RICK
ENGINEERING COMPANY

May 14, 2024

City of San Diego
Development Services
101 Ash Street
San Diego, California 92101

SUBJECT: SOUTHWEST VILLAGE – TECHNICAL MEMORANDUM ADDRESSING HYDROLOGY AND WATER QUALITY FOR EMERGENCY VEHICLE ACCESS ROAD "PROJECT ALTERNATIVE"
(RICK ENGINEERING COMPANY JOB NUMBER 15013-C)

1. Introduction

This letter report presents the existing and proposed hydrology and water quality analysis associated with the proposed emergency vehicle access road "Project Alternative" that runs north to south from the existing Jeep Trail to the United States Mexico border fence where it connects with the continuation of the Jeep Trail (herein referred to as the "project"). The project is adjacent to the Southwest Village project area. The Southwest Village project is a smaller portion of the overall community of Otay Mesa. Specifically, the Southwest Village project boundary is generally located south of State Route 905, east of Interstate 805, north of US-Mexico border, and immediately west of the northerly branch of Spring Canyon.

The proposed improvements for this "Project Alternative" include use of an existing jeep trail to serve as emergency vehicle access as a secondary access route into and out of the overall project limits. For much of the trail, the unimproved road is already established and traversable, however, there are locations which exceed 10% to 15% grades. Based on coordination with the project design team and local fire officials, it's our understanding that segments that exceed 10% should be paved, whereas the flatter segments can remain unpaved. The following sections of this memorandum address Drainage (aka Hydrology) and Water Quality considerations for this emergency vehicle access.

2. Drainage Characteristics, Methodology and Results (i.e. – "Hydrology")

As mentioned above, the emergency vehicle access road will generally follow the horizontal alignment of an existing jeep trail and will only be adjusted vertically as-needed to reduce the existing steep segments that are currently greater than 15% to be 15% or less. From a drainage perspective, the design will maintain existing drainage boundaries and flow patterns between existing and proposed conditions. To help illustrate the drainage characteristics, an exhibit has been prepared and the drainage boundaries are described as Basins 1, 2, and 3, for the extents of the EVA alignment that will connect from near the border fence at the south end to the development limits on the mesa (to the north). The overall existing condition of the project (Basin 1, 2, and 3) can be described as natural hills, canyons, and unpaved trails with grasses and sparce shrubbery. An overall existing percent impervious of 0% has been identified for Basins 1, 2, and 3, where little to no existing pavement is present. The proposed pavement for segments steeper than 10% will increase runoff slightly, however, the design maintains the existing drainage boundaries and patterns and allows for runoff to continue to sheet across the surrounding pervious areas for Basins 1 and 2, and will be conveyed via ditches in Basin 3 to an existing drainage collection facility in the Federal property adjacent to the border fence.

The rational method was used to approximate peak flow rates for Basins 1, 2, and 3 using guidance from the "City of San Diego Transportation & Storm Water Design Manuals Drainage Design Manual," January 2017 edition (herein referred to as The Drainage Design Manual). The 100-year storm event was used as the design storm event and a five-minute time of concentration was assumed in rational method calculations (which is conservative, actual times of concentration are likely a bit longer and result in lower corresponding intensities and peak flow rates. For the purposes of this comparison, it's been assumed that the entire segment of EVA road is paved within Basins 1, 2, and 3; whereas the current proposed approach would only pave the segments greater than 10%. Rational method results are shown below in Table 1.

Table 1: Existing and Proposed Hydrology for Emergency Vehicle Access

Drainage Basin #	POI #	Project Condition	Percent impervious	Runoff Coefficient	Tributary Area	Intensity	100-year Flow Rates,	% Change in 100-yr Peak Discharge (Pre to Post)
				C[1]	A	I[2]	Q_{100}	
			%		(acres)	(in/hr)	(cfs)	
1	1	Pre-project	0%	0.45	21.1	4.4	41.8	2%[3]
	1	Post-project	2%	0.46	21.1	4.4	42.5	
2	2	Pre-project	0%	0.45	5.4	4.4	10.7	4%[4]
	2	Post-project	4%	0.47	5.4	4.4	11.2	
3	3	Pre-project	0%	0.45	12.8	4.4	25.3	5%[5]
	3	Post-project	5%	0.47	12.8	4.4	26.7	

Notes:

1. Runoff coefficients were determined using Table A-1. Runoff Coefficients for Rational Method located in Appendix A of the Drainage Design Manual.
2. Intensity was determined based on a 100-year storm event and a 5-minute time of concentration for each basin. Figure A-1 Intensity-Duration-Frequency Design Chart in Appendix A of the Drainage Design Manual was used.
3. Basin 1 discharges to a sump within Basin 1's drainage boundaries. Although the 100-year peak discharge is shown to increase from Basin 1 it is anticipated that the surrounding area will see no increase in storm water runoff.
4. Basin 2 ultimately discharges to Basin 1. Although the 100-year peak discharge is shown to increase from Basin 2 it is anticipated that the surrounding area will see no increase in storm water runoff.
5. Basin 3 discharges to a sump near the existing Border Fence, to an existing drainage facility just east of the existing access road near the bottom of the steep slope. There will be slight increase in runoff to this location based on the proposed pavement, however, it will be conveyed via brow ditches down the steep segments and dissipated via riprap near the low points of each side of the road, prior to entering the existing drainage facilities. The increase is shown to be 5% without considering attenuation effects within the existing sump area and due to the existing drainage outlet works. This minimal increase is considered negligible.

The following describes each of the three (3) drainage basins in further detail:

In the existing condition, Basin 1, flows in a southwesterly direction to a low point located within Basin 1's drainage boundaries (POI-1). Basin 1 ultimately discharges to POI-1. In the proposed project condition Basin 1 will remain very similar to the existing project condition. The only improvement proposed in Basin 1 is a portion of paved emergency access road. This will slightly increase the percent impervious of Basin 1. All other drainage characteristics of Basin 1 will remain the same. It is anticipated that because Basin 1 discharges to a low point within its own drainage boundary proposed improvements to Basin 1 will not result in an increase of stormwater runoff to the surrounding area.

In the existing condition, Basin 2, flows in a southwesterly direction to a low point located within Basin 2 (POI-2). Basin 2 in the proposed project condition will remain very similar to the existing project condition. The only improvement proposed in the post-project condition of Basin 2 will be a portion of paved emergency access road. All other drainage characteristics of Basin 2 will remain the same. It is anticipated that in the 100-year storm event may overtop the local sump located at POI-2 and flow into Basin 1. Since runoff within Basin 2 is also contained within existing sump areas at POI-2 and POI-1, there is no net increase of runoff in the proposed condition from the project site in the event of a 100-year storm.

In the existing condition Basin 3 drains south before entering an existing drainage facility near the border fence (POI-3). The existing drainage facility appears to be hydraulically connected to a culvert which crosses the border. Drainage on the southside of the border makes its way westerly and connects into the Tijuana River. Based upon the available information, it is assumed that the runoff is conveyed via a system of storm drain and open channels to a concrete lined reach of the Tijuana River on the Mexican side of the border. In the proposed condition

Basin 3 will follow the same drainage pattern and discharge to POI-3. An increase of 1.4 cfs is anticipated at POI-3, which represents a 5% increase. This minor increase is considered negligible and is likely attenuated further within the existing sump and drainage outlet structure.

3. Water Quality Analysis, Methodology and Results

Basins 1 and 2 qualify as a singular self-mitigating DMA per section 5.2.1 of “The City of San Diego Stormwater Standards,” last revised May 2021 (herein referred to as “The Storm Water Standards”). The impervious area within Basin 1 and 2 is 2 and 4 percent respectively of the surrounding drainage area from which runoff will dissipate across the existing pervious areas, which is less than the 5% allowable for self-mitigating areas. Furthermore, these areas do not discharge beyond the existing low points, so there is no concern for the discharge of pollutants from these two drainage basins.

Basin 3 discharges to POI-3. The amount of impervious area within this drainage basin is also at the 5% or less threshold to qualify for a self-mitigating DMA, however, the drainage is not able to surface discharge across large portions of the surrounding pervious areas as typically intended for self-mitigating DMAs. Due to the steep grades of the existing road, and the adjacent steep hillsides draining towards the roadway corridor, brow ditches have been proposed to help collect runoff from the roadway (and in some cases the surrounding hillside) and discharge it towards the south in the vicinity of the existing drainage collection facility. Riprap would be used at the end of the brow ditches on both sides of the improved roadway. The paving of this section is needed to provide emergency vehicle access which means the typical pollutants associated with a roadway are not expected to occur along this segment. The addition of permanent storm water BMPs is not very practical or feasible given the steep grades along the existing road alignment, nor at the low point as the property is not under the ownership of this project and is part of the federal ownership associated with the border fence. Due to these constraints, the lack of actual traffic and associated pollutants of concern, and the amount of impervious area is still equal to 5% or less, we recommend allowing this reach to remain untreated, whether it’s categorized as a self-mitigating DMA or untreated DMA.

6. Conclusion

This letter report presents the existing and proposed hydrology and water quality analysis for the emergency vehicle access “project alternative” for the overall project. Peak flow rates for the 100-year storm event were determined using the Rational Method in conformance with the Drainage Design Manual. From a drainage or hydrological perspective, the change to peak flow rates are minimal in each of the three (3) drainage basins, estimated at less than 5% in each case, two of which are self-contained within existing low points and do not discharge from the site. From a water quality perspective, pollutants of concern are not anticipated to be present as they would for a normal use roadway. Stormwater runoff occurring within Basins 1 and 2 meet the criteria associated with self-mitigating DMAs since the amount of impervious area will be equal to or less than 5% of the overall drainage management area (DMA). The paved sections will runoff across pervious areas before eventually reaching the existing low points which do not discharge from the site. For Basin 3, the amount of impervious area is also equal to or less than 5% of the overall DMA, however, it has less opportunity to discharge across the surrounding pervious areas due to the steep hillsides draining towards the existing road alignment. Due to the physical constraints along this segment, the lack of actual traffic and associated pollutants of concern, and the amount of impervious area is still equal to 5% or less, we recommend allowing this segment to remain untreated, whether it's categorized as a self-mitigating DMA or untreated DMA. The eventual discharge from Basin 3 is collected near the border fence in an existing drainage structure, conveyed south into Mexico, and eventually outlets into the concrete-lined Tijuana River further west within Mexico.

The combined post project drainage map / drainage management area exhibit is included in Attachment 2 of this letter.

Please feel free to contact Eric Hengesbaugh or myself if you have any questions and/or concerns at (619) 291-0707.

Sincerely,

RICK ENGINEERING COMPANY

Brendan Hastie

Brendan Hastie, P.E.
R.C.E. #65809, Exp. 9/25
Principal

BH:EGH:vs/files/Report/15013-C.017

Attachment 1

Normal Depth Drainage Ditch and Storm Drain Sizing

Hydraulic Analysis Report

Project Data

Project Title: Drainage Conduit

Designer:

Project Date: Monday, May 13, 2024

Project Units: U.S. Customary Units

Notes:

Channel Analysis: West Type "A" Lined Ditch

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.5000 ft/ft

Side Slope 2 (Z2): 2.5000 ft/ft

Longitudinal Slope: 0.1450 ft/ft

Manning's n: 0.0130

Flow: 10.4000 cfs

Result Parameters

Depth: 0.5023 ft

Area of Flow: 0.6307 ft^2

Wetted Perimeter: 2.7048 ft

Hydraulic Radius: 0.2332 ft

Average Velocity: 16.4897 ft/s

Top Width: 2.5114 ft

Froude Number: 5.7987

Critical Depth: 1.0145 ft

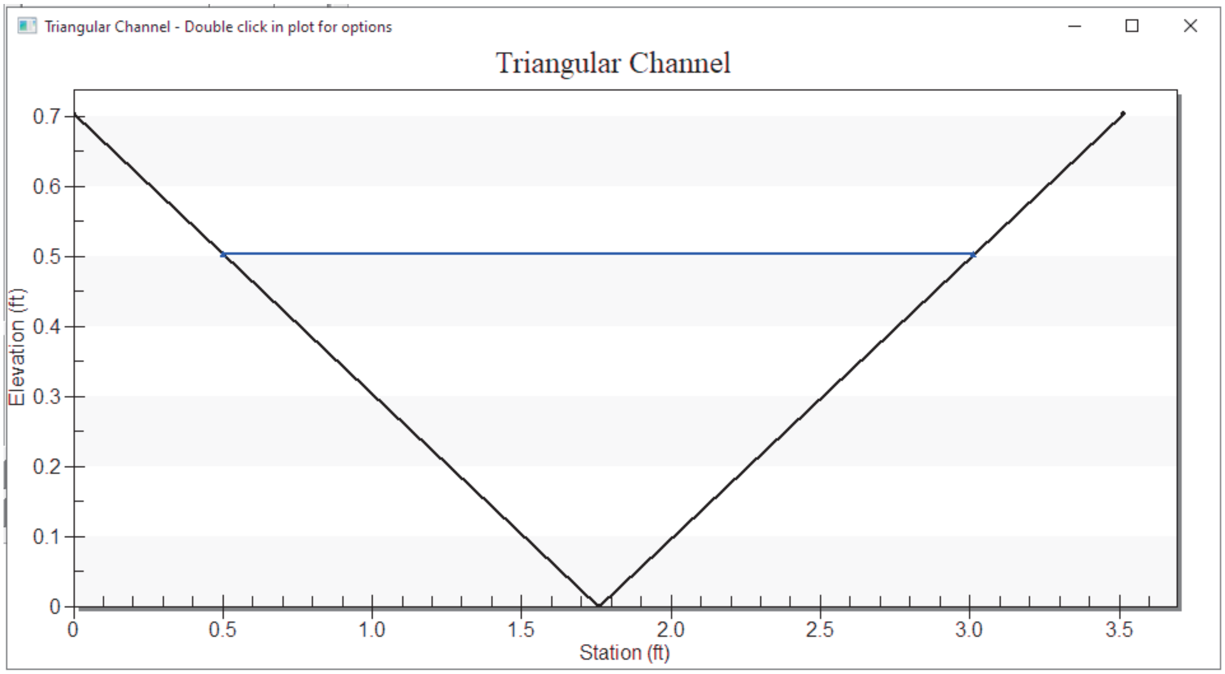
Critical Velocity: 4.0416 ft/s

Critical Slope: 0.0034 ft/ft

Critical Top Width: 5.07 ft

Calculated Max Shear Stress: 4.5446 lb/ft^2

Calculated Avg Shear Stress: 2.1098 lb/ft^2



Runnoff from the 100-year storm event has been modeled and is shown as the blue line in the cross-section of the drainage ditch located west of the emergency evacuation route above. An 18-inch deep Type “A” lined ditch is proposed. Per “City of San Diego Standard Drawings for Engineering and Capital Improvement Projects Construction 2021 Edition.”

Channel Analysis: East Type "A" Lined Ditch

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.5000 ft/ft

Side Slope 2 (Z2): 2.5000 ft/ft

Longitudinal Slope: 0.1450 ft/ft

Manning's n: 0.0130

Flow: 16.3000 cfs

Result Parameters

Depth: 0.5945 ft

Area of Flow: 0.8835 ft^2

Wetted Perimeter: 3.2013 ft

Hydraulic Radius: 0.2760 ft

Average Velocity: 18.4502 ft/s

Top Width: 2.9723 ft

Froude Number: 5.9639

Critical Depth: 1.2143 ft

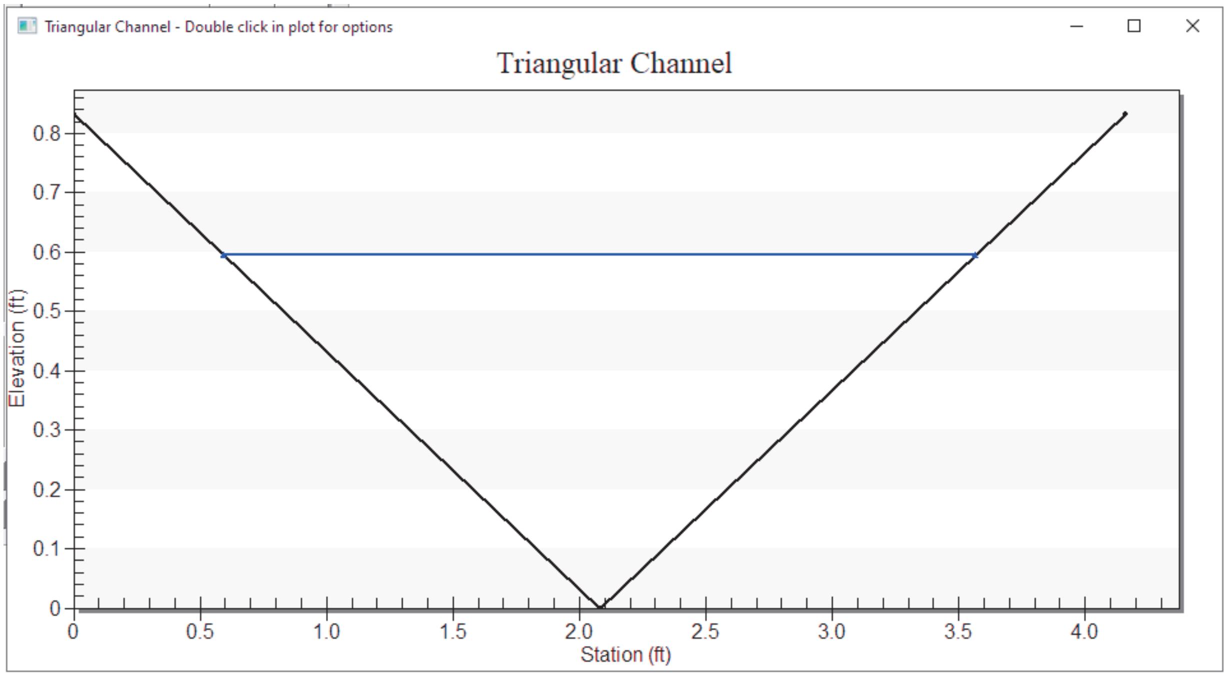
Critical Velocity: 4.4216 ft/s

Critical Slope: 0.0032 ft/ft

Critical Top Width: 6.07 ft

Calculated Max Shear Stress: 5.3787 lb/ft^2

Calculated Avg Shear Stress: 2.4970 lb/ft^2



Runnoff from the 100-year storm event has been modeled and is shown as the blue line in the cross-section of the drainage ditch located east of the emergency evacuation route above. An 18-inch deep Type “A” lined ditch is proposed. Per “City of San Diego Standard Drawings for Engineering and Capital Improvement Projects Construction 2021 Edition.”

Channel Analysis: CrossEvacRoadSD

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0130

Flow: 10.4000 cfs

Result Parameters

Depth: 1.2161 ft

Area of Flow: 1.5347 ft^2

Wetted Perimeter: 3.3622 ft

Hydraulic Radius: 0.4565 ft

Average Velocity: 6.7765 ft/s

Top Width: 1.1751 ft

Froude Number: 1.0450

Critical Depth: 1.2400 ft

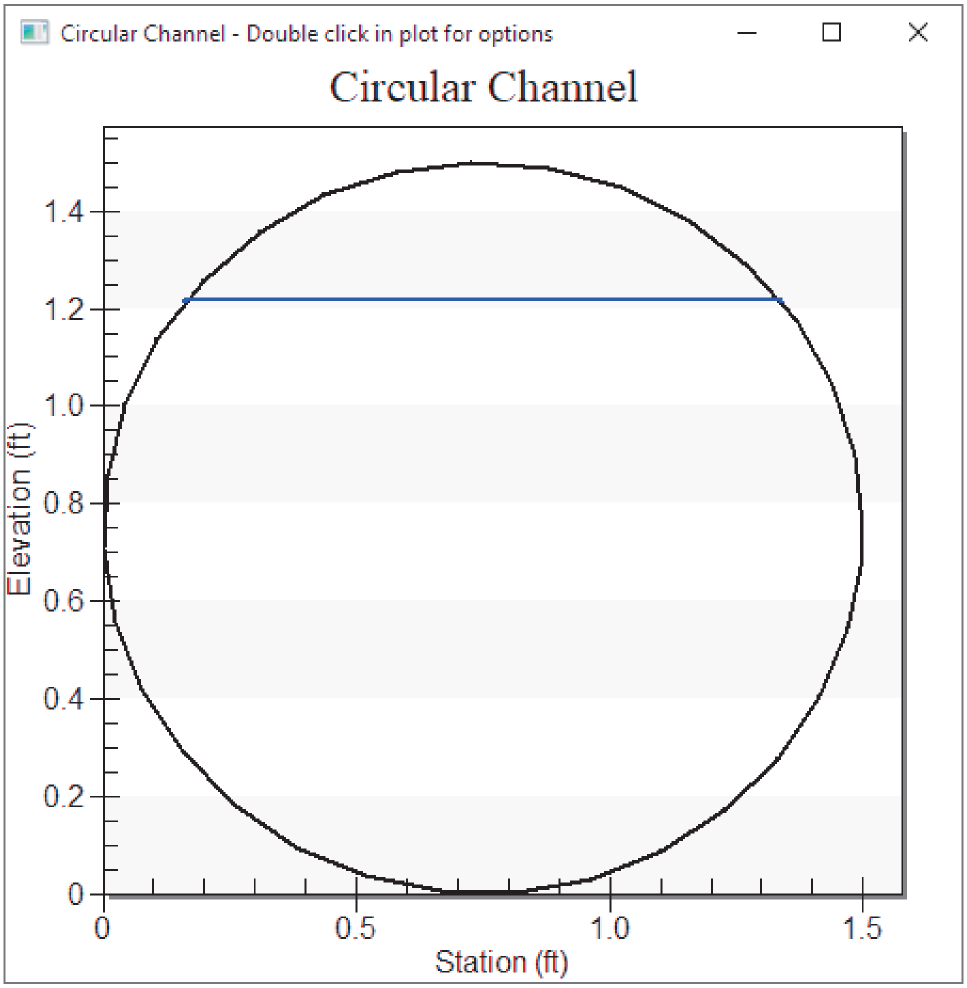
Critical Velocity: 6.6570 ft/s

Critical Slope: 0.0097 ft/ft

Critical Top Width: 1.14 ft

Calculated Max Shear Stress: 0.7589 lb/ft^2

Calculated Avg Shear Stress: 0.2848 lb/ft^2

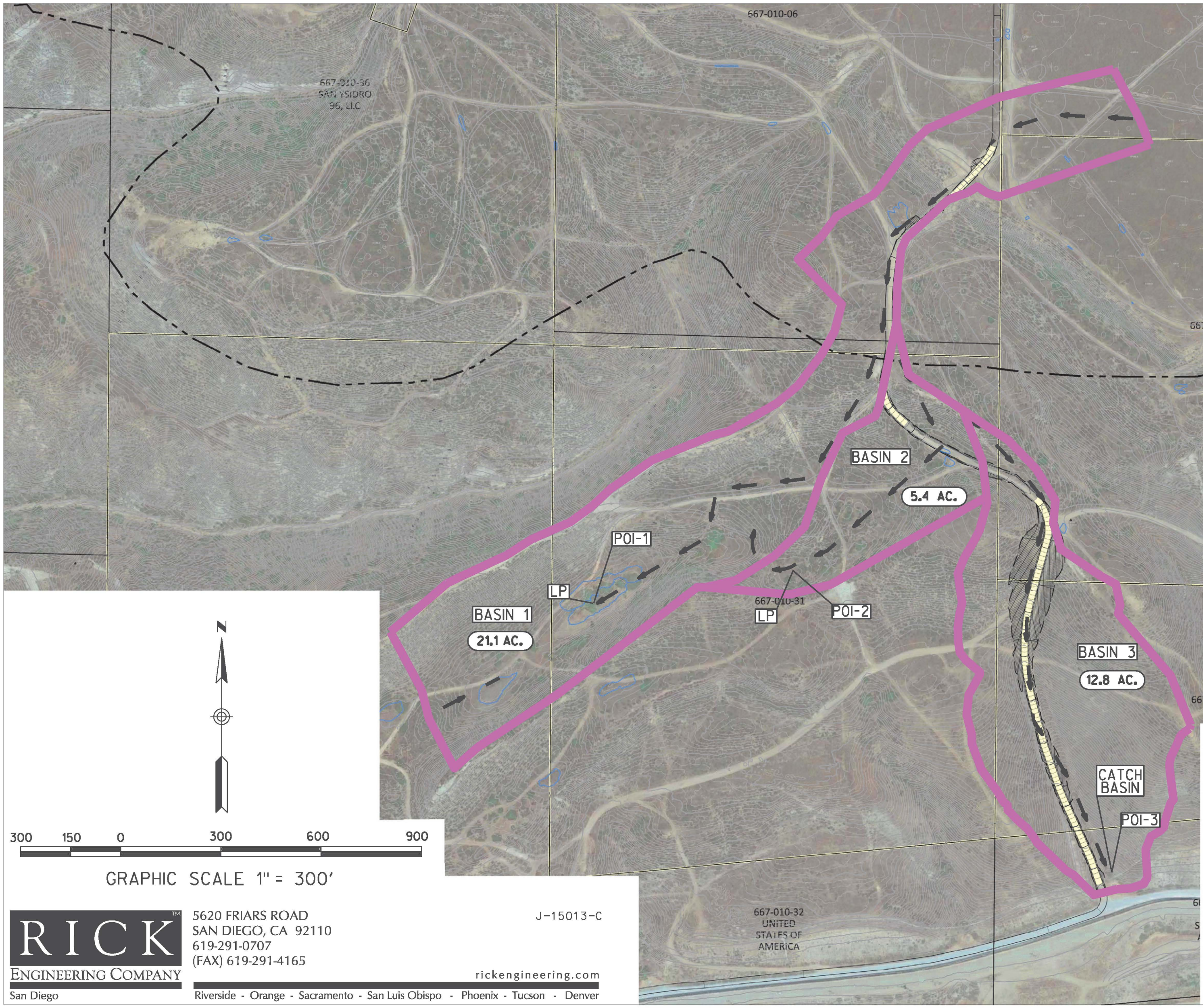


Runnoff from the 100-year storm event has been modeled and is shown as the blue line in the cross-section of the storm drain pipe which crosses the down stream end of the emergancy evacuation route, flowing from west to east above. An 18-inch RCP is proposed.

Attachment 2

Post Project Drainage Map / Drainage Management Area Exhibit

(Combined Exhibit)



300 150 0 300 600 900

GRAPHIC SCALE 1" = 300'

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J-15013-C

LEGEND

- POI
- XX.X AC. — BASIN AREA
- MAJOR BASIN BOUNDARY
- EXISTING SHALLOW SUMP OVERFLOW DIRECTION
- FLOW PATH
- POTENTIAL PAVING

NOTES

1. POI-1 IS LOCATED AT A SUMP WITHIN BASIN 1. THERE WILL BE NO NET RUNOFF DISCHARGING FROM BASIN 1.
2. POI-2 IS LOCATED AT A LOCAL SUMP WITHIN BASIN 2. DURING BIGGER STORM EVENTS IT IS ANTICIPATED THE POI-2 WILL DISCHARGE TO BASIN 1.
3. POI-3 IS LOCATED AT A CATCH BASIN WHICH DISCHARGES TO A CULVERT AND IS TRIBUTARY TO THE TIJUANA RIVER

EMERGENCY VEHICLE ACCESS FOR SOUTHWEST VILLAGE VTM (POST-PROJECT)

J-15013-C Date: December 18, 2021

NOT FOR CONSTRUCTION

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