APPENDIX F

Hydrology and Water Quality Information

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Hydrology and Hydraulic Study

Kaiser Permanente – Irwindale Medical Office Building and Parking Structure
12761 Schabarum Avenue
Irwindale, CA 91706
KPFF Job # 115355

May 2016

Prepared for:
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Appendices

References

Hydrology Manual, Los Angeles County Department of Public Works, January 2006

I. Purpose & Project Description

The purpose of this study is to analyze the existing drainage characteristics of the proposed project site and compare and contrast them with the impact of the proposed improvements. The hydraulic characteristics of the developed site will also be analyzed to ensure the proposed storm drainage infrastructure willhave the capacity to meet the stormwater demand generated by the project.

The site is located at 12761 Schabarum Avenue in the City of Irwindale. The site is approximately 4 acres in size and the building currently on the project site serves as a distribution center. The proposed improvements will replace the existing on-site structure with a medical office building and a parking structure.

II. Existing Drainage Conditions

Existing site drainage can generally be described as flowing from north to south where stormwater discharges on to the public right of way at Schabarum Avenue. The site's highpoint is at its northeast corner, at about 325', and its low point, at about 320', is at the southeast corner of the site. This 5' grade difference over the site creates a relatively flat area with slopes generally being at around 1%. The site dedicates approximately 14% of its site as pervious area, and the remaining 86% as impervious. Additionally, there is a concrete swale along the western parking lot which conveys stormwater to an 18" storm drain. From this point it's transported to the public system, a 30" RCP line running trough Schabarum Avenue. This 18" HDPE line is fed by two area drains before sizing up to a 24" RCP line and discharging to the public 30" line. To more accurately describe the site drainage it was broken up into three subareas showing drainage patterns along both sides of the existing building, and along the existing at-grade parking lot. See ***Figure II.1 – Existing Hydrology Map*** for detailed hydrologic conditions.

III. Proposed Drainage Conditions

Proposed site drainage is influenced heavily by the proposed improvements, by the relatively flat existing site conditions and by the Los Angeles County Low Impact Development (LID) ordinance. The proposed improvement project will alter site grading but drainage patters will remain mostly undisturbed. The site will continue to drain from north to south and west to east. In addition, in order to comply with the City's LID ordinance, an infiltration system intended to capture and infiltrate the 85th percentile storm has been proposed.

Finished conditions would establish a new highpoint of 338.5' at the MOB's patient drop off point, which is located centrally on the site. Due to building height conditions and existing site grading, it was necessary to create a local low point within the site at 120.00. This low point is approximately 6" below the discharge point to the public system, and once ponding reaches that depth it would overflow onto the public right of way. Due to the change in site grading and the creation of a high point at a much higher elevation that the existing one, site slopes have become more steep leading up to the patient loading zone, at around 5%, and remaining generally flat elsewhere at 0.5%-1% elsewhere.

To better describe the proposed site drainage four subareas were designated for the proposed site plan. These subareas represent the 4 major drainage areas of the site, each having distinct discharge point which ultimately converge before discharge to the infiltration system or the public system. The four areas encompass the on-grade parking lot, the parking structure, the MOB, and the entry ramp leading to the MOB. These four areas have their own distinct characteristics and contribute to the overall hydrology patterns of the site. See ***Figure III.1 – Proposed Hydrlogy Map*** for detailed hydrologic conditions.

Finally, the proposed drainage system consists of area drains to capture runoff in the at-grade parking lots, a new 21" RCP line to convey stormwater, 6" roof drains to convey stormwater runoff over building footprints, an infiltration system designed to infiltrate the 85th percentile storm, and a new 21" rcp overflow pipe connected to the existing 30" RCP City line. The proposed storm drain lines were sized to accommodate the 25-Year Design storm and to prevent flooding of the proposed structures. The design intent is to covey captured water to the infiltration system throughout the year and allow generated runoff to infiltrate into the soils. In the event of more significant storm events, such as the 25-year design storm, the intent is to allow the infiltration system to fill to capacity and overflow onto the existing City storm drain line along Schabarum Avenue.

IV. Design Criteria

This study meets the required design criteria set forth by the Los Angeles County Hydrology Manual. Per design specifications, the drainage system for this site has been designed to meet the Urban Flood Protection level set by the Hydrology Manual. This level of protection ensures that proposed site grading and drainage in addition to storm drain systems can accommodate a 25-year frequency design storm falling on a saturated watershed. Since this project is entirely within the private right of way and does not encroach onto the public right of way only on-site design standards will be considered. Street flow restrictions are not applicable to this development and will not be considered or analyzed.

a. Peak Flow Analysis

Peak flow analysis for this study was calculated using the Los Angeles County Developed software, HydroCalc. This program models different design storms, their peak flows and 24-hour run-off volumes based on several parameters. Using this program the site specific peak flow rates for a 25-year design storm was calculated for pre and post design conditions. For a detailed breakdown of peak flows per subarea see ***Appendicex A – HydroCalc Hydrology Analysis***. The tables below summarize peak flow rates per proposed subarea. It should be noted that peak flow rates for post development conditions will be reduced due to the infiltration system that is proposed as a part of the project's low impact development design.

Sub Area	Area (acres)	Percent Impervious	Flow Length (feet)	T_C (minutes)	Q_{25} (cfs)
E1	1.58	85%	690	13	2.74
E2	1.69	100%	400	5	5.10
E3	0.76	71%	390	7	1.63
		Total Peak Flow			**9.47**

Table IV.1 – Existing Peak Flow Rates per Subarea

Sub Area	Area (acres)	Percent Impervious	Flow Length (feet)	T_C (minutes)	Q_{25} (cfs)
P1	1.53	71%	690	14	2.29
P2	0.98	100%	250	5	2.96
P3	0.64	86%	350	5	1.79
P4	0.89	92%	210	5	2.58
		Total Peak Flow			**9.62**

Table IV.2 – Proposed Peak Flow Rates per Subarea

V. Hydraulic Analysis

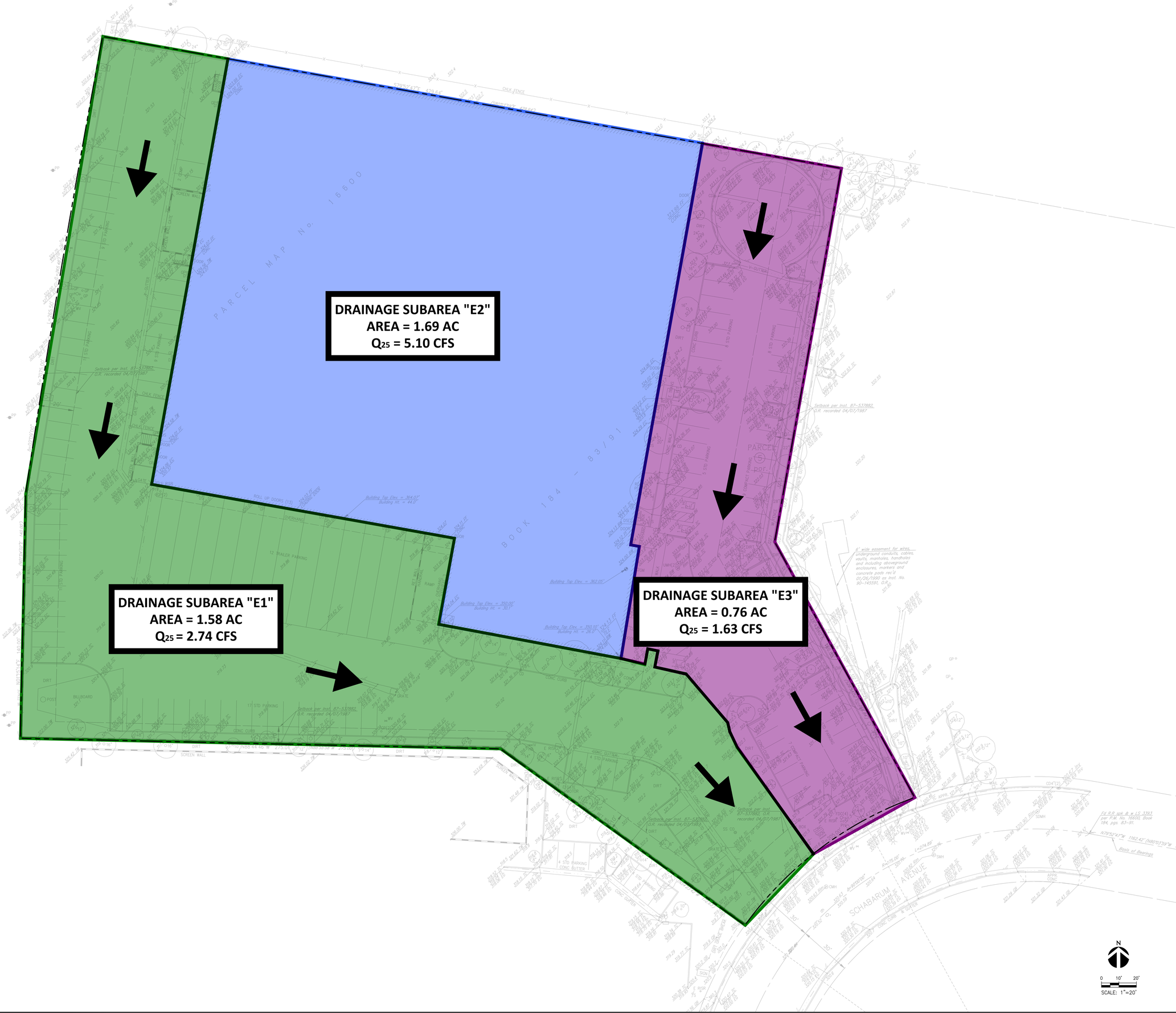
A hydraulic analysis for this study was performed to ensure the proposed system has the capacity to accommodate a 25-yesr storm event. The storm drain lines, inlets, and structures were sized using the values obtained from the peak flow analysis. FlowMaster was used to model the capacity of proposed drainage facilities and to ensure they could meet the demand set by the Hydrology Manual and calculated through HydroCalc. Based on the FlowMaster model, it is proposed that a 21" storm drain system will be sufficient to accommodate the runoff the site will experience during a 25-year storm event. See ***Appendix C – FlowMaster Hydraulic Analysis*** for details and model assumptions.

VI. Summary and Conclusion

This analysis provided in this study has shown that the proposed drainage system for this project will be able to accommodate the 25-year design storm as set forth by the guidelines in the Los Angeles County Hydrology Manual. During a 25-year storm event runoff will be able to be captured at inlets, area drains and catch basins, conveyed to the proposed infiltration system, and allowed to overflow onto the public storm drain line along Schabarum Avenue.

Appendix A

Figures and Exhibits



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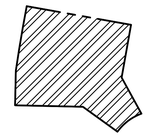
CONSULTANTS

STAMP

REVISIONS		
DATE	△	ISSUED FOR
XX/XX/XX	1	DESCRIPTION

DATE	05.12.2016
PROJECT NUMBER	113355
DESIGNED BY	GT
DRAWN BY	GT
CHECKED BY	ID
SCALE	AS SPECIFIED

KEY MAP



PROJECT DESCRIPTION

KAISER IRWINDALE MOB & PARKING STRUCTURE

12761 SCHABARUM AVENUE
IRWINDALE, CA. 91706

DRAWING TITLE

EXISTING HYDROLOGY MAP

SHEET NUMBER (EXHIBIT NUMBER)

EX1.00

N

0 10' 20'

SCALE: 1"=20'

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STAMP

REVISIONS

DATE		ISSUED FOR
XX/XX/XX	1	DESCRIPTION

DATE	05.12.2016
PROJECT NUMBER	113355
DESIGNED BY	GT
DRAWN BY	GT
CHECKED BY	ID
SCALE	AS SPECIFIED

KEY MAP

PROJECT DESCRIPTION

KAISER IRWINDALE MOB & PARKING STRUCTURE

12761 SCHABARUM AVENUE
IRWINDALE, CA. 91706

DRAWING TITLE

PROPOSED HYDROLOGY MAP

SHEET NUMBER (EXHIBIT NUMBER)

EX2.00

Appendix B

HydroCalc Hydrology Analysis

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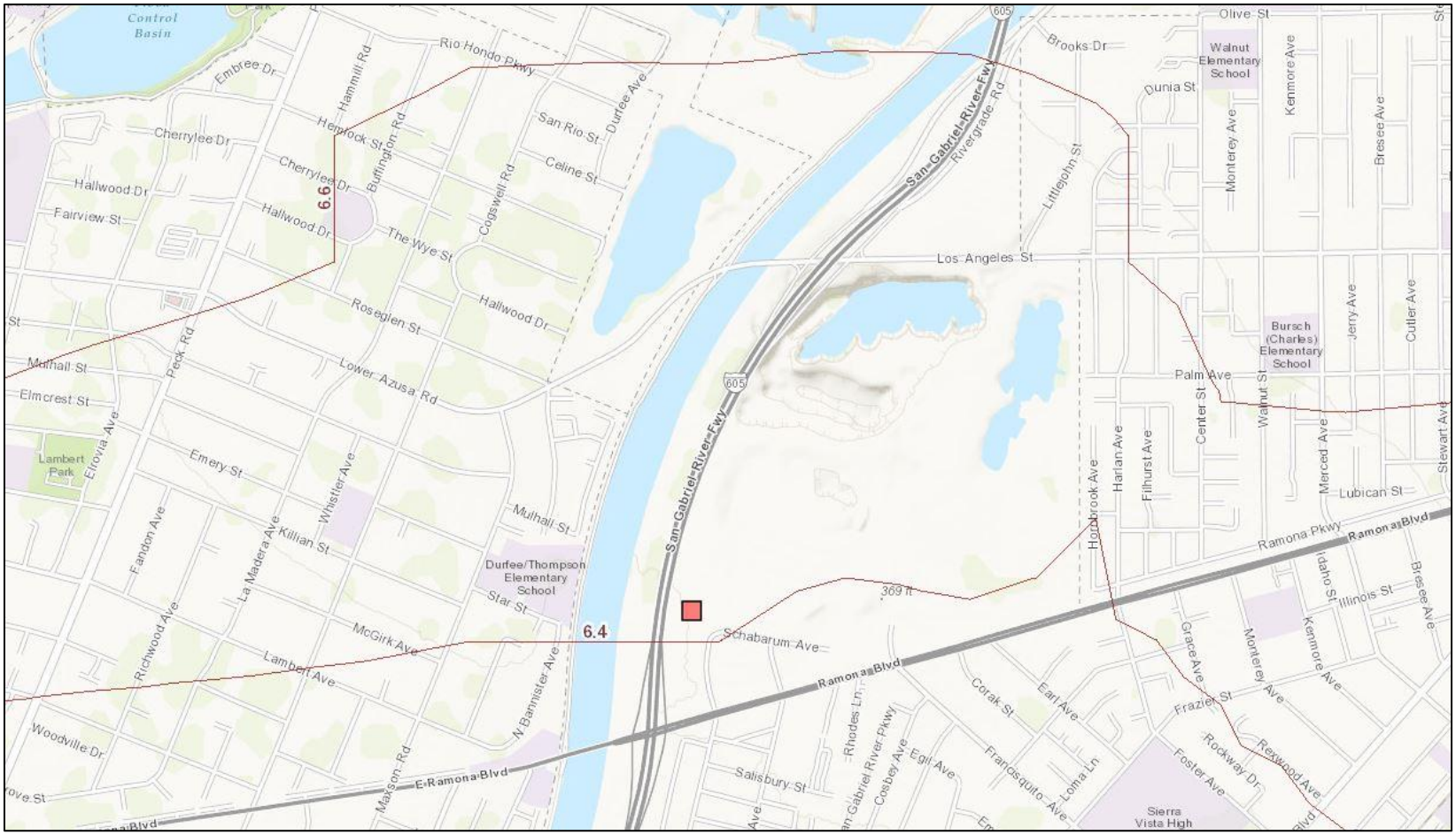

50-Year Isohyet – Los Angeles County Department of Public Works Hydrology GIS

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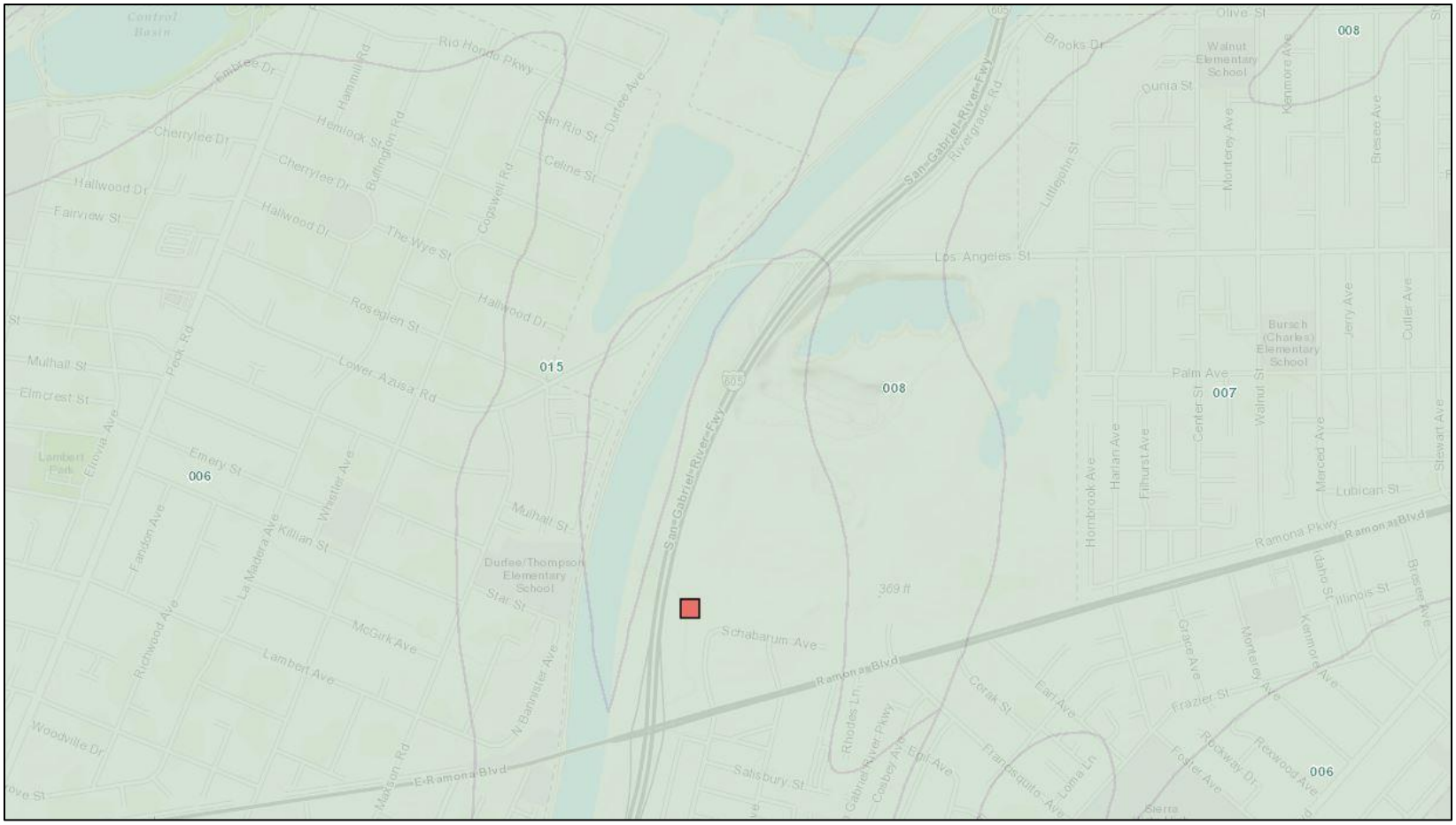


Soil Types – Los Angeles County Department of Public Works Hydrology GIS

Peak Flow Hydrologic Analysis

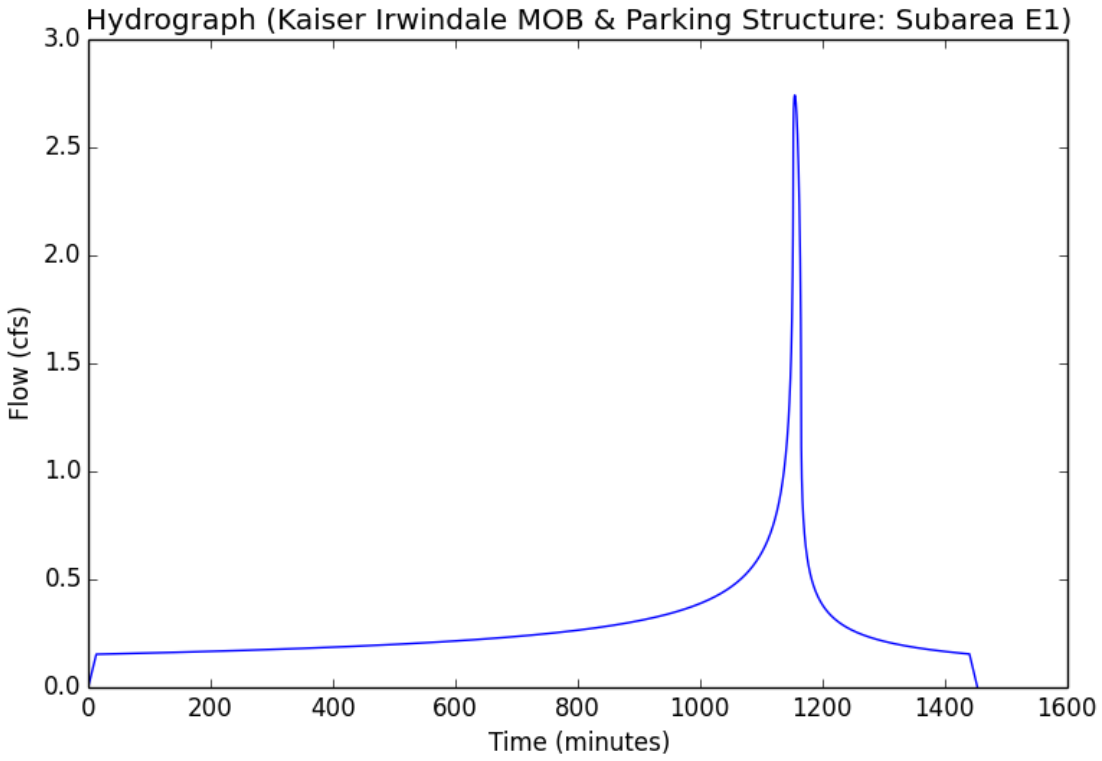
File location: P:/2015/115355 Kaiser Irwindale MOB and Parking Structure/ENGR/Hydrology/Appendix/Subarea E1- 25 Year Storm.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	Kaiser Irwindale MOB & Parking Structure
Subarea ID	Subarea E1
Area (ac)	1.58
Flow Path Length (ft)	690.0
Flow Path Slope (vft/hft)	0.002
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.85
Soil Type	15
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.6192
Peak Intensity (in/hr)	2.1396
Undeveloped Runoff Coefficient (Cu)	0.3072
Developed Runoff Coefficient (Cd)	0.8111
Time of Concentration (min)	13.0
Clear Peak Flow Rate (cfs)	2.7419
Burned Peak Flow Rate (cfs)	2.7419
24-Hr Clear Runoff Volume (ac-ft)	0.574
24-Hr Clear Runoff Volume (cu-ft)	25003.1267



Peak Flow Hydrologic Analysis

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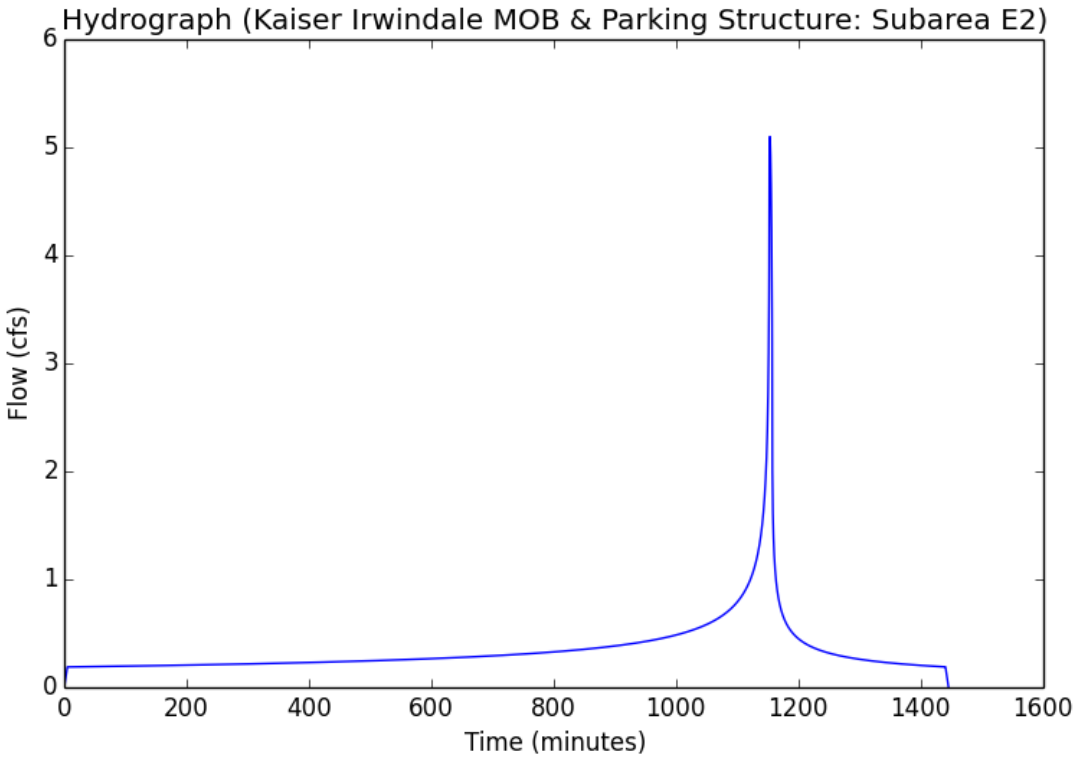
Version: HydroCalc 0.3.1

Input Parameters

Project Name	Kaiser Irwindale MOB & Parking Structure
Subarea ID	Subarea E2
Area (ac)	1.69
Flow Path Length (ft)	400.0
Flow Path Slope (vft/hft)	0.15
50-yr Rainfall Depth (in)	6.4
Percent Impervious	1.0
Soil Type	15
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.6192
Peak Intensity (in/hr)	3.3526
Undeveloped Runoff Coefficient (Cu)	0.4443
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	5.0993
Burned Peak Flow Rate (cfs)	5.0993
24-Hr Clear Runoff Volume (ac-ft)	0.7063
24-Hr Clear Runoff Volume (cu-ft)	30768.5012



Peak Flow Hydrologic Analysis

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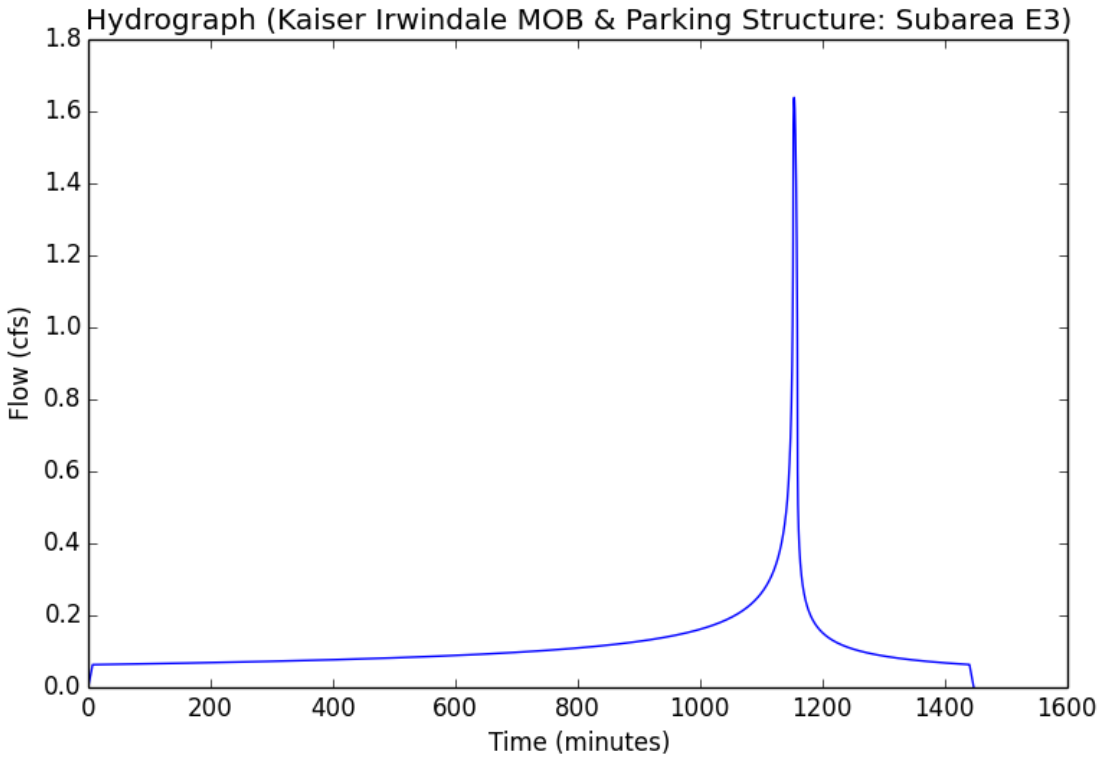
Version: HydroCalc 0.3.1

Input Parameters

Project Name	Kaiser Irwindale MOB & Parking Structure
Subarea ID	Subarea E3
Area (ac)	0.76
Flow Path Length (ft)	390.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.71
Soil Type	15
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.6192
Peak Intensity (in/hr)	2.8622
Undeveloped Runoff Coefficient (Cu)	0.394
Developed Runoff Coefficient (Cd)	0.7533
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	1.6386
Burned Peak Flow Rate (cfs)	1.6386
24-Hr Clear Runoff Volume (ac-ft)	0.2376
24-Hr Clear Runoff Volume (cu-ft)	10349.2401



Peak Flow Hydrologic Analysis

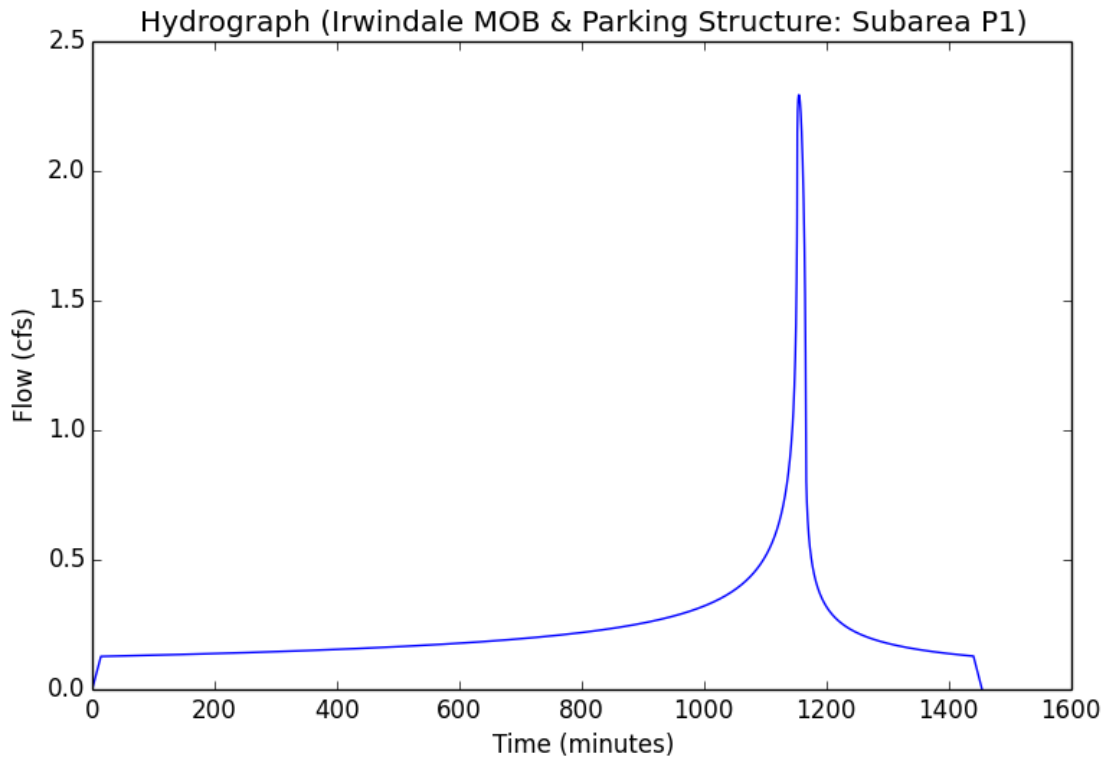
File location: P:/2015/115355 Kaiser Irwindale MOB and Parking Structure/ENGR/Hydrology/HydroCalc/Subarea P1- 25 Year Storm.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	Irwindale MOB & Parking Structure
Subarea ID	Subarea P1
Area (ac)	1.53
Flow Path Length (ft)	690.0
Flow Path Slope (vft/hft)	0.002
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.71
Soil Type	15
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.6192
Peak Intensity (in/hr)	2.0664
Undeveloped Runoff Coefficient (Cu)	0.2983
Developed Runoff Coefficient (Cd)	0.7255
Time of Concentration (min)	14.0
Clear Peak Flow Rate (cfs)	2.2938
Burned Peak Flow Rate (cfs)	2.2938
24-Hr Clear Runoff Volume (ac-ft)	0.4777
24-Hr Clear Runoff Volume (cu-ft)	20807.9366



Peak Flow Hydrologic Analysis

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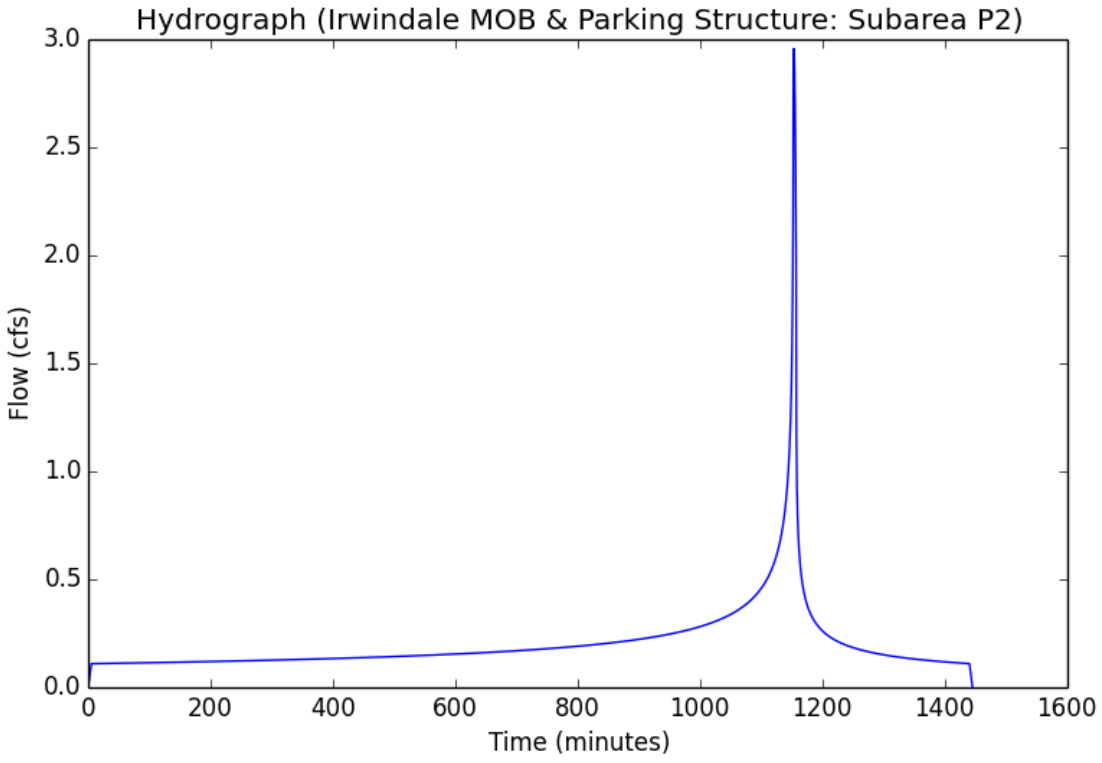
Version: HydroCalc 0.3.1

Input Parameters

Project Name	Irwindale MOB & Parking Structure
Subarea ID	Subarea P2
Area (ac)	0.98
Flow Path Length (ft)	250.0
Flow Path Slope (vft/hft)	0.15
50-yr Rainfall Depth (in)	6.4
Percent Impervious	1.0
Soil Type	15
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.6192
Peak Intensity (in/hr)	3.3526
Undeveloped Runoff Coefficient (Cu)	0.4443
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.957
Burned Peak Flow Rate (cfs)	2.957
24-Hr Clear Runoff Volume (ac-ft)	0.4096
24-Hr Clear Runoff Volume (cu-ft)	17842.0894



Peak Flow Hydrologic Analysis

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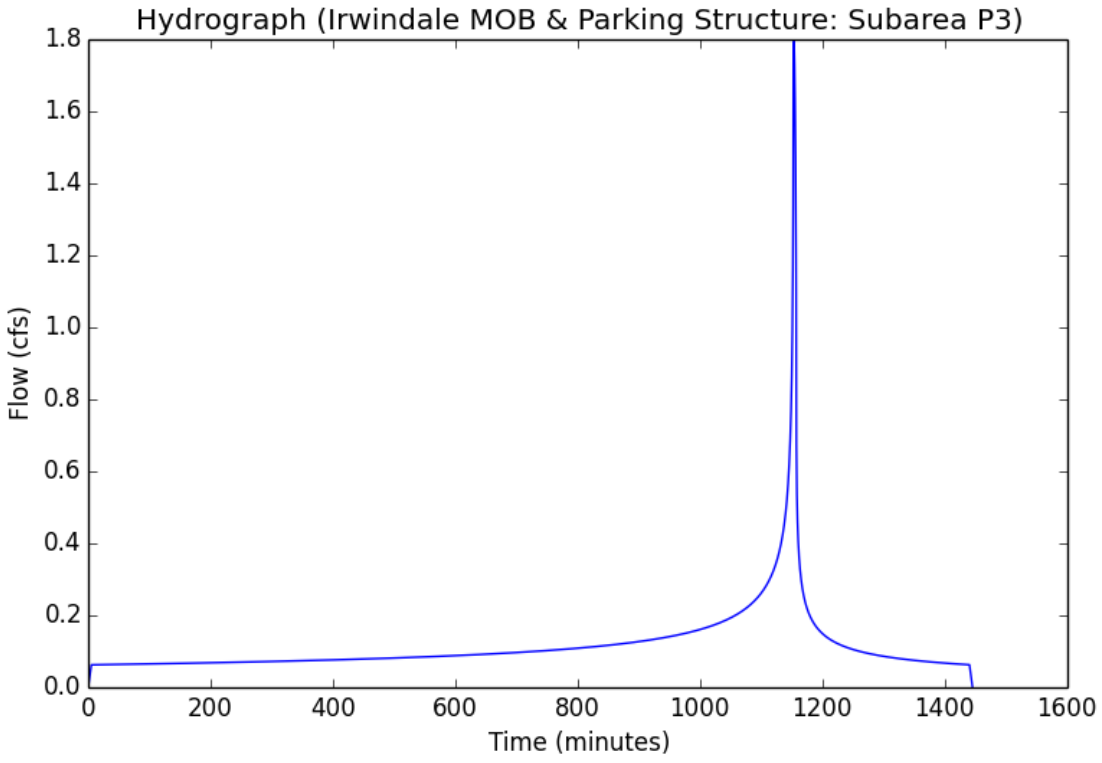
Version: HydroCalc 0.3.1

Input Parameters

Project Name	Irwindale MOB & Parking Structure
Subarea ID	Subarea P3
Area (ac)	0.64
Flow Path Length (ft)	350.0
Flow Path Slope (vft/hft)	0.15
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.86
Soil Type	15
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.6192
Peak Intensity (in/hr)	3.3526
Undeveloped Runoff Coefficient (Cu)	0.4443
Developed Runoff Coefficient (Cd)	0.8362
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.7942
Burned Peak Flow Rate (cfs)	1.7942
24-Hr Clear Runoff Volume (ac-ft)	0.235
24-Hr Clear Runoff Volume (cu-ft)	10236.3942



Peak Flow Hydrologic Analysis

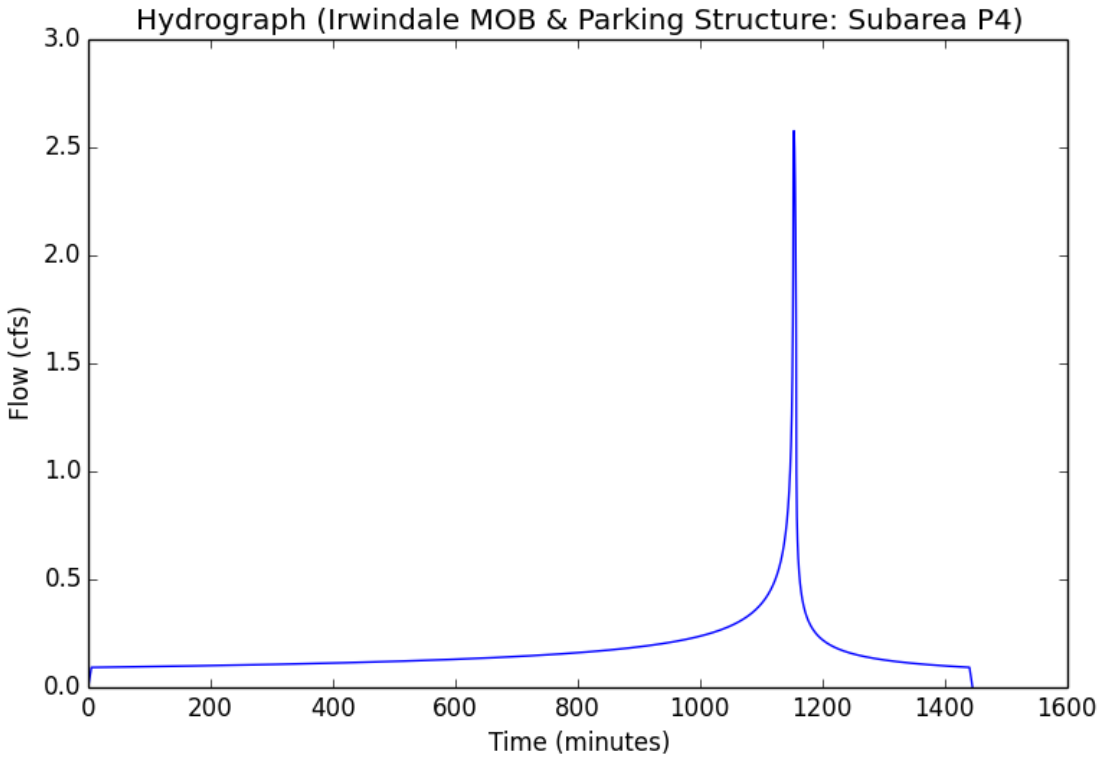
File location: P:/2015/115355 Kaiser Irwindale MOB and Parking Structure/ENGR/Hydrology/HydroCalc/Subarea P4- 25 Year Storm.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	Irwindale MOB & Parking Structure
Subarea ID	Subarea P4
Area (ac)	0.89
Flow Path Length (ft)	210.0
Flow Path Slope (vft/hft)	0.15
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.92
Soil Type	15
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.6192
Peak Intensity (in/hr)	3.3526
Undeveloped Runoff Coefficient (Cu)	0.4443
Developed Runoff Coefficient (Cd)	0.8635
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.5766
Burned Peak Flow Rate (cfs)	2.5766
24-Hr Clear Runoff Volume (ac-ft)	0.3462
24-Hr Clear Runoff Volume (cu-ft)	15078.6476



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Appendix C

FlowMaster Hydraulic Analysis

Kaiser irwindale MOB & Parking Structure Minimum Pipe Capacity

Project Description

Friction Method	Kutter Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	1.66	ft
Diameter	1.66	ft
Discharge	9.62	ft³/s

Results

Diameter	1.66	ft
Normal Depth	1.66	ft
Flow Area	2.16	ft²
Wetted Perimeter	5.21	ft
Hydraulic Radius	0.41	ft
Top Width	0.00	ft
Critical Depth	1.17	ft
Percent Full	100.0	%
Critical Slope	0.00680	ft/ft
Velocity	4.46	ft/s
Velocity Head	0.31	ft
Specific Energy	1.97	ft
Froude Number	0.00	
Maximum Discharge	10.44	ft³/s
Discharge Full	9.62	ft³/s
Slope Full	0.00500	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Kaiser irwindale MOB & Parking Structure Minimum Pipe Capacity

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.66	ft
Critical Depth	1.17	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00680	ft/ft

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Appendix D

Los Angeles County Hydrology Manual Excerpts

CHAPTER

4

Policy on Levels of Protection

4.1 DEPARTMENT POLICY MEMORANDUM

A Department of Public Works memorandum dated March 31, 1986, General Files No. 2-15.321, established the policy on levels of flood protection. This policy describes degrees of flooding and which design storms should be used for certain conditions and structures. Chapter 5 defines the design storms for use in the County of Los Angeles.

4.2 CAPITAL FLOOD PROTECTION

The Capital Flood is the runoff produced by a 50-year frequency design storm falling on a saturated watershed (soil moisture at field capacity). A 50-year frequency design storm has a probability of 1/50 of being equaled or exceeded in any year. Capital Flood protection also requires adding the effects of fires and erosion under certain conditions. This section describes specific criteria for applying the burning and bulking requirements for Capital Flood protection.

The following sections describe facilities and structures required to meet the Capital Flood level of protection.

Natural Watercourses

The Capital Flood level of protection applies to all facilities, including open channels, closed conduits, bridges, dams, and debris basins not under State of California jurisdiction. These facilities must also be constructed in or intercept flood waters from natural watercourses. Facilities under the State of California jurisdiction must also meet the state's criteria, which may include the Probable Maximum Flood criteria described in Section 4.4.

A natural watercourse is a path along which water flows due to natural topographic features. For definition purposes, a natural watercourse drains a watershed greater than 100 acres. Natural watercourses have not been subject to major engineering works such as channel realignment or bank protection. The watercourse must also meet one or more of the following conditions during a Capital Flood:

1. Flow velocities greater than 5 ft/sec.

2. Flow depths greater than 1.5 feet.

Replacement of the natural watercourse with flood control facilities that do not provide the Capital Flood level of protection requires water surface elevation analysis. The water surface elevation must be at least one foot below the base of existing dwellings adjacent to the channel. The construction must also meet the requirement of the National Flood Insurance Program described in Section 4.6. An example of a natural watercourse in Bouquet Canyon is shown in Figure 4.2.1.

Figure 4.2.1
Bouquet Canyon
Natural Watercourse
in June 2005

Floodways

The Capital Flood applies to all areas mapped as floodways. See Section 4.6 for more information on floodways.

Natural Depressions or Sumps

The Capital Flood level of protection applies to all facilities constructed to drain natural depressions or sumps. These facilities include channels, closed conduits, retention basins, detention basins, pump stations, and highway underpasses. A depression or sump is an area from which there is no surface flow outlet and must meet one or more of the following conditions during a Capital Flood:

1. Ponded depth of 3 feet or greater.

2. Ponded water surface elevations within one foot below the base of adjacent dwellings resulting from construction of facilities with less than the Capital Flood capacity. This condition does not apply if ponded water can escape as surface flow before reaching the base of adjacent dwellings during the Capital Flood.

Figure 4.2.2 shows an example of a flooded sump at the intersection of San Fernando Road and Tuxford Street in Sun Valley.

Figure 4.2.2
Flooded Sump at Intersection of San Fernando Road and Tuxford Street
January 9, 2005

Sumps with drainage from roadways require special care. If flows reach the sump by following the roadway from upstream, use the Capital Flood on all areas upstream of the sump that drain to the roadway. The roadway must carry the Capital Flood capacity with a water surface elevation below the private property line. Otherwise, drainage facilities must be added beneath the roadway. See the Los Angeles County Highway Design Manual[1], and Chapter 44 of the Land Development Division Guidelines.

Culverts

The Capital Flood level of protection applies to all culverts under major and secondary highways.

Tributary Areas Subject to Burning

Canyons and mountainous areas within the County of Los Angeles are subject to burning. The Capital Flood applies to all areas likely to remain in a natural state, regardless of size. Burned canyons and mountainous areas also add debris to the runoff. Therefore, flow from "burned" areas must be "bulked." Bulking reflects increases in runoff volumes and peak flows related to inclusion and transport of sediment and debris.

Section 6.3 discusses the development of burned watershed hydrology. Section 3.3 of the Public Works' Sedimentation Manual contains information on bulking flows.

4.3 URBAN FLOOD PROTECTION

All drainage facilities in developed areas not covered under the Capital Flood protection conditions must meet the Urban Flood level of protection. The Urban Flood is runoff from a 25-year frequency design storm falling on a saturated watershed. A 25-year frequency design storm has a probability of 1/25 of being equaled or exceeded in any year.

Street flow due to the urban flood may not exceed the private property line elevation. However, runoff can be conveyed in drains under the street and on the street surface. Urban Flood runoff is allowed to flow in the street to the point where the flow reaches the street capacity at the property line. Depth analysis is to be started at the upstream end of the watershed. The flow should be split to allow conveyance in the street and in a drain below the street when flows exceed street capacity. Drains must at least carry flow

from the 10-year frequency design storm. See the Los Angeles County Highway Design Manual[1] and Chapter 44 of the Land Development Division Guidelines for road design requirements.

The street or highway must carry the balance of the 25-year frequency design storm below the property line. The drain may carry more flow to lower the water surface on the street to below the private property line or meet other requirements for vehicular or pedestrian traffic. See the Los Angeles County Highway Design Manual for the traffic requirements[1]. The maximum allowable pipe diameter for hydrology studies is 96 inches. Beyond this size, choose a rectangular channel conveyance. Figure 4.3.1 provides an example of street flow.

Figure 4.3.1
Street Flow After 1938 Storm

4.4 PROBABLE MAXIMUM FLOOD PROTECTION

The Probable Maximum Flood (PMF) results from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in the region[2]. The Probable Maximum Precipitation[3] (PMP) represents the greatest depth of rainfall theoretically possible for a

given duration over a given drainage basin. The PMF occurs when the PMP falls over watersheds that have reached field capacity (saturated) conditions.

California's Division of Safety of Dams (DSOD) requires a PMF analysis for dams and debris basins that hold at least 1,000 acre-feet, are 50 feet or higher, would require at least 1,000 people to be evacuated, and have a damage potential of $25,000,000 or more. Most dams and debris basins (earth embankment, concrete, or other materials) in the County of Los Angeles must safely pass the PMF[4]. Figure 4.4.1 shows a chart of the State's height and storage parameters that define dam jurisdiction[5]:

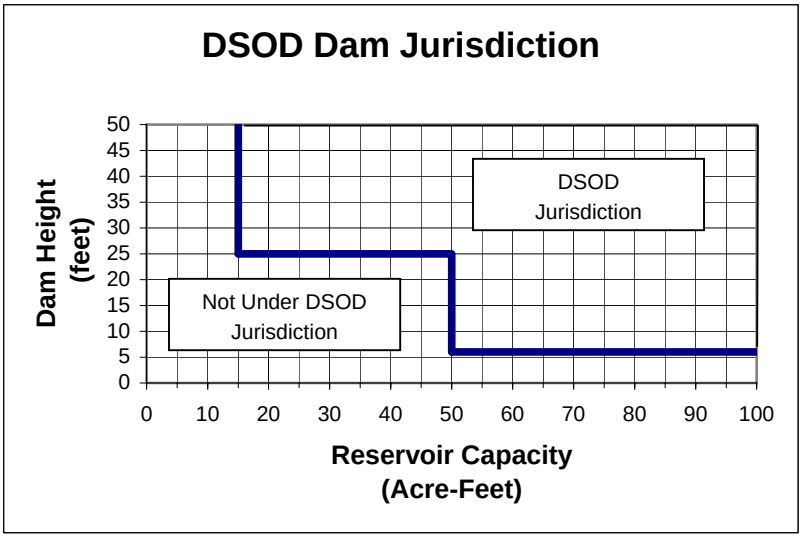

Figure 4.4.1
Dam Jurisdiction Chart

Spillway sizing requirements for dams and debris basins is available through the California Department of Water Resources, Division of Safety of Dams[4]. Figure 4.4.2 is a picture of Morris Dam, constructed in 1932, which falls under DSOD jurisdiction.

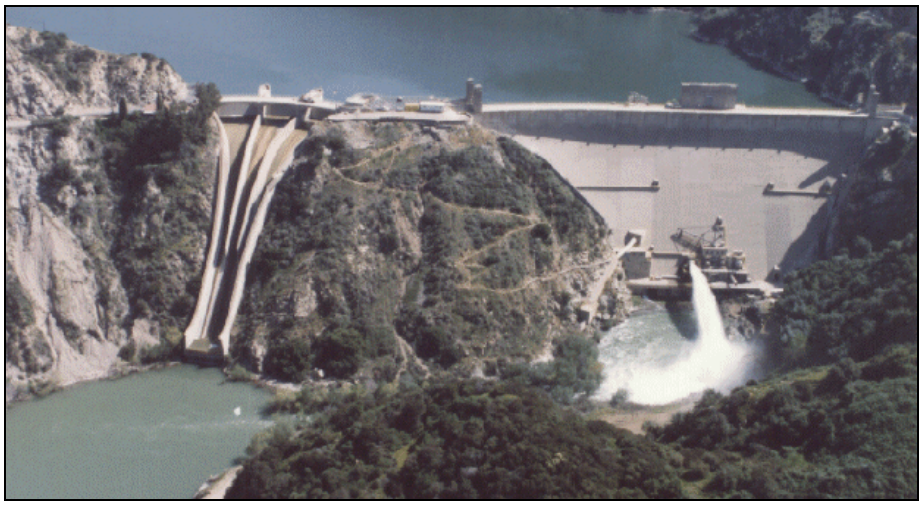

Figure 4.4.2
Morris Dam
1993

4.5 NATIONAL FLOOD INSURANCE PROGRAM

The National Flood Insurance Program (NFIP) set the 100-year flood as the standard for flood insurance protection. The 100-year flood relies on historic runoff records for definition. The standard makes no allowance for future urbanization or the possible inclusion of debris in the flow. In flood hazard areas, the federal standard requires the finished floor elevation of proposed dwellings to be at least 1 foot above the water surface elevation of the 100-year flood[5]. The Base Flood Elevation (BFE) refers to the water surface elevation of the 100-year flood on the pre-developed condition.

Public Works uses the Capital Flood peak flow rate for Los Angeles County floodway mapping standards. FEMA Flood Insurance Rate Maps (FIRM Maps) are available at: http://www.ladpw.org/apps/wmd/floodzone. More information about the NFIP level of protection requirements are available at the www.fema.gov/nfip/ website.

The floodway is determined using the 1-foot rise criterion. Some misinterpret this to mean that development in a floodway is permitted if it does not raise the BFE more than one foot. Floodplain management regulations dictate that any rise in the BFE, as a result of a floodway encroachment, is unacceptable without a Conditional Letter of Map Revision[6]. FEMA provides guidelines and standards for flood hazard mapping and requirements to meet the NFIP level of protection. More information on the FEMA requirements is found at http://www.fema.com/fhm/gs_main.shtm.

4.6 COMPATIBILITY WITH EXISTING SYSTEMS

The level of protection standards may require modification if the receiving system has limited capacity at the proposed drain's outlet. If the receiving drain will be replaced or relieved in the future, size the proposed drain for the appropriate level of protection. The proposed drain capacity is restricted to match the capacity available in the downstream drain when no future relief is planned.

Solutions to the situations with restricted capacities require project specific decisions. The Design Division of Public Works should review the proposed drainage system and the outlet conditions to determine the compatible level of protection.

4.7 EXISTING LEVEL OF FLOOD PROTECTION

Sub-surface drainage often replaces surface drainage when land is developed. Replacing or modifying surface drainage systems requires maintaining or increasing the original level of flood protection. The total capacity, sub-surface and surface, must equal or exceed the original surface capacity. Adequate surface drainage capacity must be retained if the proposed sub-surface drain provides a lower level of protection than the original surface drainage system.

4.8 MULTIPLE LEVELS OF FLOOD PROTECTION

There are numerous instances where a drainage system must provide more than a single level of flood protection. Drainage systems must meet the criteria described in this chapter of the Hydrology Manual.

For example, there may be a natural canyon area tributary to a proposed drainage system that drains an urban area containing a sump. The proposed drainage system must convey the burned and bulked Capital Flood flow from the canyon area, protect the sump from a Capital Flood, and protect the developed area from the Urban Flood. Refer to Table 4.1.1 of the Sedimentation Manual to determine if a structure, such as a debris basin, is needed for the natural canyon. If a structure is needed, then only the burned flow is carried through the drainage system.

Figure 4.8.1 is an example of a debris basin.

Figure 4.8.1
Sawpit Debris Basin
January 11, 2005
(Courtesy of Leopoldo A. Herrera)

---

1 Los Angeles County Highway Design Manual 5th edition. 2001.

2 US Army Corps of Engineers. Flood-Runoff Analysis (EM 1110-2-1417). page 13-7. Washington, D.C. 1994.

3 US Department of Commerce, National Oceanic and Atmospheric Administration, US Army Corps of Engineers. Hydrometeorological Report Number 59. Probable Maximum Precipitation for California. 1999.

4 Calzascia and Fitzpatric. Hydrologic Analysis Within California's Dam Safety Program. California Department of Water Resources, Division of Safety of Dams. http://wwwdsod.water.ca.gov/tech-ref/fitz-paper.pdf

5 National Flood Insurance Program Flood Insurance Manual. Federal Emergency Management Agency. October 2004.

6 Dyhouse, G., J. Hatchett, J. Benn. Floodplain Modeling Using HEC-RAS. Haestad Methods. Connecticut. 2003.

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County of Los Angeles Low Impact Development (LID) Report

Kaiser Permanente – Irwindale Medical Office Building and Parking Structure
12761 Schabarum Avenue
Irwindale, CA 91706
KPFF Job # 115355

May 2016

Prepared for:
CO Architects
5055 Wilshire Blvd, 9th Floor
Los Angeles, CA 90036
(323) 525-0500

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(310) 665-2800

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Appendix "B" – Geotechnical Investigation Concerning Infiltration Feasibility
Appendix "C" – Percolation test Report

References

Los Angeles County Standard Urban Storm Water Mitigation Plan. Los Angeles County Department of Public Works, September 2002.

I. Introduction

a. Project Description

The purpose of this study is to develop a Low Impact Development (LID) plan per the City of Irwindale's requirements. This will be accomplished by adhering to the Los Angeles County LID Standards Manual. The goal of this plan is to reduce the amount of stormwater runoff discharged onto the public right of way and to allow developed sites to mimic the natural hydrologic environments which they build over.

The site is located at 12761 Schabarum Avenue in the City of Irwindale. It is bounded by the 605 Freeway to the west, a rock quarry to the north and commercial/industrial properties to the south and east. The site is approximately 4 acres in size and the building currently on the project site serves as a distribution center. The proposed improvements will replace the existing on-site structure with a medical office building and a parking structure. The pervious to impervious pavement ratio will remain the same post and pre development.

b. Drainage Characteristics

Existing site drainage can generally be described as flowing from north to south where stormwater discharges on to the public right of way at Schabarum Avenue. The site's highpoint is at its northeast corner, at about 325', and its low point, at about 320', is at the southeast corner of the site. This 5' grade difference over the site creates a relatively flat area with slopes generally being at around 1%. The site dedicates approximately 14% of its site as pervious area, and the remaining 86% as impervious.

There is an existing concrete swale along the western parking lot which conveys stormwater to an 18" storm drain. From this point it's transported to the public system, a 30" RCP line running trough Schabarum Avenue. This 18" HDPE line is fed by two area drains before sizing up to a 24" RCP line and discharging to the public 30" line. To more accurately describe the site drainage it was broken up into three subareas showing drainage patterns along both sides of the existing building, and along the existing at-grade parking lot. See ***Figure I.1 – Existing Hydrology Map*** for detailed hydrologic conditions.

Proposed site drainage conditions would establish a new highpoint of 338.5' at the MOB's patient drop off point, which is located centrally on the site. Due to building height conditions and existing site grading, it was necessary to create a local low point within the site at 120.00. This low point is approximately 6" below the discharge point to the public system, and once ponding reaches that depth it would overflow onto the public right of way. Due to the change in site grading and the creation of a high point at a much higher elevation that the existing one, site slopes have become more steep leading up to the patient loading zone, at around 5%, and remaining generally flat elsewhere at 0.5%-1% elsewhere.

The proposed drainage system consists of area drains to capture runoff in the at-grade parking lots, a new 21" RCP line to convey stormwater, 6" roof drains to convey stormwater runoff over building footprints, an infiltration system designed to infiltrate the 85th percentile storm, and a new 21" rcp overflow pipe connected to the existing 30" RCP City line. The proposed infiltration system is designed by Contech and is designed to collect storm water, pre-treat it through the use of a hydro-dynamic separation unit, allowing it into its infiltration chamber and then allowing the storm water to collect and infiltrate into the engineered base and underlying native soils. In the case of a storm even

greater than the 85th percentile, for which the infiltration system is designed, an overflow is built into the system to allow water to overflow into the existing 30" line along Schabarum Avenue.

To better describe the proposed site drainage four subareas were designated for the proposed site plan. These subareas represent the 4 major drainage areas of the site, each having distinct discharge point which ultimately converge before discharge to the infiltration system or the public system. The four areas encompass the on-grade parking lot, the parking structure, the MOB, and the entry ramp leading to the MOB. These four areas have their own distinct characteristics and contribute to the overall hydrology patterns of the site. See ***Figure III.1 – Proposed Hydrlogy Map*** for detailed hydrologic conditions.

c. Required Treatment Design Volume

The required treatment design volume (V_D) has been calculated to be 11,120 cubic feet. The value was calculated using the County of Los Angeles Low Impact Development Manual based on the 85th percentile rainfall depth. The following tables summarize the runoff per sub-area.

Sub Area	Area (acres)	Percent Impervious	Flow Length (feet)	T_C (minutes)	Q_D (cfs)	V_D (cu. ft.)
P1	1.53	71%	690	48	0.21	3,606
P2	0.98	100%	250	9	0.39	3,112
P3	0.64	86%	350	5	0.18	1,779
P4	0.89	92%	210	5	0.33	2,625
Total Peak Flow & Volume					**1.11**	**11,122**

Table I.1 – 85th Percentile Peak Flow Rates

Input Parameters and calculations shown in Appendix A.

II. Best Management Practices (BMPs)

a. Basis of Design

Following the latest County of Los Angeles Low Impact Development Handbook, consideration was first given to infiltration. The percolation report, Low Impact Development Storm Water Infiltration – Geotechnical Report," by Geobase, Inc. dated January 11, 2016 recommends infiltration in the vicinity of the percolations test locations (see Appendix B). Following geotechnical recommendations, storm water will infiltrate by way of a Contech CMP Infiltration System.

b. Structural BMPs

i. Contech CMP Infiltration System

A Contech CMP Infiltration System is being proposed to allow pretreatment and infiltration of the first 85th percentile of storm water runoff produced by the building and site. The Contech CMP Infiltration system is designed with perforated corrugated metal pipes in a stabilized infiltrations basin allowing water to be stored and percolate as soils allow. Pre-treatment will occur in the form of a CDS unit prior to the system. The system will be sized to contain 100% of the design volume, will be provided with an overflow, and allowed to infiltrate captured stormwater at its own rate.

The site specific system would encompass an approximate 26' x 96' footprint below the surface of the at-grade parking lot for the MOB. The infiltration system will be able to retain the entire design volume of 11,120 cubic feet of storm water as specified above. In addition a CDS unit sized to handle the peal flow from a 85th percentile storm will be added in-line with the system as a form of pre-treatment. The CDS unit will be able to handle at least the 1.1 CFS established from the peak flow analysis in Table I.1 above.

See Appendix D for detailed information on infiltration system and CDS unit sizing.

c. Non-Structural BMPs

i. Open Paved Areas and Planters

1. Regular sweeping of all open and planter areas, at a minimum, on a weekly basis in order to prevent dispersal of pollutants that may collect on those surfaces.
2. Regular pruning of the trees and shrubs in the planter areas to avoid formation of dried leaves and twigs, which are normally blown by the wind during windy days. These dried leaves are likely to clog the surface inlets of the drainage system when rain comes, which would result to flooding of the surrounding area due to reduced flow capacities of the inlets.
3. Trash and recycling containers shall be used such that, if they are to be located outside, are fully enclosed and watertight in order to prevent contact of storm water with waste matter, which can be a potential source of bacteria and other pollutants in runoff. These containers shall be emptied and the wastes disposed of properly on a regular basis.

ii. Educational Training

The owners shall be made aware of the structural BMP installed in the project. Information materials, such as brochures, shall also be provided for their complete information. They shall also be briefed about chemical management and proper methods of handling and disposing of wastes and should understand the on-site BMP and its maintenance requirements.

iii. Landscaping

Minimize the use of pesticides and fertilizers to the maximum extent practical.

iv. Monitoring and Maintenance

1. BMPs shall be operated, monitored, and maintained for the life of the project and at a minimum, all structural BMPs shall be inspected, cleaned-out, and where necessary, repaired, at the following minimum frequencies: 1) prior to October 15th each year; 2) during each month between October 15th and April 15th of each year and, 3) at least twice during the dry season (between April 16 and October 14 of every year).
2. Debris and other water pollutants removed from structural BMPs during cleanout shall be contained and disposed of in a proper manner.
3. The drainage system and the associated structures and BMPs shall be maintained according to manufacturer's specification to ensure maximum pollutant removal efficiencies.

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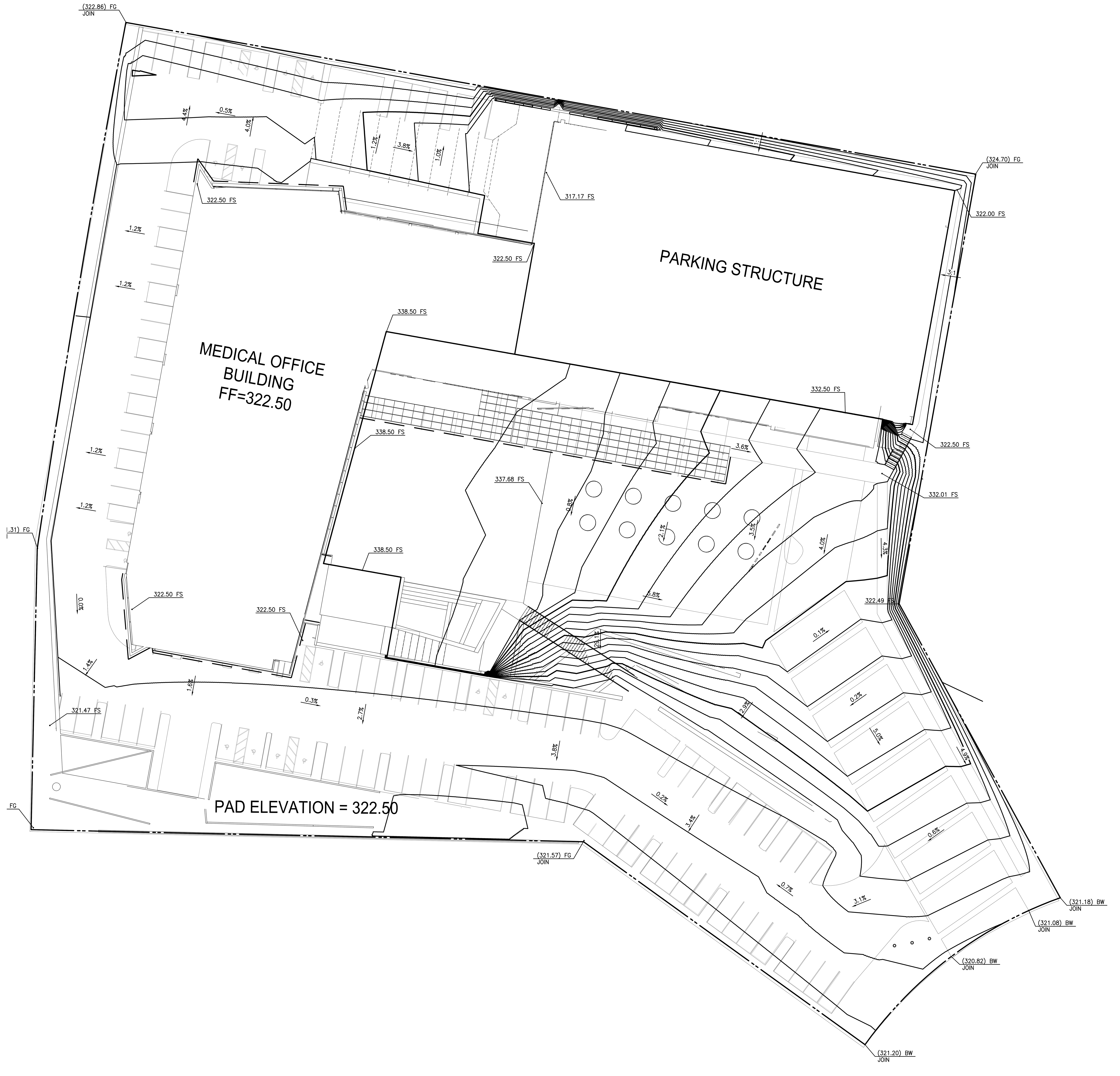
Civil Plans and Exhibits



LEGEND

- PROPERTY LINE
- BUILDING FOOTPRINT
- SUBTERRANEAN BUILDING FOOTPRINT
- ROOF OVERHANG

CONCEPTUAL DRAINAGE DESCRIPTION

IN AN EFFORT TO MAINTAIN EXISTING DRAINAGE PATTERNS RUNOFF FROM THE SITE IS DIRECTED TO THE EXISTING LOWPOINT IN THE SOUTH EAST CORNER OF THE SITE. RUNOFF SHALL BE COLLECTED THOUGH A COMBINATION OF ROOF DRAINS, DROP INLETS AND TRENCH DRAINS AND DIRECTED TO PROPOSED UNDERGROUND INFILTRATION SYSTEM. AN OVERFLOW MECHANISM SHALL BE IN PLACE TO CONVEY EXCESS RUNOFF INTO THE PUBLIC SYSTEM IN THE EVENT OF A SEVERE RAIN EVENT.

N
0 10' 20'
SCALE: 1"=20'

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SCHEMATIC DESIGN

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IRWINDALE MOB & PARKING STRUCTURE

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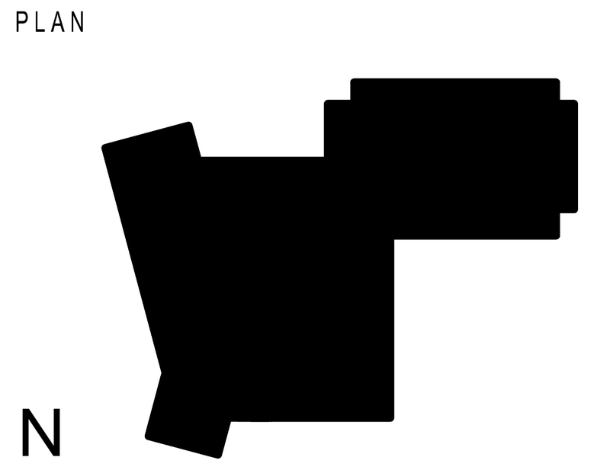
KEY PLAN



N

GRADING PLAN

SCALE: AS SPECIFIED
DATE OF FIRST ISSUE: 15 JANUARY 2016

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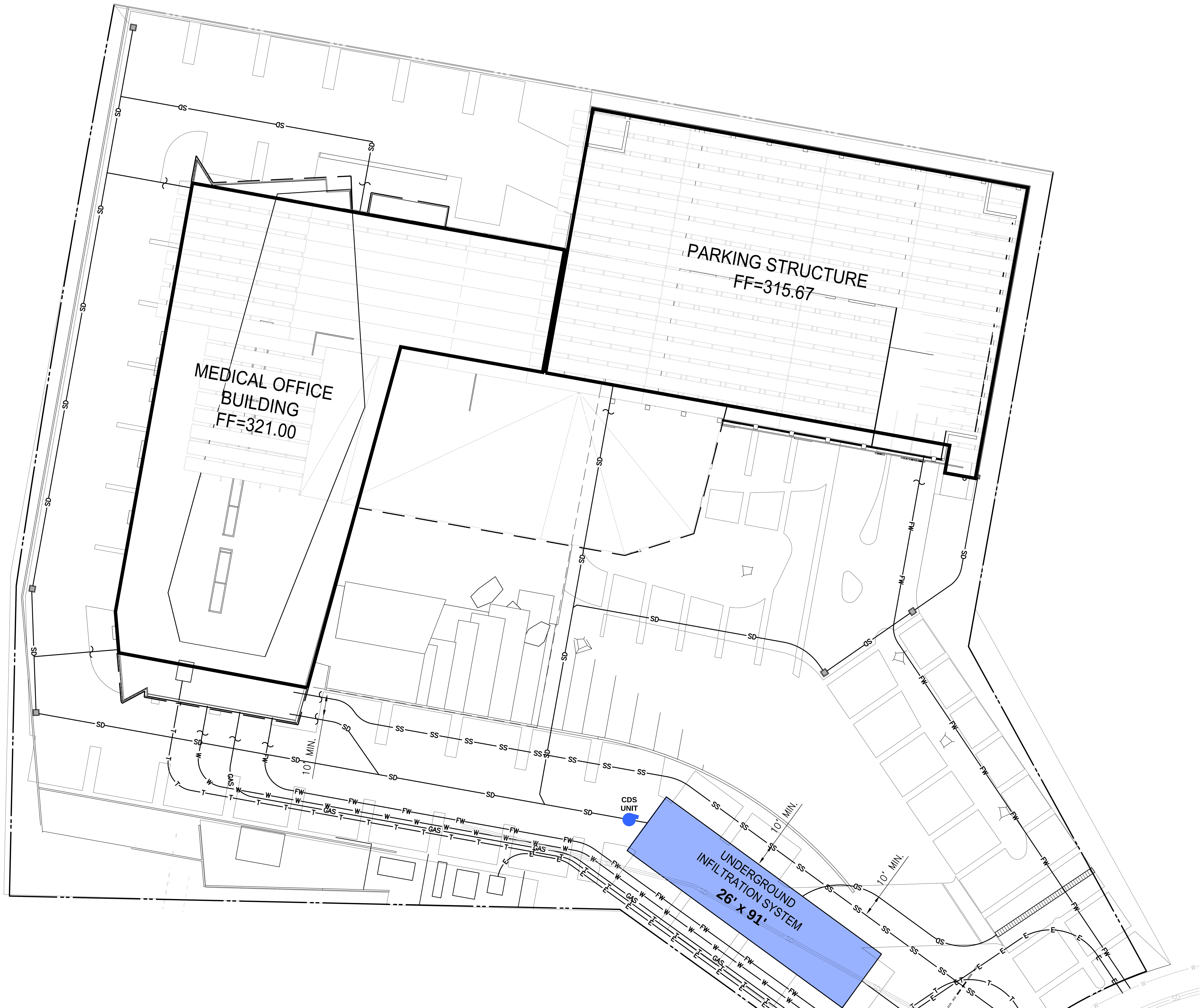
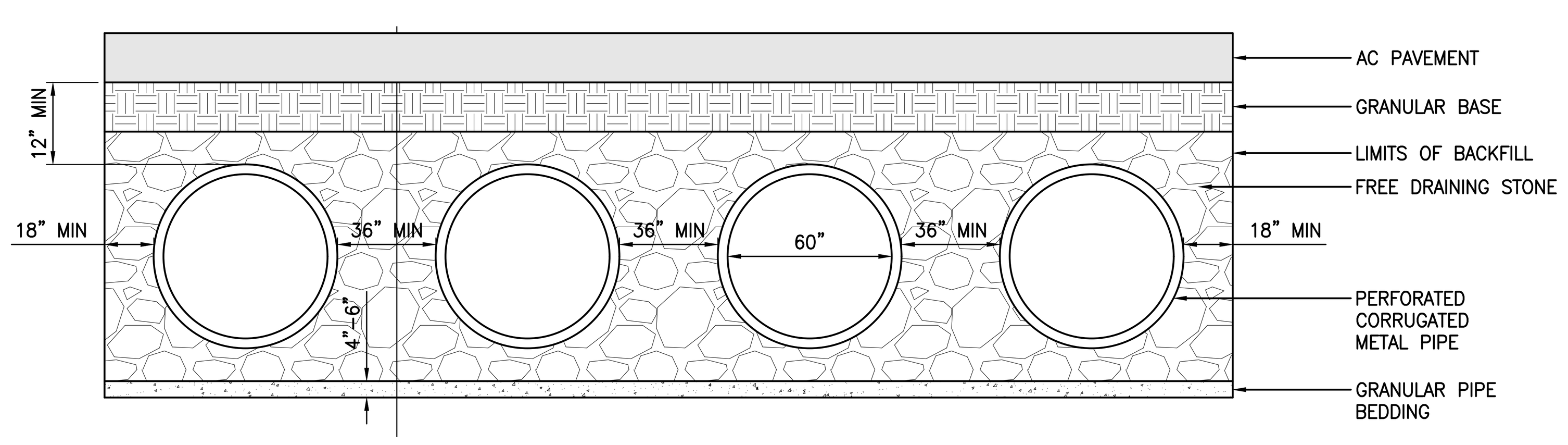
CO PROJECT NO.: 15018.000

C1.30



LEGEND

- PROPERTY LINE
- BUILDING FOOTPRINT
- SUBTERRANEAN BUILDING
- ROOF OVERHAND
- SD — STORM DRAIN LINE
- SS — SANITARY SEWER
- FW — FIRE WATER
- W — WATER LINE
- T — TELEPHONE LINE
- E — ELECTRICAL LINE
- G — GAS LINE
- SD — EXISTING STORM DRAIN
- SS — EXISTING SANITARY SEWER
- W — EXISTING WATER LINE
- GRADING INLET
- TRENCH DRAIN
- UNDERGROUND INFILTRATION SYSTEM BY CONTECH. SEE SHEET C5.00 FOR DETAILS.



1 UNDERGROUND INFILTRATION SYSTEM
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SCHEMATIC DESIGN

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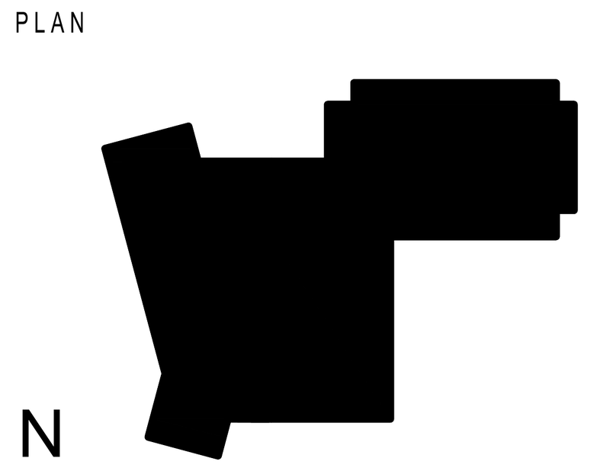
IRWINDALE, CA. 91706

KEY PLAN



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PAVING PLAN

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SCHEMATIC DESIGN
CO PROJECT NO.: 15018.000

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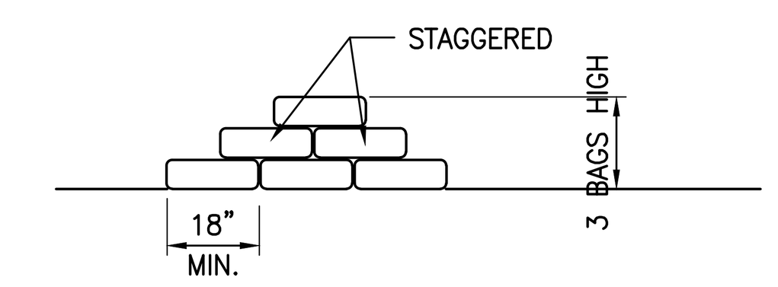
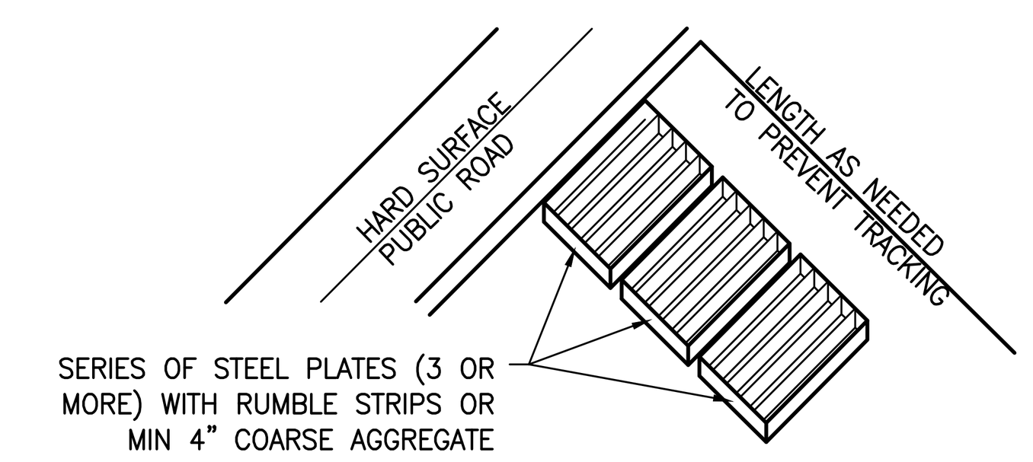


NOTES:

1. SANDBAG SHALL BE FILLED WITH NON-COHESIVE, CLASS 1 OR CLASS 2, PERMEABLE MATERIAL FREE FROM CLAY AND DELETERIOUS MATERIAL.

1 SANDBAG BARRIER
N.T.S.



NOTES:

1. THE CONSTRUCTION ENTRANCE ROADWAYS SHALL BE STABILIZED SO AS TO PREVENT SEDIMENTS FROM BEING DEPOSITED INTO THE PUBLIC ROADS. DEPOSITIONS MUST BE SWEPT UP IMMEDIATELY AND MAY NOT BE WASHED DOWN BY RAIN OR OTHER MEANS INTO THE STORM DRAIN SYSTEM.
2. STABILIZED CONSTRUCTION ENTRANCE SHALL BE:
   A. LOCATED AT ANY POINT WHERE TRAFFIC WILL BE ENTERING OR LEAVING A CONSTRUCTION SITE OR FROM A PUBLIC RIGHT OF WAY, STREET, ALLEY, AND SIDEWALK OR PARKING AREA.
   B. SERIES OF STEEL PLATES WITH "RUMBLE STRIPS", AND/OR MIN 4" COARSE AGGREGATE WITH LENGTH, WIDTH AND THICKNESS AS NEEDED TO ADEQUATELY PREVENT ANY TRACKING ONTO PAVED SURFACE.
3. ADD A WASH RACK WITH SEDIMENT TRAP LARGE ENOUGH TO COLLECT ALL WASH WATER.
4. ALL VEHICLES ACCESSING THE CONSTRUCTION SITE SHALL UTILIZE THE STABILIZED CONSTRUCTION ENTRANCE SITES.

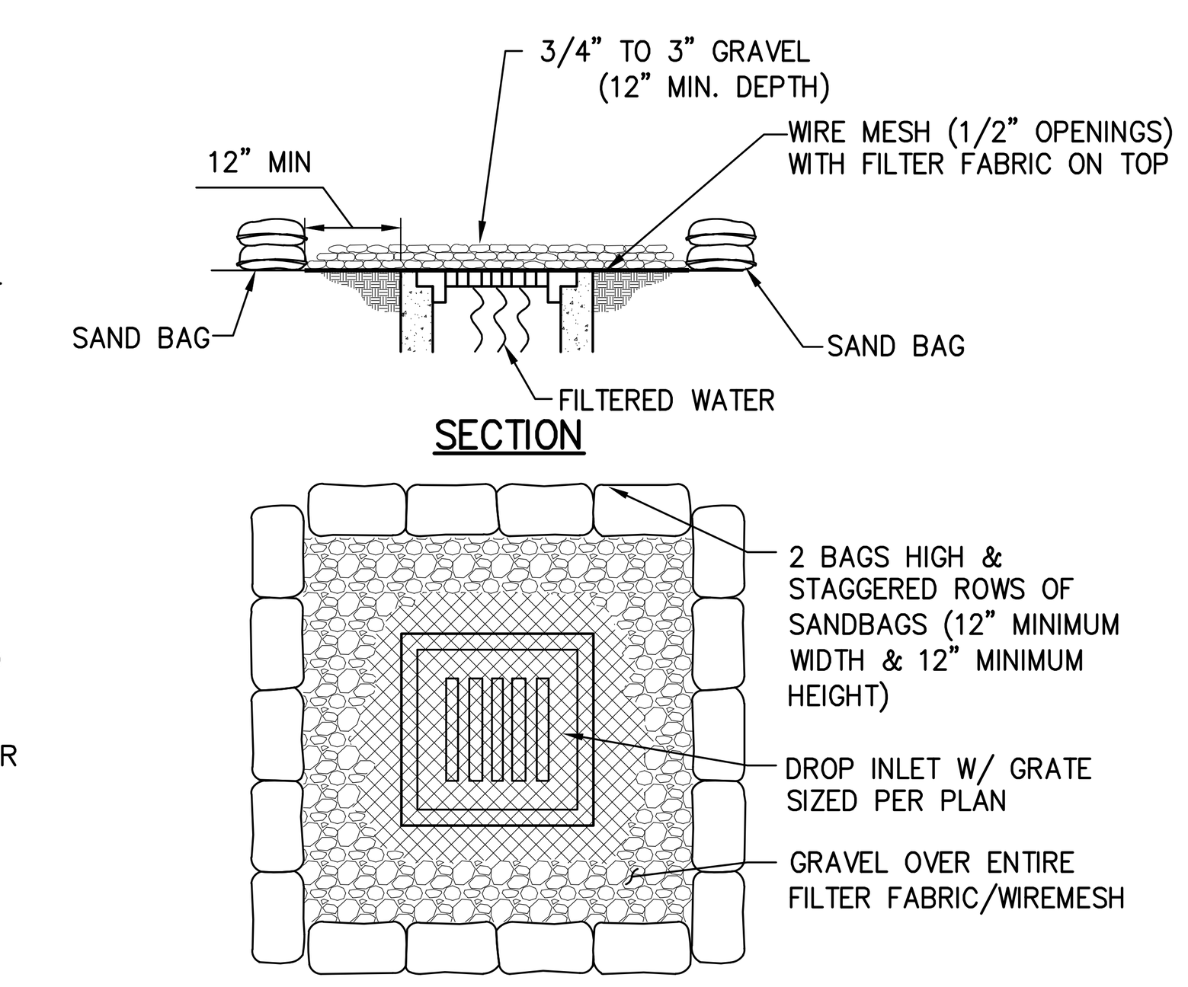
STREET MAINTENANCE

1. REMOVE ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS IMMEDIATELY.
2. SWEEP PAVED AREAS THAT RECEIVE CONSTRUCTION TRAFFIC WHENEVER SEDIMENT BECOMES VISIBLE.
3. PAVEMENT WASHING WITH WATER IS PROHIBITED IF IT RESULTS IN A DISCHARGE TO THE STORM DRAIN SYSTEM

2 STABILIZED CONSTRUCTION ENTRANCE
N.T.S.

NOTES:

1. PLACE WIRE MESH OVER AND 1' (MINIMUM) BEYOND THE INLET STRUCTURE. (MESH OPENINGS NOT TO EXCEED 1/2" x 1/2" WIRE)
2. PLACE FILTER FABRIC OVER WIRE MESH.
3. PLACE 3/4" TO 3" GRAVEL OVER THE FILTER FABRIC/WIRE MESH (12" MINIMUM DEPTH OVER THE ENTIRE INLET OPENING).
4. SAND BAG MATERIAL: POLYPROPYLENE, POLYETHYLENE OR POLYMIDE WOVEN FABRIC, MINIMUM UNIT WEIGHT 4 OUNCES PER SQUARE YARD, MULLEN BURST STRENGTH EXCEEDING 300 PSI AND ULTRAVIOLET STABILITY EXCEEDING 70%.
5. SAND BAG SHALL BE FILLED WITH NON-COHESIVE, CLASS 1 OR CLASS 2 PERMEABLE MATERIAL FREE FROM CLAY AND DELETERIOUS MATERIAL.
6. PLACE SEVERAL LAYERS OF SAND BAGS (12" MINIMUM HIGH) OVERLAPPING THE BAGS AND PACKING THEM TIGHTLY TOGETHER.
7. LEAVE GAP OF ONE BAG ON THE TOP ROW TO SERVE AS A SPILLWAY.



3 STORM DRAIN INLET PROTECTION
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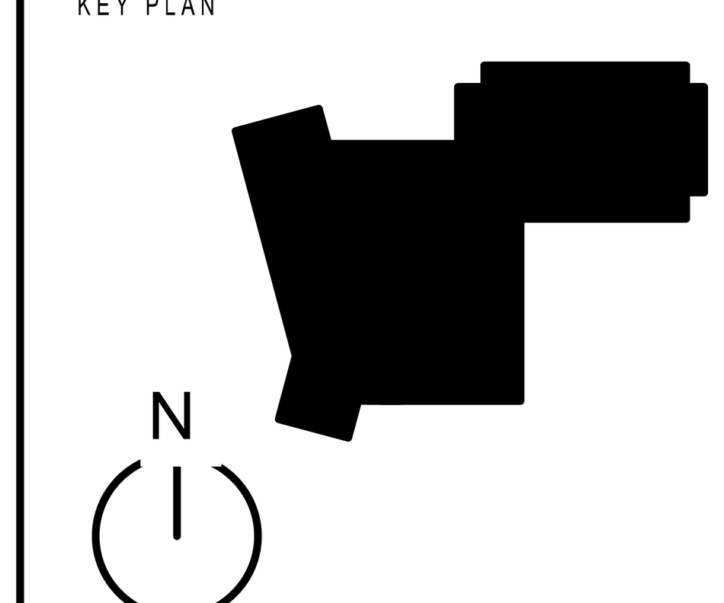


DETAILS

SCALE: AS SPECIFIED
DATE OF FIRST ISSUE: 15 JANUARY 2016

SCHEMATIC DESIGN
CO PROJECT NO.: 15018.000

C5.00

Appendix A

LID Calculations

Peak Flow Hydrologic Analysis

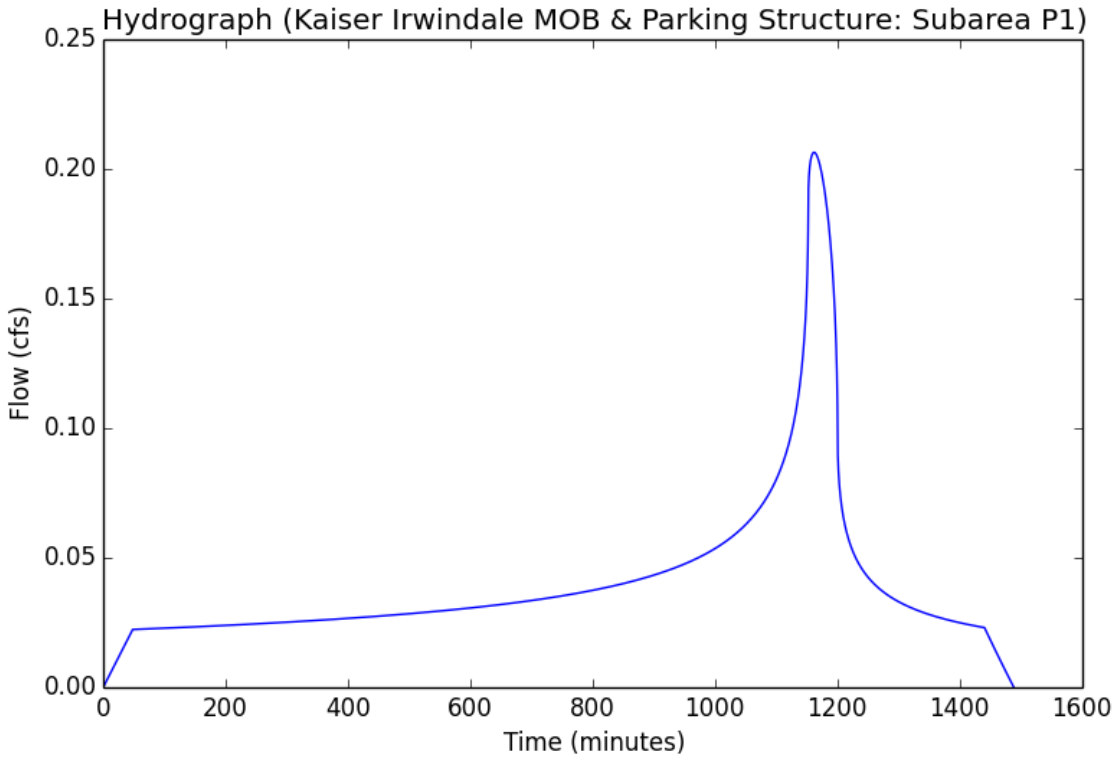
File location: P:/2015/115355 Kaiser Irwindale MOB and Parking Structure/ENGR/LID/Subarea P1 - 85th Percentile.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	Kaiser Irwindale MOB & Parking Structure
Subarea ID	Subarea P1
Area (ac)	1.53
Flow Path Length (ft)	690.0
Flow Path Slope (vft/hft)	0.002
85th Percentile Rainfall Depth (in)	0.98
Percent Impervious	0.71
Soil Type	15
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.98
Peak Intensity (in/hr)	0.202
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.668
Time of Concentration (min)	48.0
Clear Peak Flow Rate (cfs)	0.2064
Burned Peak Flow Rate (cfs)	0.2064
24-Hr Clear Runoff Volume (ac-ft)	0.0828
24-Hr Clear Runoff Volume (cu-ft)	3605.8644



Peak Flow Hydrologic Analysis

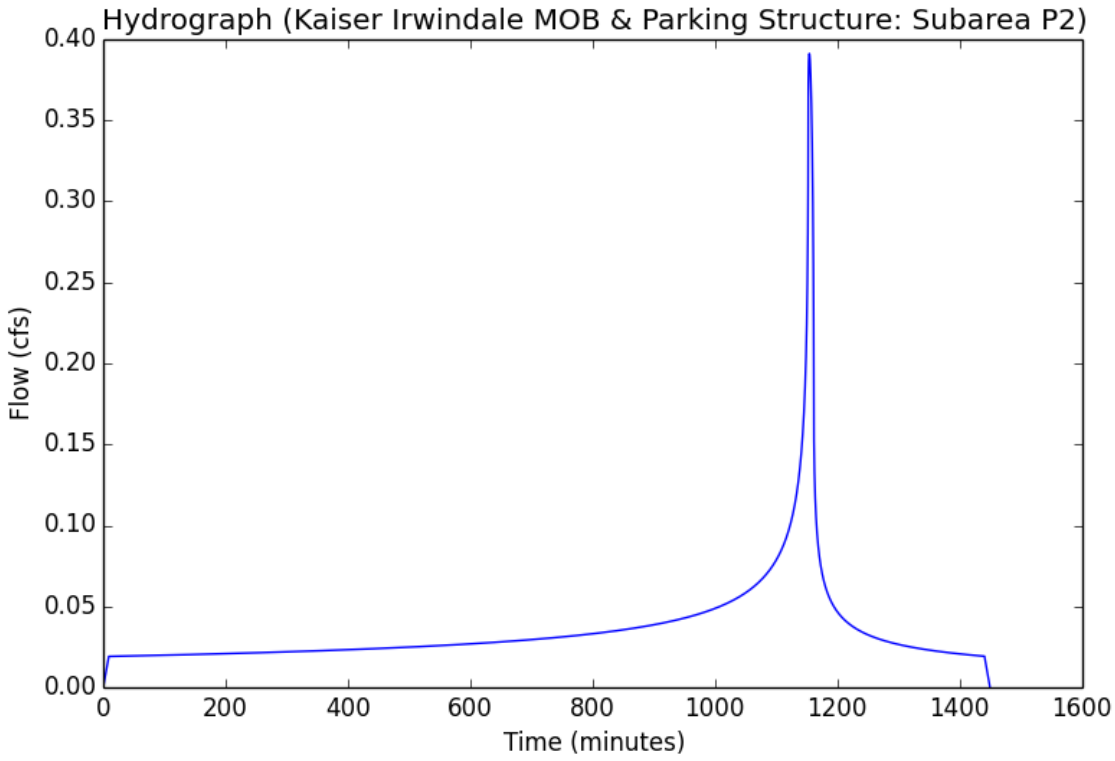
File location: P:/2015/115355 Kaiser Irwindale MOB and Parking Structure/ENGR/LID/Subarea P2 - 85th Percentile.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	Kaiser Irwindale MOB & Parking Structure
Subarea ID	Subarea P2
Area (ac)	0.98
Flow Path Length (ft)	250.0
Flow Path Slope (vft/hft)	0.15
85th Percentile Rainfall Depth (in)	0.98
Percent Impervious	1.0
Soil Type	15
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.98
Peak Intensity (in/hr)	0.4436
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	0.3912
Burned Peak Flow Rate (cfs)	0.3912
24-Hr Clear Runoff Volume (ac-ft)	0.0714
24-Hr Clear Runoff Volume (cu-ft)	3111.6992



Peak Flow Hydrologic Analysis

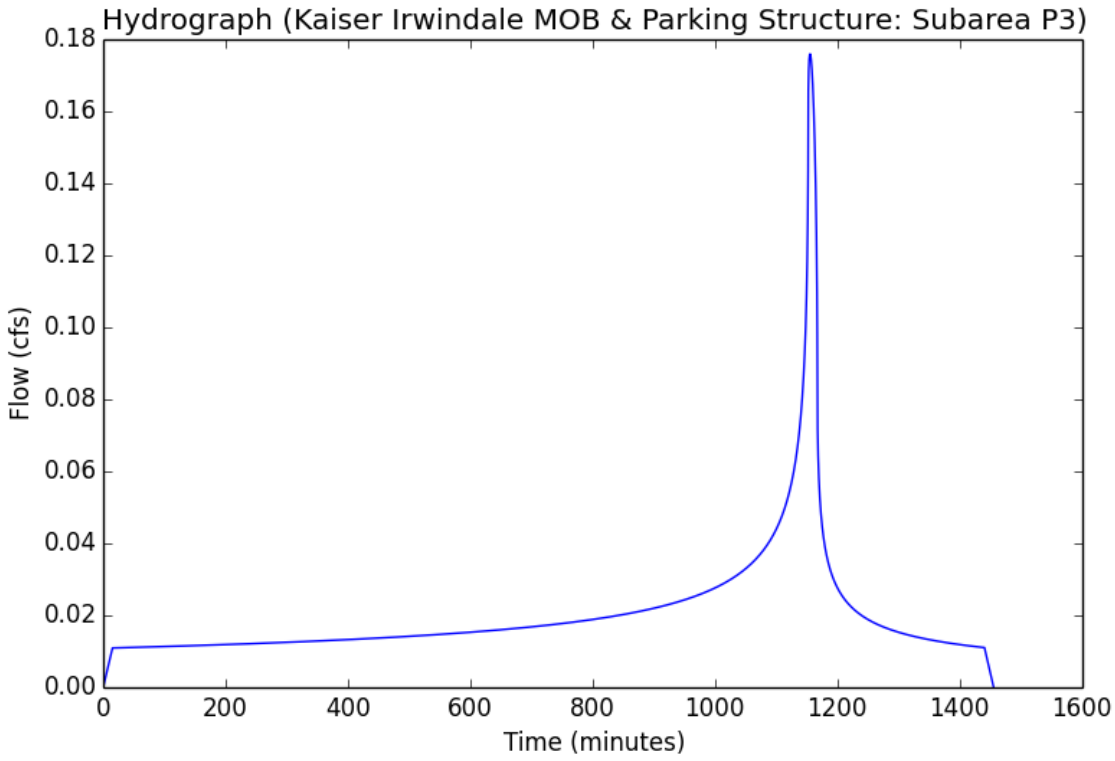
File location: P:/2015/115355 Kaiser Irwindale MOB and Parking Structure/ENGR/LID/Subarea P3 - 85th Percentile.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	Kaiser Irwindale MOB & Parking Structure
Subarea ID	Subarea P3
Area (ac)	0.64
Flow Path Length (ft)	350.0
Flow Path Slope (vft/hft)	0.055
85th Percentile Rainfall Depth (in)	0.98
Percent Impervious	0.86
Soil Type	15
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.98
Peak Intensity (in/hr)	0.3489
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.788
Time of Concentration (min)	15.0
Clear Peak Flow Rate (cfs)	0.1759
Burned Peak Flow Rate (cfs)	0.1759
24-Hr Clear Runoff Volume (ac-ft)	0.0408
24-Hr Clear Runoff Volume (cu-ft)	1779.246



Peak Flow Hydrologic Analysis

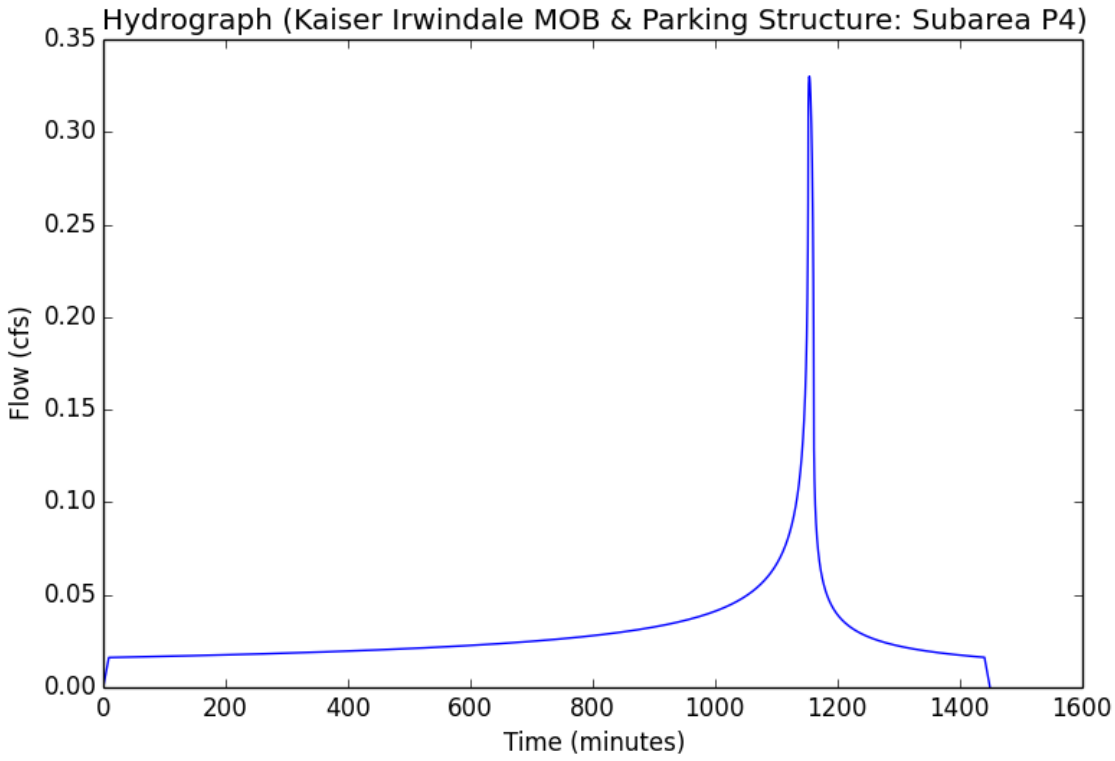
File location: P:/2015/115355 Kaiser Irwindale MOB and Parking Structure/ENGR/LID/Subarea P4 - 85th Percentile.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	Kaiser Irwindale MOB & Parking Structure
Subarea ID	Subarea P4
Area (ac)	0.89
Flow Path Length (ft)	210.0
Flow Path Slope (vft/hft)	0.15
85th Percentile Rainfall Depth (in)	0.98
Percent Impervious	0.92
Soil Type	15
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.98
Peak Intensity (in/hr)	0.4436
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.836
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	0.33
Burned Peak Flow Rate (cfs)	0.33
24-Hr Clear Runoff Volume (ac-ft)	0.0603
24-Hr Clear Runoff Volume (cu-ft)	2624.9758



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Appendix B

Geotechnical Documentation Concerning Feasibility of infiltration

GEOBASE, INC.
SOIL/ROCK MECHANICS AND FOUNDATION ENGINEERING

KAISER FOUNDATION HEALTH PLAN, INC.
4175 East La Palma Avenue
Suite 200
Anaheim, CA 92807

January 11, 2016

Project No: C.314.70.01

Attention: Mr. K.R. Jagannath, Project Director, National Facilities Services, Southern California Service Delivery Team

Dear Mr. Jagannath,

Subject: **LOW IMPACT DEVELOPMENT STORM WATER INFILTRATION – GEOTECHNICAL REPORT**
KAISER PERMANENTE - New Surgical Specialty MOB
12761 Schabarum Avenue
Irwindale, California

References: See page 4 of 4.

Under authorization from Kaiser Foundation Hospitals (Kaiser), GEOBASE, INC. (GEOBASE) has:

- commissioned C.H.J. Consultants, Inc. to carry out percolation tests at the subject site;
- provided herein recommendations for the design of Low Impact Development (LID) storm water quality control measures and their suitability for use at the specified project location based on the subsurface conditions; and,
- performed all work in accordance with Los Angeles County Department of Public Works, Guidelines for Design, Investigation and Report Low Impact Development Storm Water Infiltration, December 2014, GS200.1.

EXISTING AND PROPOSED SITE CONDITIONS

The Kaiser project site is relatively flat and currently occupied by a warehouse building and associated supporting facilities such as paved parking, driveways and walkways that consist of asphaltic concrete and concrete slabs. The proposed Kaiser development is planned to consist of demolition of the existing structure and construction of a three (3) storey, at-grade, medical office building (MOB) and a three (3) storey parking structure with one (1) level below grade. Two (2) percolation tests were carried out at the proposed storm water infiltration facility locations as shown on Figure 1, attached.

The geotechnical hazard for the proposed project site was mapped to be in a liquefiable zone with published historic highest groundwater level at twenty-five (25) feet below existing grade; however, field exploration tests and associated analysis results indicate that the subsoils are not liquefiable with a factor of safety greater than 1.3, as reported in reference 1, dated April 2015. As was noted in reference 1, the Durbin Quarry pit slopes, north of the project site, are mapped as subject to

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E-mail: geobase@geobase.com

earthquake-induced landslides; however, previous analyses by others, approved by the county of Los Angeles, show the upper portion of the off-site slope to be stable under static loading conditions. No other potential geotechnical hazards are associated with the site.

Ten (10) borings by J. Byer Group (May 1998) and four (4) CPTs by GEOBASE (May 2015) were advanced at the proposed building locations, and associated laboratory testing was completed, as reported in reference 1. Based on soil description and laboratory test results, the subsoil consist primarily of four (4) feet of fill soils (silty sands with gravels) overlying sands and to silty sands with varying amounts of gravels (SP-SW). Therefore, the subsoils are classified as HSG Type A in accordance with Part 630 Hydrology, National Engineering Handbook, Chapter 7, Hydrologic Soil Group (HSG).

The groundwater level at the subject site, at the time of the investigation, was in excess of forty-two (42) feet, as reported in reference 1. The published historic high groundwater (twenty-five [25] feet) is greater than ten (10) feet below the proposed invert of the infiltration basin; also, existing well data in the vicinity shows an elevation greater than ten (10) feet below the invert of infiltration. Historical well data number 3032M (State I.D. # 1S10W19C01) was obtained from the Department of Public Water Resources Division at http://dwp.lacounty.gov/wsd/wellinfo/, as shown on Figure 2, attached; the high and low measured groundwater depths were 159.50 and 60.80, respectively, with well surface elevation at 344.5 feet. Therefore, based on the above data, groundwater level at the site is judged to be well in excess of twenty-five (25) feet below ground surface.

As discussed above, under the direction of Kaiser, two (2) percolation tests were completed. These tests were carried out under the direction and supervision of a qualified (State of California licensed) engineering geologist and geotechnical engineer. The complete percolation testing report, with boring logs and index properties testing results, is attached. The percolation test results are summarized below:

Location	Soil Type (USCS)	Percolation Rate (in/hr)	Reduction Factor (Rf)	Measured Infiltration Rate (in/hr)	High Flowrate Adjustment Infiltration Rate (in/hr)	Design Infiltration Rate* (in/hr)
P-1	SW-SM	393.6	22.75	17.3	7.2	3.6
P-2	SM	465.6	24.25	19.2	8.5	4.3

Note: * -- Total correction factor, CF, is based on site variability, number of tests and thoroughness/soundness of subsurface investigation by applying a minimum factor of 2. ***Additionally***, the design practioner for the proposed BMP infiltration system may wish to apply, at his discretion, a correction factor based on long-term siltation, plugging and maintenance.

Percolation testing was conducted at the proposed infiltration basin locations, as shown on Figure 1, with invert depth planned to be nine (9) feet below adjacent grade.

CONCLUSIONS AND RECOMMENDATIONS

Based on the above criteria, the subsoils with corrected in-situ infiltration rates of greater than 0.3 in/hr

are considered feasible for retention-based storm water quality control measures.

The distance between the infiltration facility and adjacent private property line shall be a minimum of fifteen (15) feet. Where building foundations, subterranean walls or basements exist, a greater setback or deeper infiltration system may be required such that the structures are outside the boundary of zone of saturation, assumed to project downward from top of permeable portion of the infiltration facility at a gradient of 1H:1V (Horizontal:Vertical).

In addition, the infiltration facility shall not be located near any existing or new utility lines for the subject site, where damage or settlement of the trench backfill could occur.

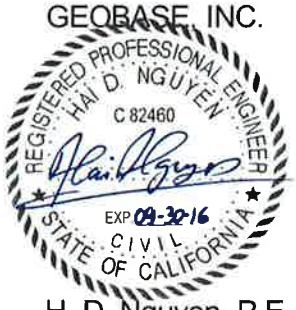
The limit of site grading should be set back from the infiltration facility footprint to prevent disturbing the subsoil below the specified invert depth of the storm water facility.

LIMITATIONS

The recommendations presented above were formulated in accordance with generally accepted geotechnical engineering principles and practices. No warranty, expressed or implied, is made as to the conclusions and professional advice included in this letter.

This letter report is subject to review by the appropriate regulating agencies.

Respectfully submitted
GEOBASE, INC.



H. D. Nguyen, P.E.
R.C.E. 82460
Associate Engineer

J-M. Chevallier, P.E., G.E.
R.C.E. 39198; G.E. 2056
Managing Principal

Attachments:

Figure 1 -- Site, CPTs and Percolation Test Locations Plan
Figure 2 -- Los Angeles County Historical Well Measurement
Percolation Investigation and Laboratory Testing by C.H.J. Consultants

REFERENCES

1. "Geotechnical Evaluation, 12761 Shabarum Avenue, Irwindale, California", prepared for Kaiser Foundation Hospitals by GEOBASE, INC., dated October 2015, project number C.314.72.00.

2. California Department of Conservation, Seismic Hazard Zone Reports, Division of Mines and Geology, Los Angeles County, 1998. http://www.consrv.ca.gov/cgs/shzp/pages/index.aspx

3. County of Los Angeles, Code of Ordinances, Title 12, Chapter 12.84, Low Impact Development Standards. https://library.municode.com/html/16274/level2/Tit12EnPr_Ch12.841oimdest.html

4. County of Los Angeles, Department of Public Works, Low Impact Development Standards Manual, February 2014. http://dpw.lacounty.gov/ldd/lib/fp/Hydrology/Low Impact Development Standards Manual.pdf

5. County of Los Angeles, Department of Public Works, Guidelines for Design, Investigation and Reporting Low Impact Development Storm Water Infiltration, GS200.1, December 2014.

6. Terzaghi, K. , Peck, Ralph B., and Mesri, G., Soil Mechanics in Engineering Practice, Third Edition, 1996.

7. United States Department of Agriculture, Chapter 7: Hydrologic Soil Groups, Natural Resources Conservation Service National Engineering Handbook. http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba

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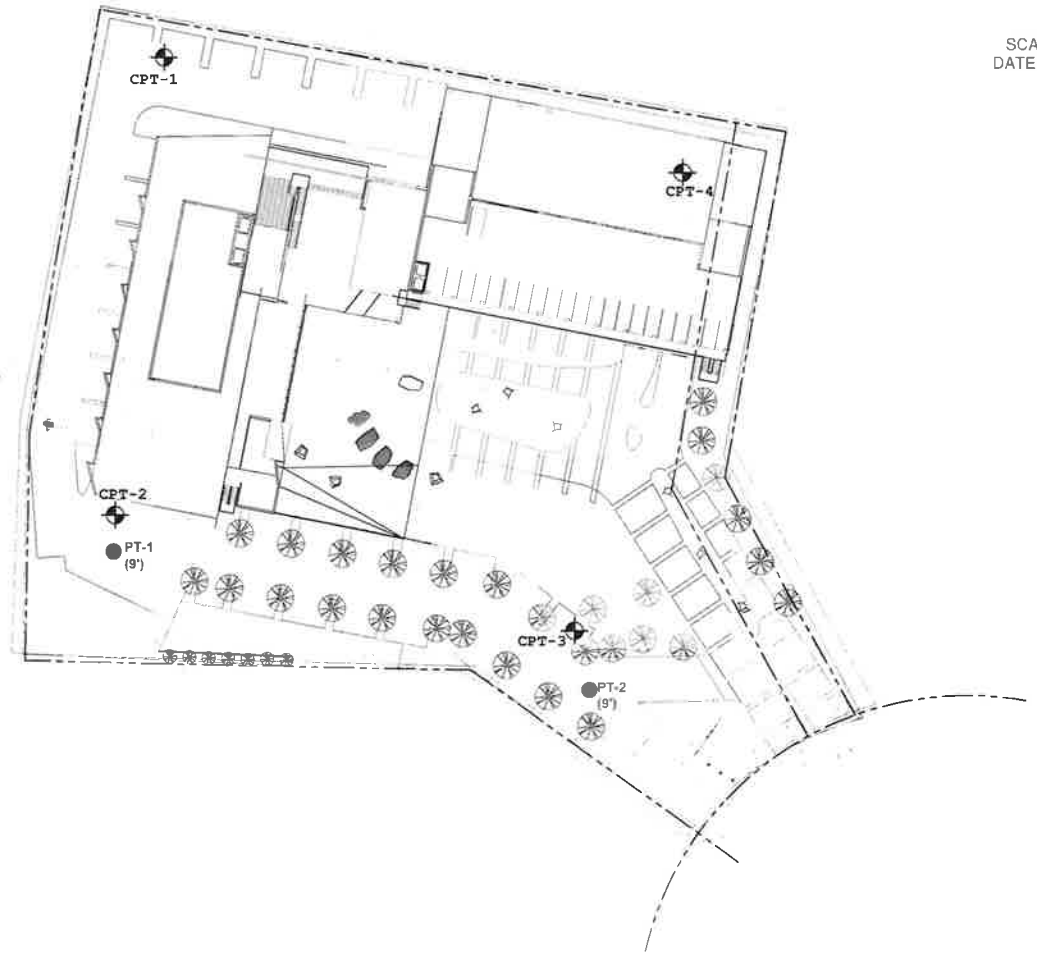
Appendix C

Percolation Test Results

KPFF
SCALE: 1"=30'
DATE: 10/27/2015



EXPLANATIONS:

Approximate Locations of CPT (GEOBASE 2015)

Approximate Locations of Percolation Test

(9') Minimum Invert Depth of Infiltration Facility

NOTES:

1. GEOBASE INC. has added only Geotechnical data to this plan prepared by others. We have not checked any other information on this plan and give no assurance of its accuracy.

2. This Drawing is part of GEOBASE INC.'s report C.314.70.01 dated January 2016 and should be read with the complete report for evaluation

GEOBASE INC.
C.314.70.01

SITE, CPTs AND PERCOLATION TEST LOCATIONS PLAN

Figure 1

SCALE 1"=30'

CO ARCHITECTS

5055 Wilshire Boulevard, 9th Floor
Los Angeles, California 90036
323.525.0000 phone, 323.525.0555 fax

THE CLIENT / UNIVERSITY / HOSPITAL NAME

BUILDING NAME

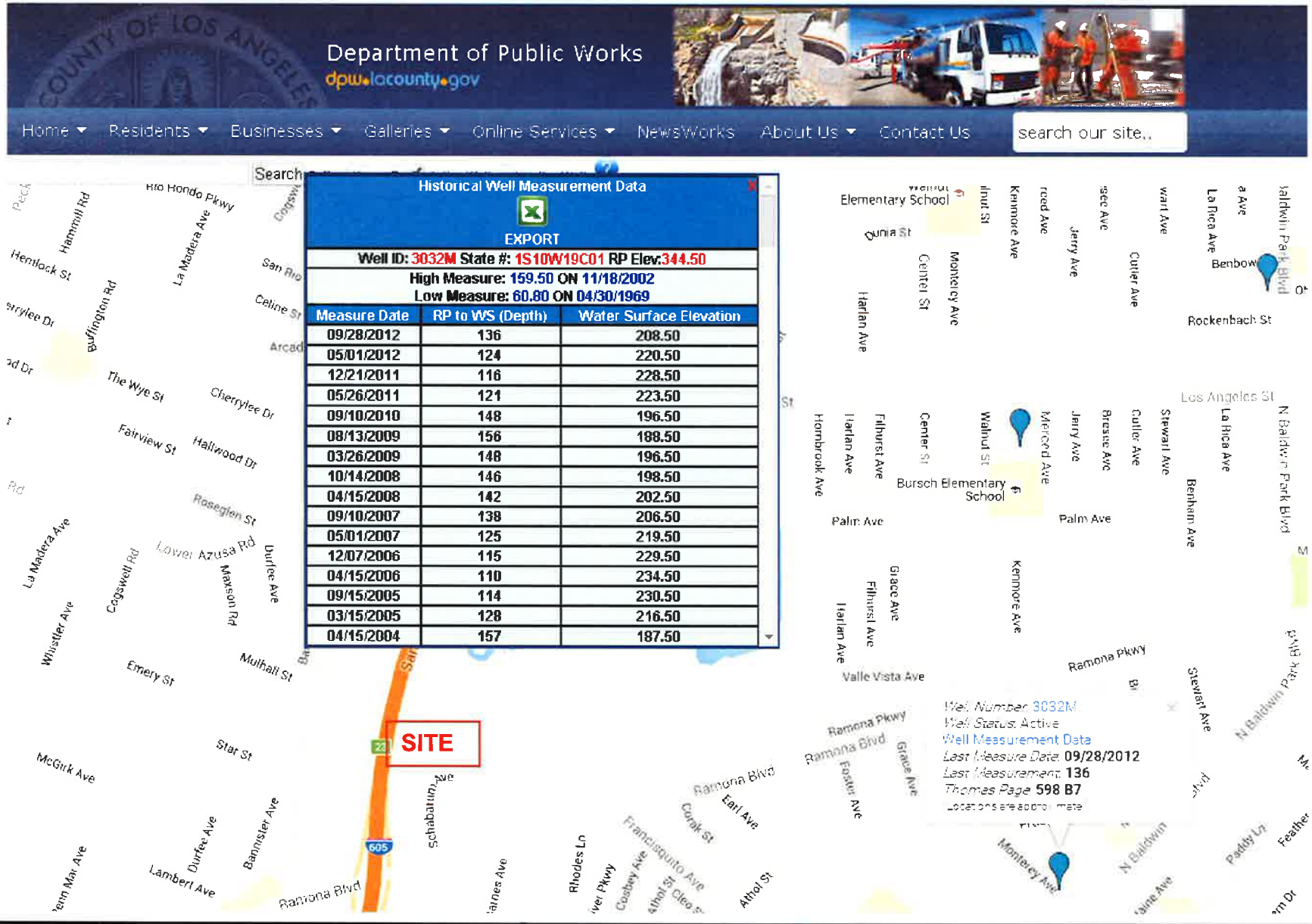
STREET ADDRESS
CITY, STATE

FACILITY PROJECT NO. PCN #####

KEY PLAN

N

C1.20



GEOBASE

LA COUNTY HISTORICAL WELL MEASUREMENT

Kaiser Permanente – New Surgical Specialty MOB
12761 Schabarum Ave
Irwindale, California

C.314.70.01

FIGURE 2

CHJ Consultants
1355 E. Cooley Drive, Suite C, Colton, CA 92324 • Phone (909) 824-7311 • Fax (909) 503-1136

December 15, 2015

GEOBASE, Inc.
23362 Peralta Drive, Unit 4
Laguna Hills, California 92691
Attention: Mr. J-M Chevallier

Job No. 15567-2

Subject: Percolation Investigation
12761 Schabarum Avenue
Irwindale, California

Dear Mr. Chevallier:

As requested, percolation testing was performed at the subject site. This report presents the test data and summarizes the scope of testing. The site location is shown on Enclosure A-1, and the location of the percolation tests is shown on Enclosure A-2.

The percolation tests were performed in general accordance with the boring percolation testing procedures provided in the Administrative Manual for Low Impact Development Best Management Practice Guideline for Design, Investigation, and Reporting prepared by the Los Angeles County Department of Public Works (2014). The test holes were prepared by drilling an 8-inch-diameter boring using a CME75 drill rig to a depth of 9 feet below the ground surface. In order to prevent caving of the test holes, a 2-inch perforated PVC pipe was placed inside each test hole and pea gravel was placed in the annular space between the PVC pipe and the sides of the hole. The test holes were pre-soaked in accordance with the method referenced above prior to testing.

Per the test method, the frequency of measurement during testing is either every 10 minutes if two consecutive measurements show that 12 inches of water seep away in 30 minutes, OR every 30 minutes if less than 12 inches of water seep away. The test is performed either for eight measurements or until the rate is stabilized, whichever comes first. For the subject test, the water level was measured every 10 minutes. The average of the final three measurements taken was used to calculate the percolation rates.

It should be noted that the percolation rate is related to but not equal to the infiltration rate. The infiltration rate is a measure of the velocity/time at which water passes downward into the soil, while the percolation rate includes both downward and horizontal movement. The infiltration rate should be considered for use in detention basin or permeable pavement design, and percolation rates should be considered for dry well design.

Both the percolation rates and infiltration rates are provided in this report. The percolation test data obtained was used to calculate the average infiltration rate of the soil at the test location. The Los Angeles County Department of Public Works (2014) testing procedure describes the calculation used to convert the percolation data to an infiltration rate. When the infiltration rates calculated from the percolation rates are above 14 inches per hour, the manual requires that the "High Flowrate Percolation Test Procedure" be applied. This procedure calculates the infiltration rate by dividing the measured rate of discharge (addition of water into the test hole) by the infiltration surface area. For this project, the discharge rate was estimated using data obtained during the percolation testing. The infiltration rate obtained from the Boring Percolation Test Procedure and High Flowrate Percolation Test Procedure is presented in Table 1.

Continuous logs of the subsurface conditions, as encountered within the borings, were recorded at the time of drilling by a staff geologist from this firm. The boring logs are presented as Enclosures B-1 and B-2.

Samples of soil material from the test locations were returned to our laboratory for testing. The tests performed included sieve analysis, and the results are included in Enclosure C-1.

The percolation and infiltration rates obtained are presented in the following table. The rates provided do not include safety factors.

Infiltration and Percolation Rates

Test No.	Depth (feet)	Boring Percolation Test Rate (in./hr.)	Infiltration Rate (includes Reduction Factor) (in./hr.)	High Flowrate Test Infiltration Rate (in./hr.)	Soil Type
P-1	9	393.6	17.3	7.2	(SW-SM)
P-2	9	465.6	19.2	8.5	(SM)

It should be noted that infiltration and percolation rates are based on field test results utilizing clear water. Infiltration and percolation rates can be affected by silt buildup, debris, degree of soil saturation and other factors. Application of an appropriate safety factor may be prudent to account for soil inconsistencies, possible compaction related to site grading and potential silting of the percolating soils, depending on the application.

LIMITATIONS

CHJ Consultants has striven to perform our services within the limits prescribed by our client, and in a manner consistent with the usual thoroughness and competence of reputable geotechnical engineers and engineering geologists practicing under similar circumstances. No other representation, express or implied, and no warranty or guarantee is included or intended by virtue of the services performed or reports, opinion, documents, or otherwise supplied.

This report reflects the testing conducted on the site as the site existed during the investigation, which is the subject of this report. However, changes in the conditions of a property can occur with the passage of time, due to natural processes or the works of man on this or adjacent properties. Changes in applicable or appropriate standards may also occur whether as a result of legislation, application or the broadening of knowledge. Therefore, this report is indicative of only those conditions tested at the time of the subject investigation, and the findings of this report may be invalidated fully or partially by changes outside of the control of CHJ Consultants. This report is therefore subject to review and should not be relied upon after a period of one year.

The conclusions and recommendations in this report are based upon observations performed and data collected at separate locations, and interpolation between these locations, carried out for the project and the scope of services described. It is assumed and expected that the conditions between locations observed and/or sampled are similar to those encountered at the individual locations where observation and sampling was performed. However, conditions between these locations may vary significantly. Should conditions that appear different from those described herein be encountered in the field by the client or any firm performing services for the client or the client's assign, this firm should be contacted immediately in order that we might evaluate their effect.

The information presented in this report is not intended or represented to be suitable for reuse on extensions or modifications of this project, or for use on any other project.

CLOSURE

We appreciate this opportunity to be of service and trust this report provides the information desired at this time. Should questions arise, please do not hesitate to contact this office.

Respectfully submitted,

CHJ CONSULTANTS

V. John Romano
Staff Geologist

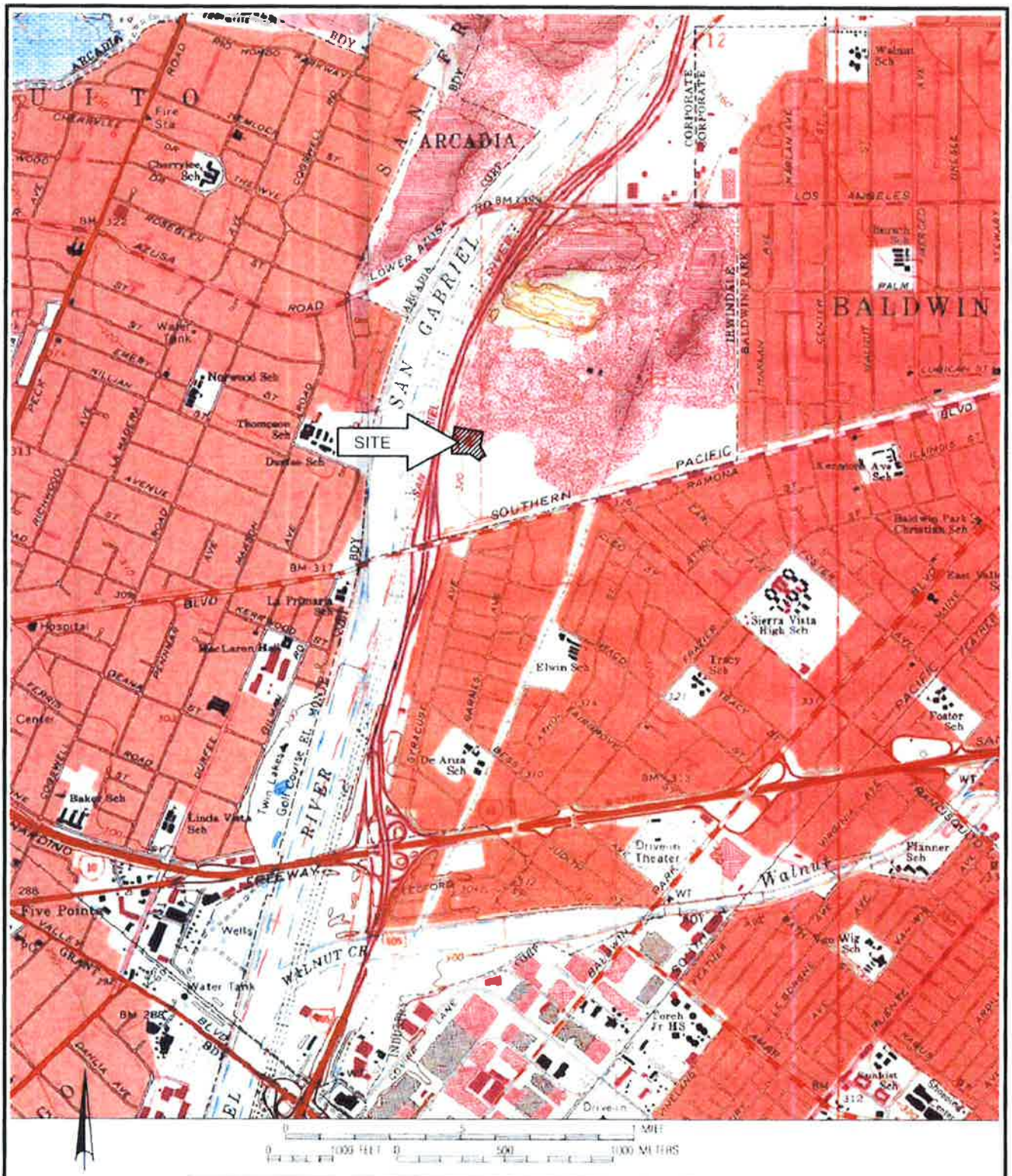
John S. McKeown, E.G. 2396
Project Geologist

Robert J. Johnson, G.E. 443
President

VJR/JSM/RJJ:lb

Enclosures:
"A-1" - Index Map
"A-2" - Site Plan
"B-1" - "B-2" - Exploratory Boring Logs
"C-1" - Particle Size Distribution

Distribution: J-M Chevallier (email)



-N-

SCALE: 1" = 2000'

INDEX MAP

FOR: GEOBASE, INC.	PERCOLATION INVESTIGATION 12761 SCHABARUM AVENUE IRWINDALE, CALIFORNIA	ENCLOSURE "A-1"
DATE: DECEMBER 2015		JOB NUMBER 15567-2

CHJ Consultants

SCALE: 1" = 80'

LEGEND:

P-2 PERCOLATION TEST LOCATION

SITE PLAN

FOR: GEOBASE, INC.	PERCOLATION INVESTIGATION 12761 SCHABARUM AVENUE IRWINDALE, CALIFORNIA	ENCLOSURE "A-2"
DATE: DECEMBER 2015		JOB NUMBER 15567-2

CHJ Consultants

EXPLORATORY BORING NO. 1

Date Drilled: 12/2/15 | Client: GEOBase, Inc.

Equipment: CME75 Truck Rig | Driving Weight / Drop / Sampler Size: N/A

Surface Elevation(ft): N/A | Logged by: GA | Measured Depth to Water(ft): N/A

DEPTH (ft)	GRAPHIC LOG	VISUAL CLASSIFICATION	REMARKS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/6 IN.	FIELD MOISTURE (%)	DRY UNIT WT. (pcf)	LAB/FIELD TESTS
0		Asphalt Concrete, 3.5"							
		(ML) Sandy Silt, fine to coarse, with clay and gravel to 2", dark yellowish brown							
5		(SW-SM) Well-Graded Sand, with silt and gravel to 2", brown							
					▨				SA
		END OF BORING							
10		NO REFUSAL, NO CAVING NO BEDROCK NO GROUNDWATER							
15									
20									
25									
30									

10331.3 15567-2.GPJ CHJ.GDT 12-4-15

CHJ

IRWINDALE MEDICAL OFFICE BUILDING
SCHABARUM AVENUE, IRWINDALE, CALIFORNIA

Job No. 15567-2 | Enclosure B-1

EXPLORATORY BORING NO. 2

Date Drilled: 12/2/15 Client: GEOBase, Inc.

Equipment: CME75 Truck Rig Driving Weight / Drop / Sampler Size: N/A

Surface Elevation(ft): N/A Logged by: GA

Measured Depth to Water(ft): N/A

DEPTH (ft)	GRAPHIC LOG	VISUAL CLASSIFICATION	REMARKS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/6 IN.	FIELD MOISTURE (%)	DRY UNIT WT. (pcf)	LAB/FIELD TESTS
		Asphalt Concrete, 3.5"							
		(ML) Sandy Silt, fine to coarse, with clay, dark yellowish brown							
		(SP) Sand, fine, grayish brown							
5		(SM) Silty Sand, fine to medium, brown							
					▨				SA
		END OF BORING							
10		NO REFUSAL, NO CAVING NO BEDROCK NO GROUNDWATER							
15									
20									
25									
30									

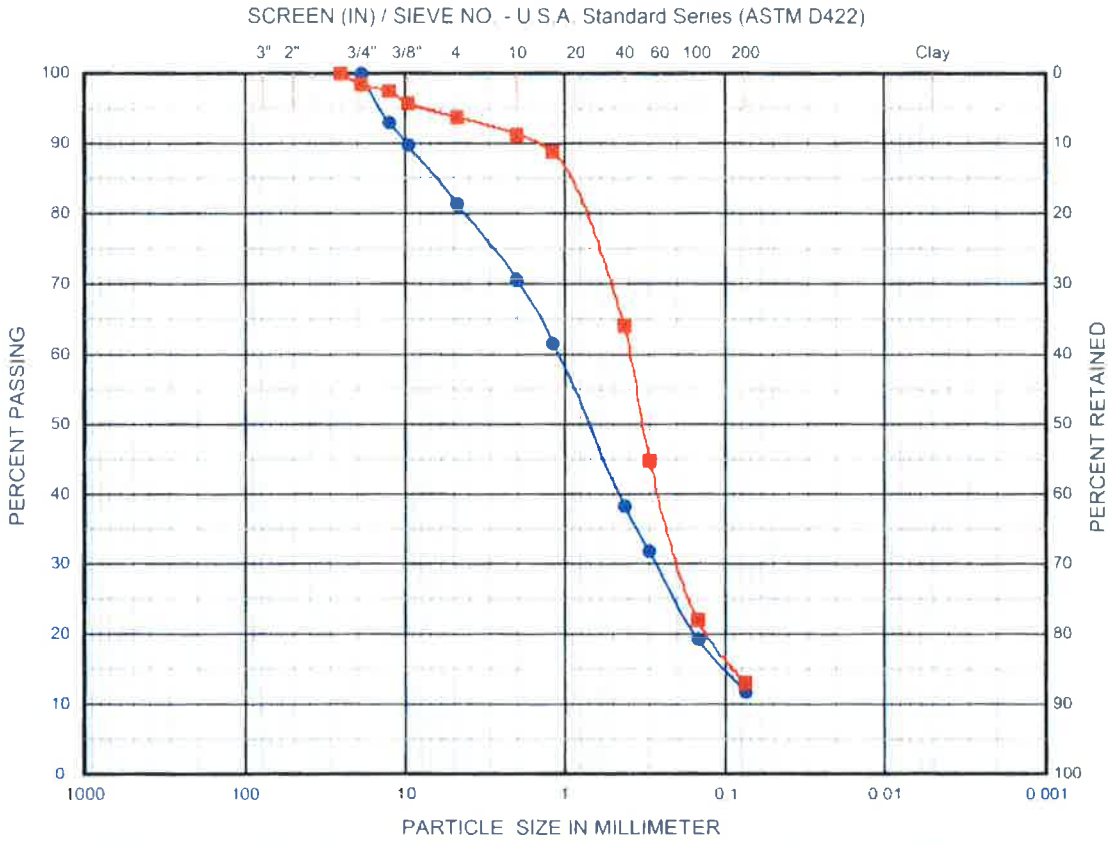
10331-3 15567-2.GPJ CHJGDT 12/4/15

CHJ

IRWINDALE MEDICAL OFFICE BUILDING
SCHABARUM AVENUE, IRWINDALE, CALIFORNIA

Job No. 15567-2

Enclosure B-2



	Sample No.	Gravel	Sand	Fines	Clay	D_{10}	D_{30}	D_{50}	D_{60}	C_u	C_c
●	P-1 (7 ft)	18.7	69.5	11.8		0.0636	0.272	0.709	1.096	17.2	1.1
	(SW-SM) Well-graded sand with silt and gravel										
■	P-2 (7 ft)	6.2	80.8	13.0		0.0597	0.202	0.331	0.390	6.5	1.8
	(SM) Silty sand, fine to medium										

PARTICLE SIZE DISTRIBUTION (ASTM D422)

Project:	Irwindale Medical Office Building				
Location:	Schabarum Avenue, Irwindale, CA				
Job Number:	15567-2	Engineer:	JMcK	Enclosure:	C-1

Prepared at 12/4/2015 9:49:16 AM

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Appendix D

Contech Infiltration System & CDS Unit

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH STORMWATER SOLUTIONS INC.

For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com

Project Summary

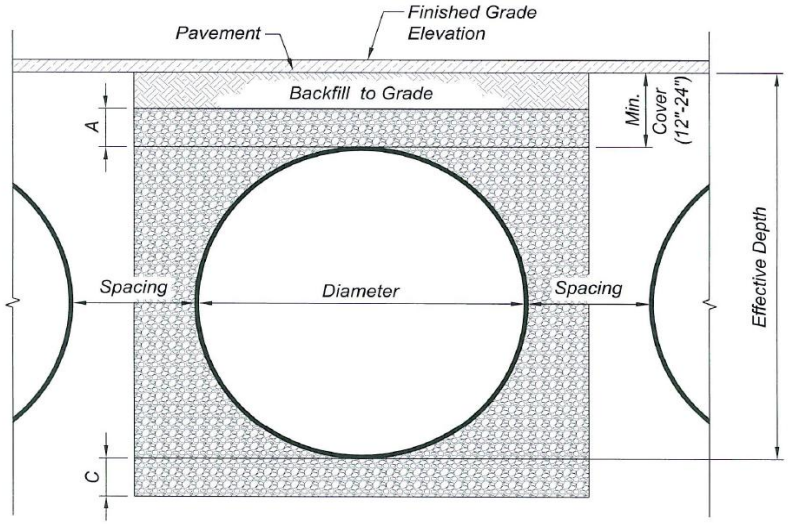
Date:	5/5/2016
Project Name:	Kaiser Irwindale MOB & Parking Structure
City / County:	Irwindale
State:	CA
Designed By:	GT
Company:	KPFF
Telephone:	

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	11,120
Limiting Width (ft):	30.00
Invert Depth Below Asphalt (ft):	10.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	72
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

28.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	7,719	cf	
Porous Stone Storage:	3,537	cf	
Total Storage Provided:	11,256	cf	101.2% Of Required Storage
Number of Barrels:	3	barrels	
Length per Barrel:	83.0	ft	
Length Per Header:	24.0	ft	
Rectangular Footprint (W x L):	26. ft x 91. ft		

CONTECH Materials

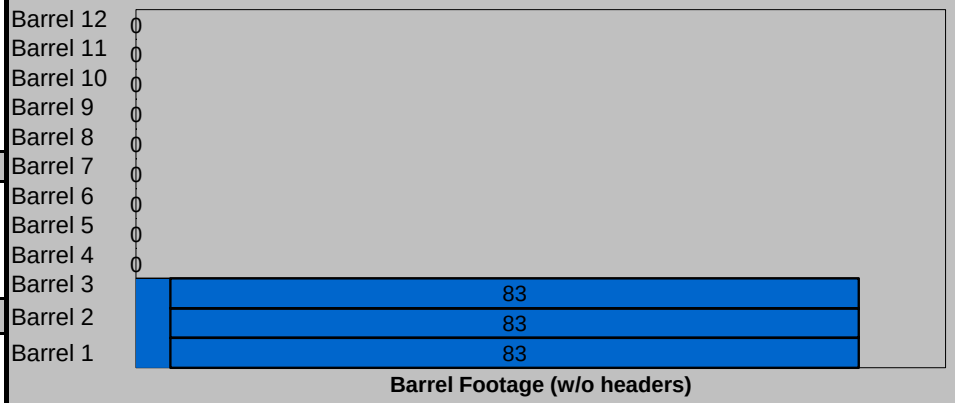
Total CMP Footage:	273	ft
Approximate Total Pieces:	13	pcs
Approximate Coupling Bands:	12	bands
Approximate Truckloads:	7	trucks

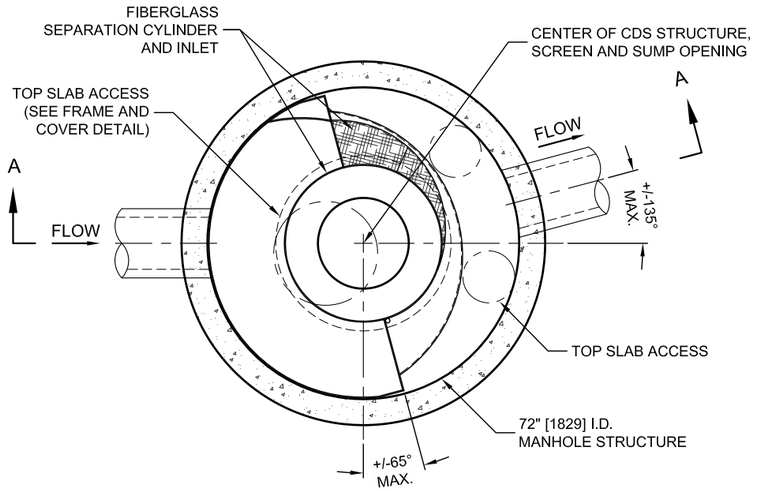
Construction Quantities**

Total Excavation:	877	cy
Porous Stone Backfill For Storage:	328	cy stone
Backfill to Grade Excluding Stone:	264	cy fill

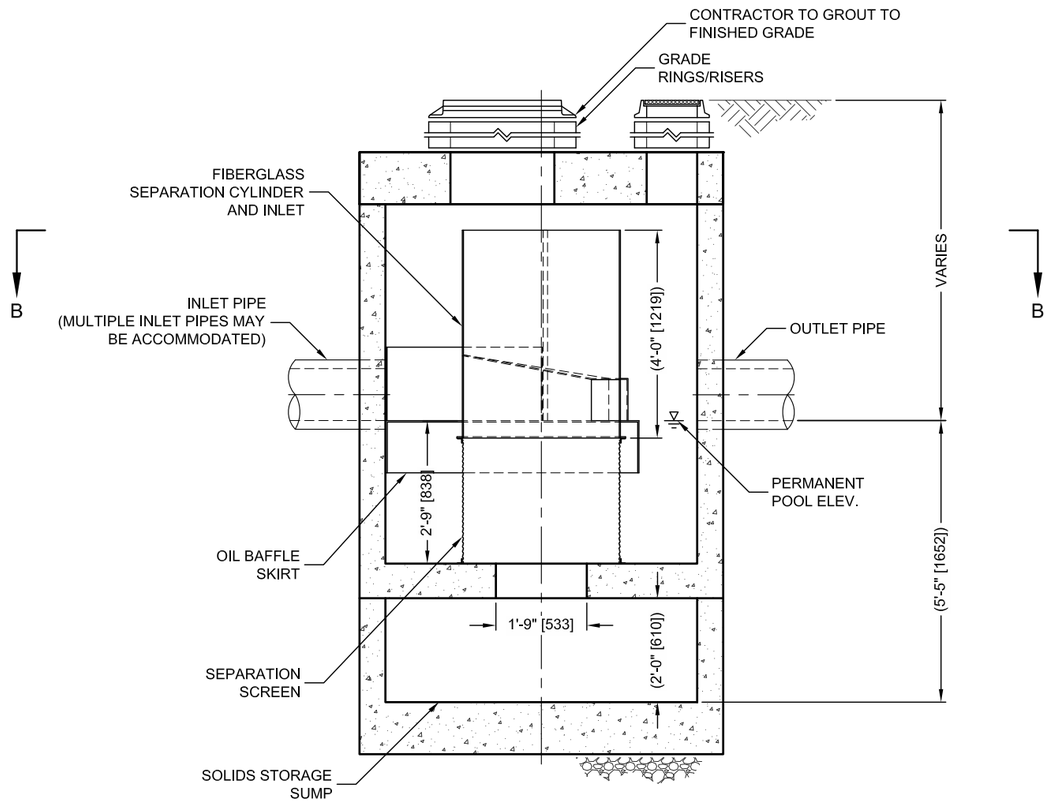
***Construction quantities are approximate and should be verified upon final design*

System Layout





PLAN VIEW B-B
N.T.S.



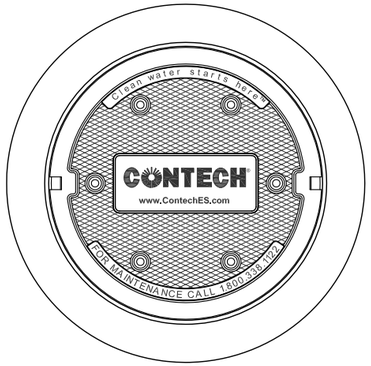
ELEVATION A-A
N.T.S.

CDS3020-6-C DESIGN NOTES

CDS3020-6-C RATED TREATMENT CAPACITY IS 2.0 CFS [56.6 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 20.0 CFS [566 L/s]. IF THE SITE CONDITIONS EXCEED 20.0 CFS [566 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS3020-6-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

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CDS3020-6-C
INLINE CDS
STANDARD DETAIL