds the City's waste reduction goal.

TABLE 5. OCCUPANCY PHASE – WASTE GENERATION AND MANAGEMENT

Material Type	Estimated Amount per Year*	Handling Method	Diverted	Disposed
Plastic	20% (22 tons)	EDCO	80% (17.6 tons)	20% (4.4 tons)
Glass	20% (22 tons)	EDCO	80% (17.6 tons)	20% (4.4 tons)
Paper	20% (22 tons)	EDCO	80% (17.6 tons)	20% (4.4 tons)
Green Waste	15% (16.5 tons)	Miramar Greenery	100% (16.5 tons)	0% (0 tons)
Food	15% (16.5 tons)	Miramar Greenery	100% (16.5 tons)	0% (0 tons)
Trash	10% (11 tons)	Miramar Landfill	0% (0 tons)	100% (11 tons)
Total	**110 tons**		**78% (85.8 tons)**	**35% (24.2 tons)**

* Total solid waste generation tonnage was estimated based upon the City's guidelines of 0.0015 tons of solid waste generated per square foot. Actual tonnage and percentages for each material type were estimated based on existing site conditions and construction documents. The numbers contained in this WMP are estimated and subject to change.

4.0 MEASURES TO MANAGE AND REDUCE WASTE

The following verification measure must be implemented by the project applicant to ensure the requirements of this WMP are met.

WMP VERIFICATION MEASURE #1: Prior to the demolition phase, the construction contractor shall educate each employee involved with construction and demolition in the requirements of this WMP. During all phases of construction, the construction contractor shall provide separate bins onsite to provide for the collection of wood, green materials, metal, concrete (block and brick) and flooring. The construction contractor shall be responsible for achieving all the identified reuse and recycling solid waste goals contained in this WMP.

WMP VERIFICATION MEASURE #2: During grading, excess dirt should be reused onsite in facilities such as planters, landscape berms or for balancing of pads. To the extent feasible, all dirt that requires exportation off-site will be directed to a usable site near the project site for reuse.

WMP VERIFICATION MEASURE #3: Occupancy shall comply with the requirements of the City of San Diego's Recycling Ordinance and Refuse and Recyclable Materials Storage Regulations. As part of compliance with this ordinance, the Property Manager or Owner shall provide:

a. Collection of recyclables as frequently as necessary;
b. Collection of at least plastic and glass bottles and jars, paper, newspaper, metal containers and cardboard;
c. Designated recycling collection areas;
d. Appropriate recycling containers and signage;
e. Annual Education, upon occupancy and when there are changes to the program, that include:
    i. Types of materials accepted in recycling program
    ii. Location of recycling containers
    iii. Responsibilities for participants

5.0 SUMMARY

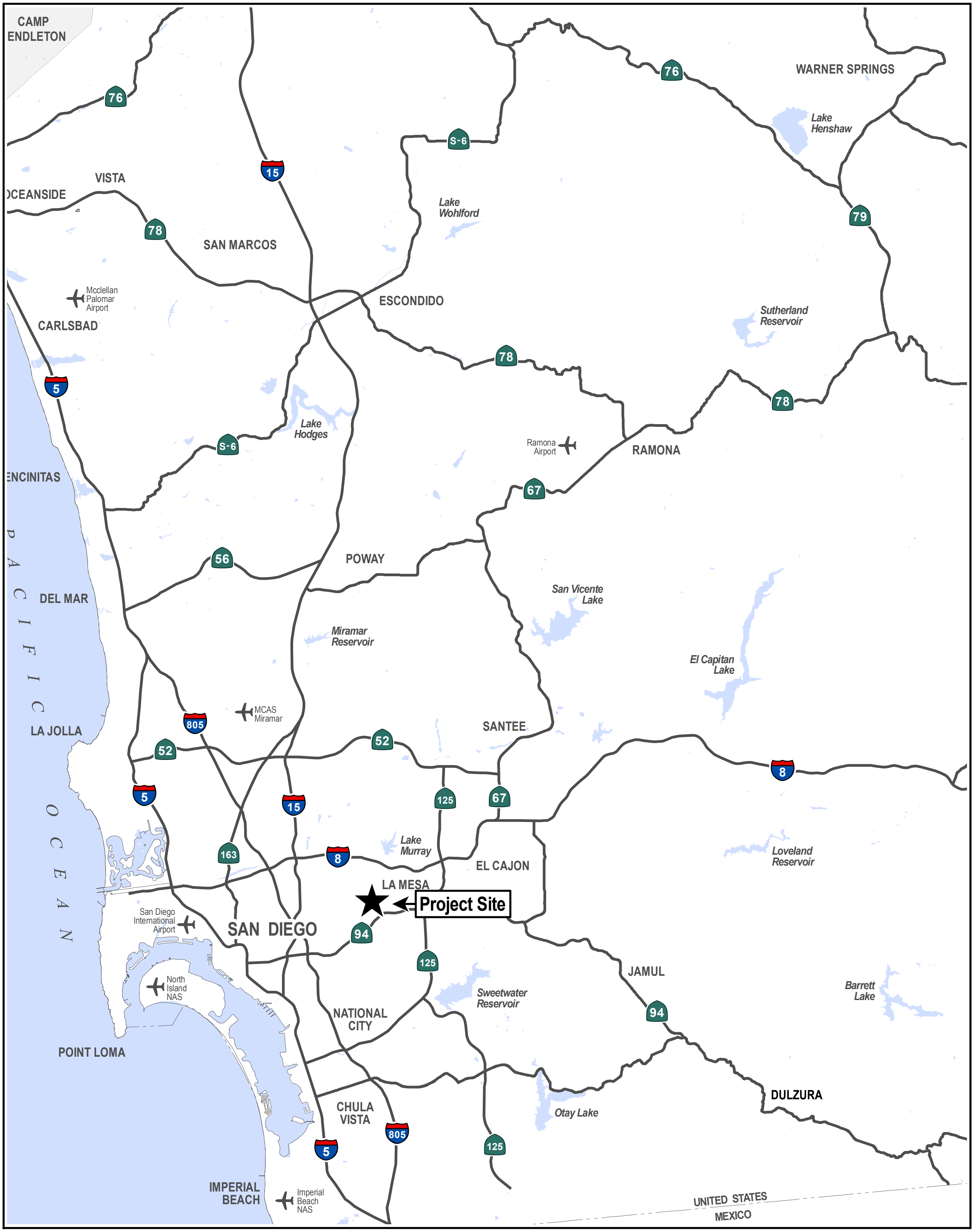
The purpose of this Waste Management Plan is to assure that the overall waste produced as part of the Project is reduced sufficiently to comply with established waste reduction targets. Implementation of WMP Verification Measures #1 through #3 would ensure compliance with the solid waste reduction strategies outlined in this plan. Solid waste diversion during demolition would be 77%, during construction would be approximately 80%; and during occupancy would be approximately 78%, all of which exceed the City's waste reduction goals.

6.0 REFERENCES

City of San Diego Environmental Services Department, California Environmental Quality Act Guidelines for a Waste Management Plan, June 2013.

City of San Diego Development Services Department, California Environmental Quality Act Significance Determination Thresholds, July 2016.

San Diego Municipal Code, Chapter 6: Public Works and Property, Public Improvement and Assessment Proceedings, Article 6: Collection, Transportation and Disposal of Refuse and Solid Waste, Division 6, Construction and Demolition Debris Diversion Deposit Program.



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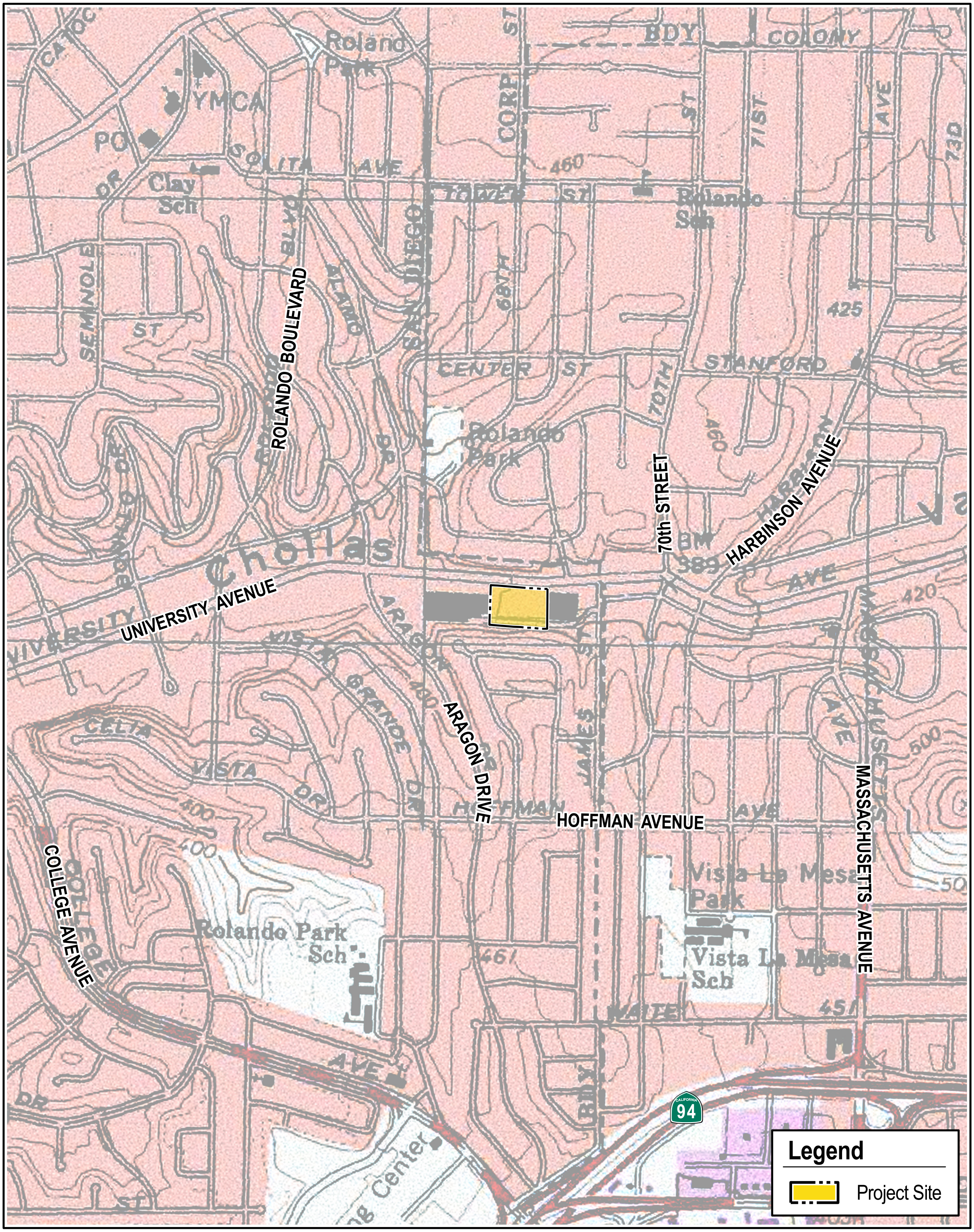
Regional Location

KROC SPORTS AND WELLNESS PROJECT

Source: SANGIS GIS Data, 2011

FIGURE 1

January 2018



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Vicinity Map

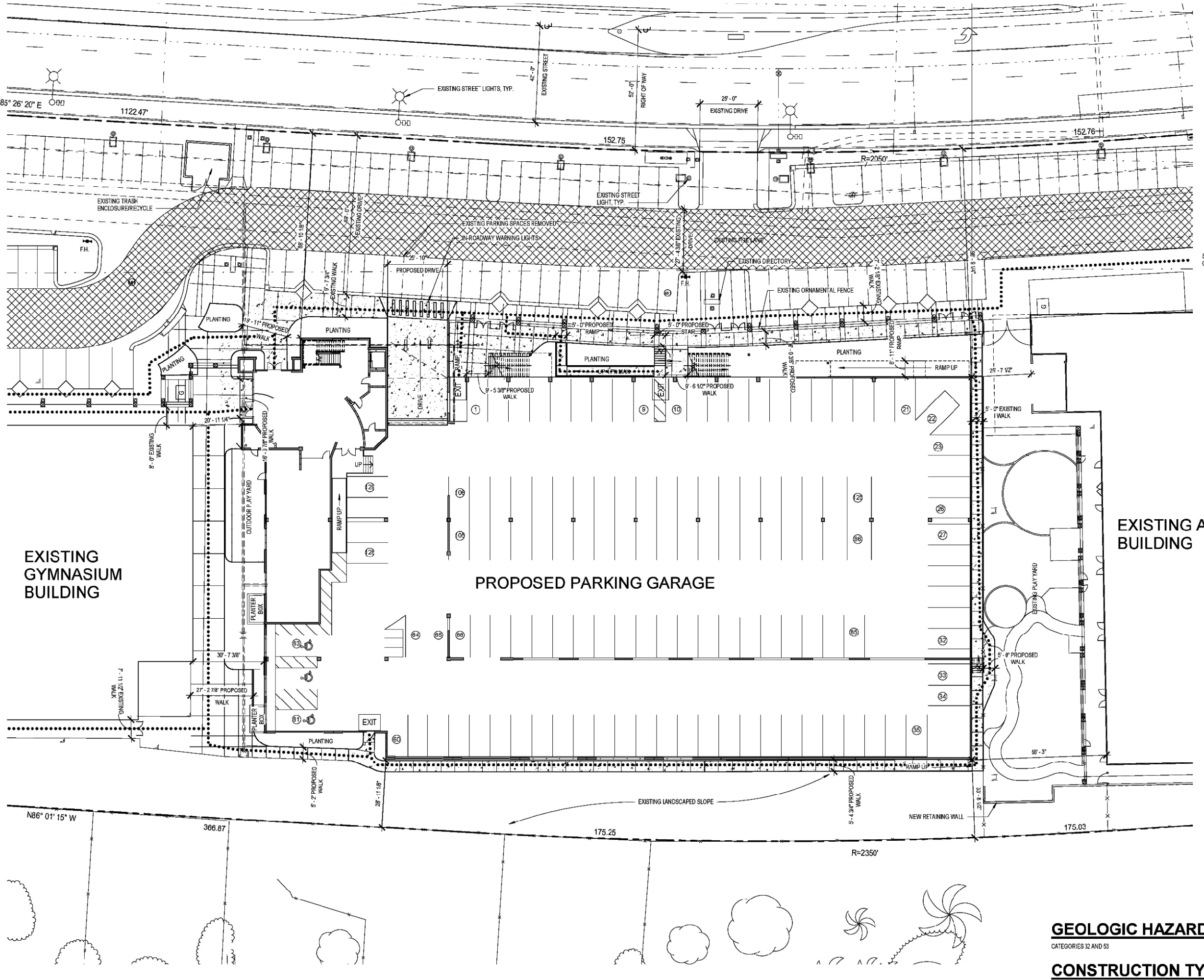
KROC SPORTS AND WELLNESS PROJECT

Feet
0 500 1,000

Source: Esri Basemap

FIGURE 2

January 2018



PARKING REQUIRED

ON-SITE PARKING SHOWN ON SCR-12-11-2000:		384 SPACES
OFF-SITE (STREET) PARKING SHOWN ON SCR-12-11-2000:		50 SPACES

NEW WELLNESS CENTER PARKING

HEALTH CLUB: 27,779 S.F. AT 5 SPACE/1,000 S.F.:	139 SPACES	
15% REDUCTION FOR TRANSIT OVERLAY:	<20 SPACES>	
TOTAL PARKING REQ'D FOR NEW BUILDING:	119 SPACES	119 SPACES
TOTAL PARKING REQUIRED		553 SPACES

TOTAL PARKING PROVIDED

ACTUAL ON-SITE PARKING:	378 SPACES
OFF-SITE (STREET) PARKING:	50 SPACES
PROPOSED PARKING STRUCTURE:	129 SPACES
PARKING DELETED AT STRUCTURE ENTRANCE:	<4> SPACES
TOTAL PARKING PROVIDED:	553 SPACES
SURPLUS:	0 SPACES

NOTE: ROOFTOP SOCCER FIELD IS SATISFIED BY EXISTING PARKING APPROVED IN P.C.D. PERMIT 99-0887

SITE LEGEND

—W——W— - EXISTING WATER SERVICE LINE
—S——S— - EXISTING SEWER SERVICE LATERAL
—F——F— - EXISTING FIRE (WATER) SERVICE LINE
—I——I— - EXISTING IRRIGATION (WATER) SERVICE LINE
—E——E— - EXISTING ELECTRICAL SERVICE LINE
—G——G— - EXISTING GAS SERVICE LINE
- EXISTING FIRE HYDRANT
- PROPOSED POLE MOUNTED LIGHT STANDARD
① - NUMBER OF PARKING
♿ - HANDICAP PARKING SYMBOL

ACCESSIBLE PATH OF TRAVEL

•••••••••• NEW PATH OF TRAVEL (P.O.T.) AS INDICATED IS A BARRIER FREE ACCESS ROUTE WITHOUT ANY ABRUPT VERTICAL CHANGES EXCEEDING 1/2" BEVELED AT 1:2 MAXIMUM SLOPE EXCEPT THAT LEVEL CHANGES DO NOT EXCEED 1/4" VERTICAL AND IS AT LEAST 48" WIDE. SURFACE IS SLIP RESISTANT, STABLE, FIRM, AND SMOOTH. CROSS-SLOPE DOES NOT EXCEED 2% AND SLOPE IN DIRECTION OF TRAVEL IS LESS THAT 5% UNLESS OTHERWISE INDICATED. P.O.T. SHALL BE MAINTAINED FREE OF OVERHANGING OBSTRUCTIONS TO 80" MINIMUM (1133B.8.2) AND PROTRUDING OBJECTS GREATER THAN 4" PROJECTION FROM A WALL AND ABOVE 27" AND LESS THAN 80" (1133B.8.6).

NOTES

1. YARDS USED FOR AREA INCREASES SHALL BE PERMANENTLY MAINTAINED.
2. THIS PROJECT SHALL COMPLY WITH THE 2016 EDITION OF THE CALIFORNIA BUILDING CODE (CBC), THE 2016 CALIFORNIA ELECTRICAL CODE (CEC), THE 2013 CALIFORNIA MECHANICAL CODE (CMC), THE 2016 CALIFORNIA PLUMBING CODE (CPC), THE 2016 CALIFORNIA FIRE CODE (CFC), IN ADDITION TO ALL THEIR RESPECTIVE 2013 CALIFORNIA AMENDMENTS, AND THE CURRENT EDITION OF THE CALIFORNIA ENERGY EFFICIENCY STANDARDS.
3. NO HAZARDOUS MATERIALS SHALL BE STORED AND/OR USED IN THIS BUILDING IN EXCESS OF THE QUANTITIES LISTED IN CBC TABLES 307.1 (1) AND 307.1 (2)
4. ALL PROPERTY LINES, EASEMENTS, STREET AND EXISTING AND PROPOSED STRUCTURES ARE SHOWN ON THIS SITE PLAN.
5. A GRADING PERMIT IS REQUIRED FOR THIS PROJECT
6. FIRE HYDRANTS ARE TO COMPLY WITH THE CITY'S ENGINEERING DEPARTMENT STANDARDS AND SPECIFICATIONS FOR ON-SITE FIRE HYDRANTS.
7. ALL CURBING WHICH OUTLINES THE ACCESS ROADWAY SHALL BE PAINTED RED. WHITE 4" HIGH LETTERING READING "NO PARKING - FIRE LANE" SHALL BE STENCILED EVERY 30'-0" ON THE RED CURB. IF NO CURB IS PRESENT, AN 8" WIDE RED STRIPE SHALL BE PAINTED ON THE PAVEMENT. THIS 8" STRIPE SHALL BE MARKED WITH 4" HIGH WHITE LETTERING EXACTLY AS IF IT WERE A CURB.
8. BACKFLOW PROTECTION OF WATER CONNECTION TO FIRE PROTECTION SYSTEMS SHALL BE PROVIDED PER UPC, SECT. 603.5.15.

SITE INFORMATION

SITE AREA:	536,659 SF	12.32 ACRES
PROPOSED BUILDING COVERAGE:	50,469 SF	9.4 %
EXISTING BUILDING COVERAGE	155,765 SF	29.02 %

TYPE OF DEVELOPMENT: RECREATION

GEOLOGIC HAZARD CATEGORY

CATEGORIES 32 AND 53

CONSTRUCTION TYPE

TYPE II-B

OCCUPANCY

PARKING GARAGE: S-2
PLAY CARE: E
FITNESS CENTER: A3

OWNER

THE SALVATION ARMY
180 E. OCEAN BLVD - LEGAL DEPT
LONG BEACH, CA 90802
Tel.(562)491-8775
Fax:(562)591-8875
CONTACT:VICTOR DOUGHTY

EXISTING DEVELOPMENT PERMITS

P.C.D. PERMIT 99-0887

ACCESSIBLE ROUTES:

FOR ACCESSIBLE ROUTES, SEE THIS PLAN & 'OVERALL SITE PLAN'

EXISTING BUILDINGS AND ADJACENT USES:

FOR ADJACENT USES SEE 'OVERALL SITE PLAN'

BUILDING ADDRESSES:

ADDRESSES SHALL BE VISIBLE AND LEGIBLE FROM THE ROAD OR STREET FRONTING THE PROPERTY PER FHPS POLICY P-00-6 (UFC 901.4.4)

LANDSCAPE SQUARE FOOTAGE

PLANTING AREA: 5,820

SQUARE FOOTAGE

Name	Area
LOBBY/PLAY CARE	4,097 SF
PARKING	46,372 SF
01 FIRST FLOOR	50,469 SF
FITNESS CENTER	22,940 SF
02 SECOND FLOOR	22,940 SF
Grand total	73,409 SF

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Site Plan

KROC SPORTS AND WELLNESS PROJECT

NOT TO SCALE

Source: KDS Architect, 2018

FIGURE 3

January 2018