

**SUMMARY OF FINDINGS FOR THE
ANNUAL DRAINAGE CHANNEL FIELD
ASSESSMENT AND MAINTENANCE PRIORITIZATION
PROJECT (PHASE 1)
FOR
THE CITY OF SAN DIEGO – MASTER STORM WATER
SYSTEM MAINTENANCE PROGRAM (MMP) MAP 97:
SOUTH CHOLLAS CREEK CHANNEL**

**Job Number 17204-D
August 4, 2015**

RICK
RICK ENGINEERING COMPANY
ENGINEERING COMPANY
RICK ENGINEERING CO

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PROGRAM (MMP) MAP 97: SOUTH CHOLLAS CREEK CHANNEL**

Job Number 17204-D


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August 4, 2015

TABLE OF CONTENTS

1.0 Executive Summary	1
2.0 Introduction.....	1
3.0 Desktop Channel Maintenance Prioritization Analysis	1
4.0 Hydrologic Summary.....	2
5.0 Hydraulic Analysis.....	3
6.0 Other Channel Prioritization Factors	4
7.0 Summary of Findings and Recommendations	4

Tables

Table 1: Channel Prioritization Assessment Factors and Weighting	2
Table 2: Summary of Peak Discharges	3
Table 3: Summary of Hydraulic Analysis Results	3
Table 4: Channel Prioritization Assessment Scoring Summary.....	4

Appendices

Appendix A: Master Storm Water System Maintenance Program (MMP), dated October 2011, Storm Water Facilities Key Map and Map 97: South Chollas Creek Channel	
Appendix B: City of San Diego Operations and Maintenance (O&M) Channel Maintenance Inspection Forms completed for the channel and Site photos taken by the City of San Diego	
Appendix C: Hydrologic Support Material	
Appendix D: Hydraulic Analysis Output	
Appendix E: Channel Prioritization Assessment Sheet	
Appendix F: Channel Maintenance Prioritization Summary Sheet	
Appendix G: Available As-built plans	
Appendix H: Compact Disc: PDF Version of Full Report	

1.0 Executive Summary

This report and preliminary analyses concludes that the Channel Prioritization Score for the South Chollas Creek Channel (MMP Map 97) is **71.8 out of 100**. This score is above average and indicates that the channel is highly recommended for maintenance. If the channel is maintained to reflect the as-built condition, the hydraulic capacity of the channel will increase from the current 10- to 25-year storm event capacity to a 50- to 100-year storm event capacity. In addition to the hydraulic capacity, the analyses considered other factors including water quality, community input and aesthetics. The analyses concluded that these other factors are generally in good condition and the benefits of maintaining the channel are mainly to reduce the flood risk.

2.0 Introduction

This report summarizes the findings for the Annual Drainage Channel Field Assessment and Maintenance Prioritization Project (Phase 1) for the City of San Diego for Master Storm Water System Maintenance Program (MMP), dated October 2011, Map 97: South Chollas Creek Channel. Refer to Appendix A for the MMP Storm Water Facilities Key Map and Map 97.

Purpose

As part of the Master Storm Water System Maintenance Program (MMP), the City of San Diego performed site visits to drainage channels within the MMP and designated several drainage channels as maintenance priorities. The purpose of Phase 1 of this project is to perform a desktop analysis to evaluate the drainage channels identified by the City of San Diego and rank them in order of significance for the purposes of City of San Diego maintenance activities.

3.0 Desktop Channel Maintenance Prioritization Analysis

The desktop channel maintenance prioritization analysis is based on the following items which were reviewed and evaluated to determine the maintenance priority:

- City of San Diego Operations and Maintenance (O&M) Channel Maintenance Inspection Forms completed for the channel by the City of San Diego (Refer to Appendix B)
- Site photos taken by the City of San Diego (Refer to Appendix B)
- Available as-built plans (Refer to Appendix G)
- Hydraulic Analysis (Refer to Section 5.0 and Appendix D for detailed output)

Section 5.1 of the MMP discusses the Annual Maintenance Needs Determination Process. As part of the determination process, the MMP recommends that certain factors be evaluated including flood risk to life and property, water quality, community input and aesthetics. These four factors were utilized

for this channel maintenance prioritization analysis. For the purposes of prioritizing the channel for maintenance activities, each main factor is weighted as shown in Table 1 below:

Table 1

Channel Prioritization Assessment Factors and Weighting	
Factor	Percent Weighted (%)
Flood Risk	75
Water Quality	10
Community Input	10
Aesthetics	5

As part of the channel prioritization analysis, each of the main factors has been divided into sub-factors. To determine the Flood Risk factor, a basic hydraulic analysis was performed for the channel. The hydraulic analysis is described in more detail in the Hydraulic Analysis section (Section 5.0) of this report. The remaining factors, Water Quality, Community Input and Aesthetics were assessed based on the site photos and the information provided on the (O&M) Channel Maintenance Inspection Form completed for the channel provided by the City of San Diego. These factors and sub-factors and how they relate to the Channel Prioritization Score are shown in more detail on the Channel Prioritization Assessment Sheet located in Appendix E.

4.0 Hydrologic Summary

Federal Emergency Management Agency (FEMA) Peak Discharges

A drainage study for the channel was not available at the authorship of this report. The drainage channel is a Federal Emergency Management Agency (FEMA) defined channel. Peak flow rates for the channel are based on the FEMA Flood Insurance Study (FIS) for San Diego County dated May 16, 2012 (2012 San Diego FIS). The 10-, 50-, and 100-year storm event peak discharges used for the analysis were taken directly from the 2012 San Diego FIS. Estimates of the 2-, 5-, and 25-year storm event peak discharges were extrapolated from the FEMA discharges using logarithmic plotting paper. Hydrologic support material including excerpts from the 2012 San Diego FIS and an excerpt of the Flood Insurance Rate Map (FIRMette) showing the channel are located in Appendix C. A summary of the peak discharges are provided in Table 2 below:

Table 2

Summary of Peak Discharges						
Drainage Area: 10.9 square miles						
South Las Chollas Creek Above Confluence with Las Chollas Creek						
Frequency	2-yr²	5-yr²	10-yr³	25-yr²	50-yr³	100-yr³
Discharge (cfs)¹ at downstream point of channel assessment limit	540	1,250	2,000	3,000	3,900	5,300

1. cfs = cubic feet per second
2. Estimated based on extrapolation using logarithmic plotting paper
3. Peak Discharge also shown on available as-built plans

5.0 Hydraulic Analysis

A basic hydraulic analysis of the channel was performed to assess the Flood Risk factor. The channel assessment limits are shown on Map 97 located in Appendix A. Manning’s equation was utilized to calculate the capacity of the channel under two conditions:

1. As-built Conditions: based on the material and geometry as shown on the available as-built plans. (Refer to Appendix G)
2. Current Conditions: based on the vegetation and sediment levels estimated from the site photos taken by the City of San Diego and information provided on the (O&M) Channel Maintenance Inspection Form prepared by the City of San Diego.

Culvert crossings that may exist within the channel reach were not analyzed as part of this hydraulic analysis. Existing culverts may be inefficient or undersized, however the culvert hydraulics were not considered as part of this analysis.

The multiple storm event peak discharges previously calculated in Section 4.0 were evaluated under each condition to assess the capacity of the channel and evaluate the benefit of performing maintenance activities on the channel. See the table below for a summary of the hydraulic results and Appendix D for detailed hydraulic output.

Table 3

Summary of Hydraulic Analysis Results			
CURRENT CHANNEL CAPACITY		AS-BUILT CHANNEL CAPACITY	
Current Condition (cfs)	Equivalent Storm Event (year)	As-built Condition (cfs)	Equivalent Storm Event (year)
2568.6	10 to 25	4380.2	50 to 100

cfs = cubic feet per second

6.0 Other Channel Prioritization Factors

Sections 4.0 and 5.0 above discuss the determination process for the Flood Risk factor. For more information on the assessment of the Water Quality, Community Input, and Aesthetics factors please refer to the Channel Prioritization Assessment Sheet in Attachment E. The Channel Prioritization Assessment Sheet lists and describes the sub-factors that are considered in the determination of the four main channel assessment factors.

7.0 Summary of Findings and Recommendations

A summary of the Channel Assessment is shown in the table below:

Table 4

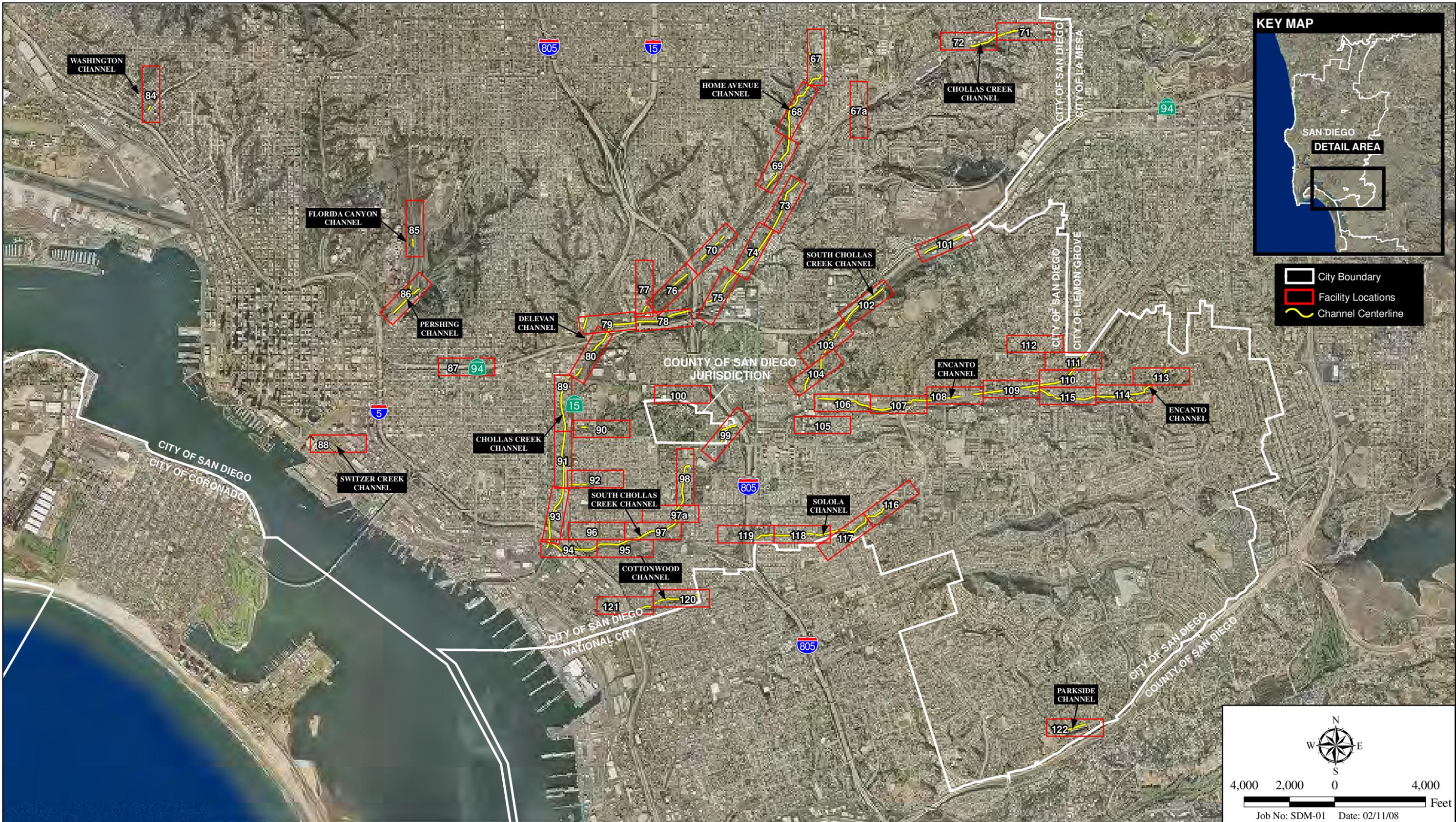
Channel Prioritization Assessment Scoring Summary		
Factor	Percent Weighted (%)	Weighted Factor Score/Maximum
Flood Risk	75	63.8/75
Water Quality	10	3/10
Community Input	10	5/10
Aesthetics	5	0/5
Overall Channel Score:		<i>71.8/100</i>

Based on the evaluation of the four weighted channel prioritization factors described in Section 3.0 of this report, the Channel Prioritization Score for MMP Map 97: South Chollas Creek Channel is **71.8**. Refer to the Channel Prioritization Assessment Sheet located in Appendix E for details on the evaluation of the weighted factors and resulting score for this channel.

It is recommended that this drainage channel be maintained to increase the current capacity of the channel from a 10- to 25-year storm event back to a 50- to 100-year storm event capacity.

A summary of the channel including an aerial map, channel prioritization score, and other pertinent information is shown on the exhibit titled “Channel Maintenance Prioritization Summary Sheet” located in Appendix F.

Appendix A
Master Storm Water System Maintenance Program (MMP),
dated October 2011, Storm Water Facilities
Key Map and Map 97: South Chollas Creek Channel



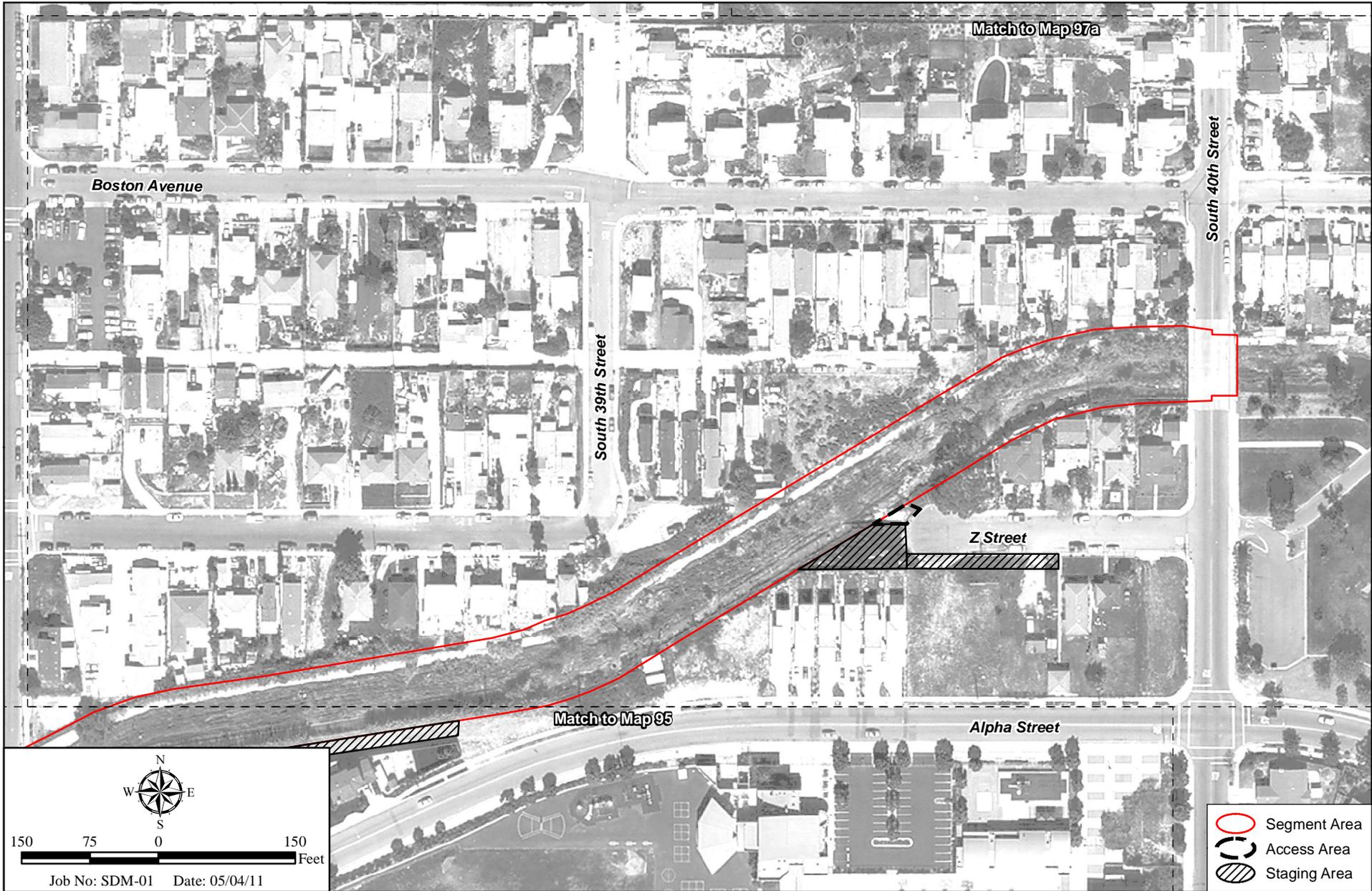
I:\ArcGIS\SDM-01\Map\ENV\MSMP\Fig2d_CentralSD.mxd-NM

Stormwater Facilites - Central San Diego Area

CITY OF SAN DIEGO MASTER STORMWATER SYSTEM MAINTENANCE PROGRAM

Figure 2d





E:\ArcGIS\SDM-01 StormDrainMaintenance\Map\ENV\MasterPlan\Map97.mxd -RK

Access and Staging Areas

CITY OF SAN DIEGO MASTER STORMWATER SYSTEM MAINTENANCE PROGRAM

Appendix B
City of San Diego Operations and Maintenance (O&M)
Channel Maintenance Inspection Forms completed
for the channel and Site photos taken by the City of San Diego

Operations and Maintenance

Channel Maintenance Inspection Form

Date: 5/5/15 Time: Am

Channel Map No.: 97 South Chalks Creek Watershed: Pueblo S.D

Inspector: Sam Richard Weather: cloudy

Initial Inspection Follow Up Inspection

Item	Condition	Comments
A. Channel Condition		
1= Poor Condition/Needs Immediate Attention		
2= Moderate Condition		
3= Good Condition		
1. Structure Condition	1 2 (3) N/A	
2. Erosion	1 2 (3) N/A	
3. Trash/Debris	1 (2) 3 N/A	Type of trash and source: light household
4. Water Conveyance	1 (2) 3 N/A	
4. Standing Water	Y (N)	
A. Ponding	Y (N)	
B. Noticeable odors	Y (N)	
C. Algae	Y (N)	
5. Vegetation	(1) 2 3 N/A	Approx. Coverage/Density of Vegetation: 70%
A. Invasive (Arundo)	(1) 2 3 N/A	
B. Native	(1) 2 3 N/A	
6. Sediment	1 (2) 3 N/A	Approx. Depth/Coverage of Sediment: 20%
7. Transients/encampments	Y (N)	

B. Culverts and Outfalls

1= Poor Condition/Needs Immediate Attention

2= Moderate Condition

3= Good Condition

Item	Condition	Comments
1. Structure Condition	1 2 3 N/A	
2. Trash/Debris/Sediment	1 2 3 N/A	light
3. Clogging	1 2 3 N/A	

C. See Map Attached

-Identify Key Issues on Map

-Inspect and take photographs from vantage points identified on Map

Other Comments:

D. To Be Completed by Management

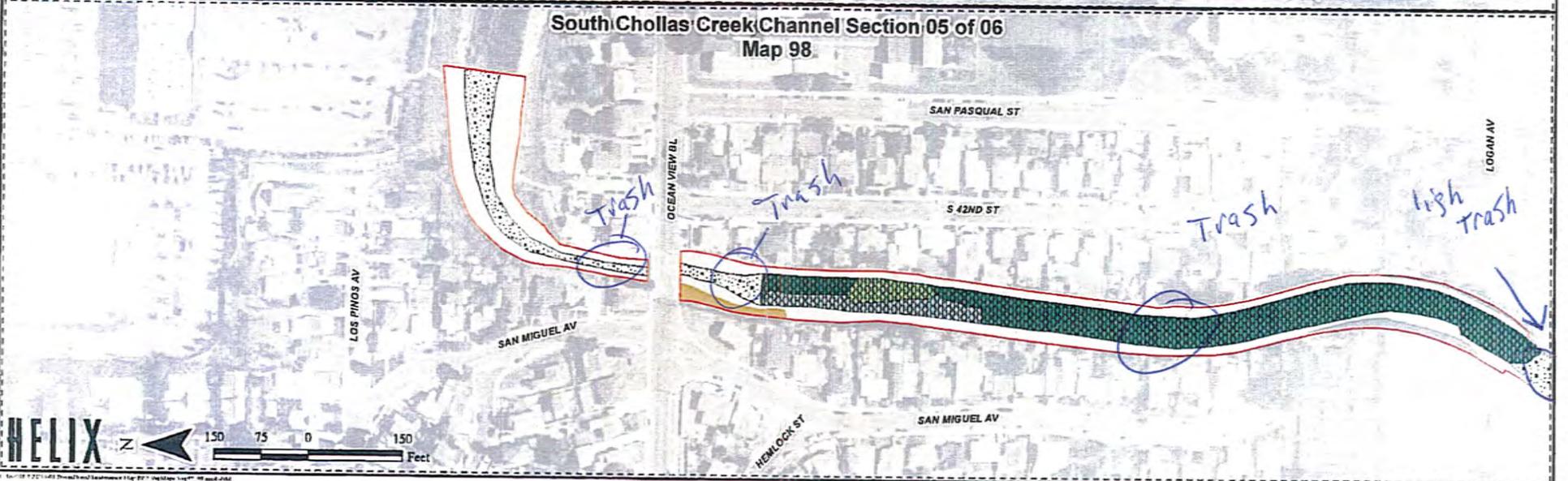
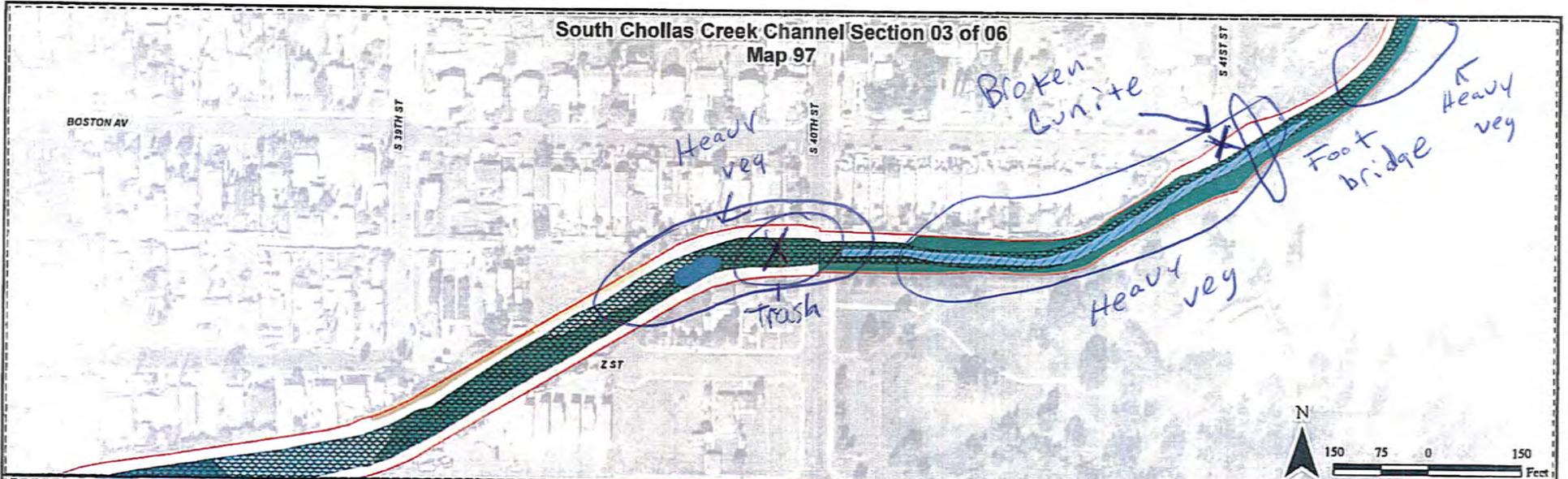
Follow Up Actions

- 1.
- 2.
- 3.

E. Infrastructure Failure Issues		
Item	Condition	Comments
1. Broken Concrete/Gunite?	<input checked="" type="radio"/> Y N/A	
2. Broken/Missing Trash Fence?	Y <input checked="" type="radio"/> N N/A	
3. Broken/Missing Poles/Supports?	Y <input checked="" type="radio"/> N N/A	
4. Exposed Rebar?	Y <input checked="" type="radio"/> N N/A	
5. Rock/Debris Accumulation?	Y <input checked="" type="radio"/> N N/A	
6. Potential Flooding/Litigation?	Y <input checked="" type="radio"/> N N/A	
7. Slope Failure?	Y <input checked="" type="radio"/> N N/A	

Other Comments/Observations:

Broke Gunite near foot bridge to Park

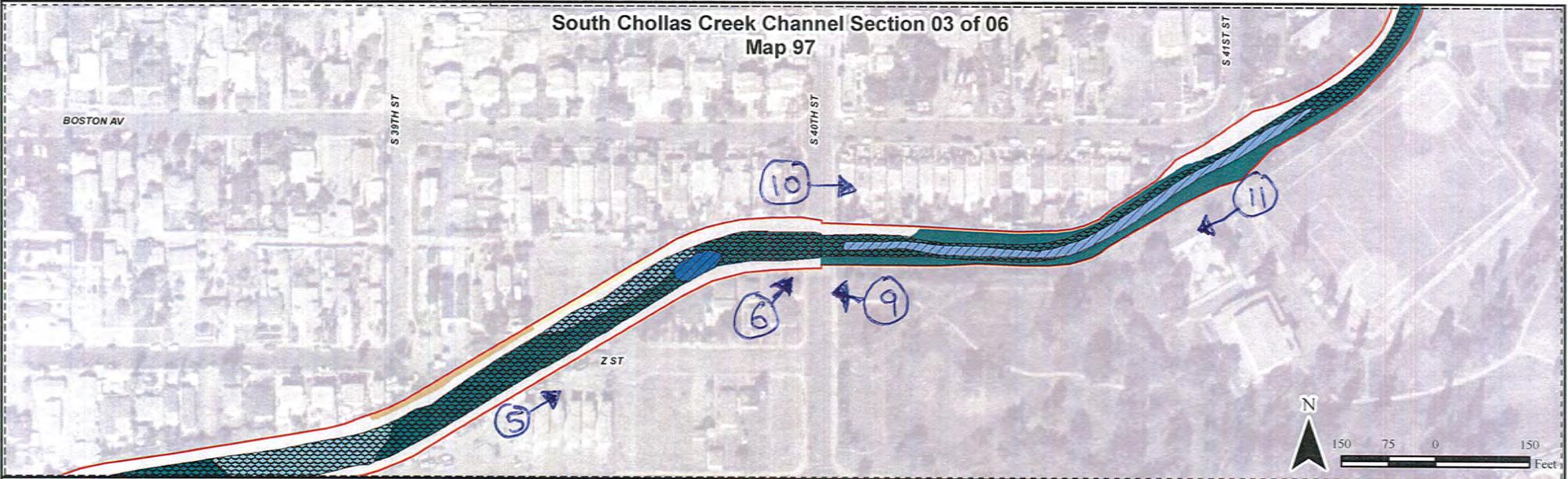


HELIX

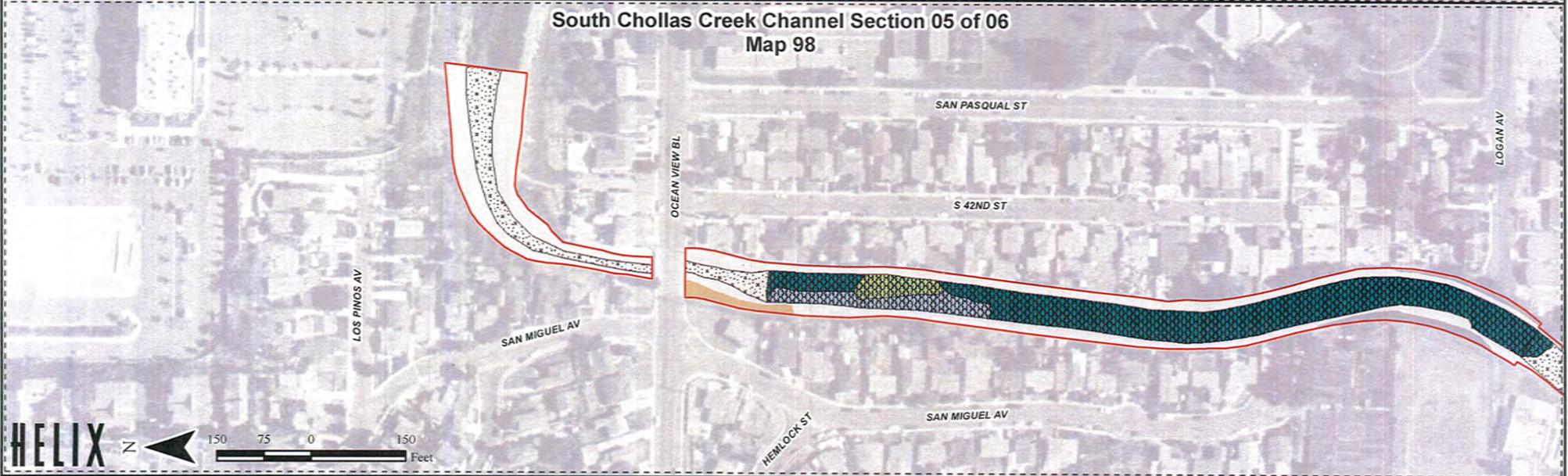
Vegetation/Wetland Delineation - Maps 97 & 98

CITY OF SAN DIEGO MASTER STORMWATER SYSTEM MAINTENANCE PROGRAM

South Chollas Creek Channel Section 03 of 06
Map 97



South Chollas Creek Channel Section 05 of 06
Map 98



HELIX Z
150 75 0 150 Feet

Appendix C
Hydrologic Support Material

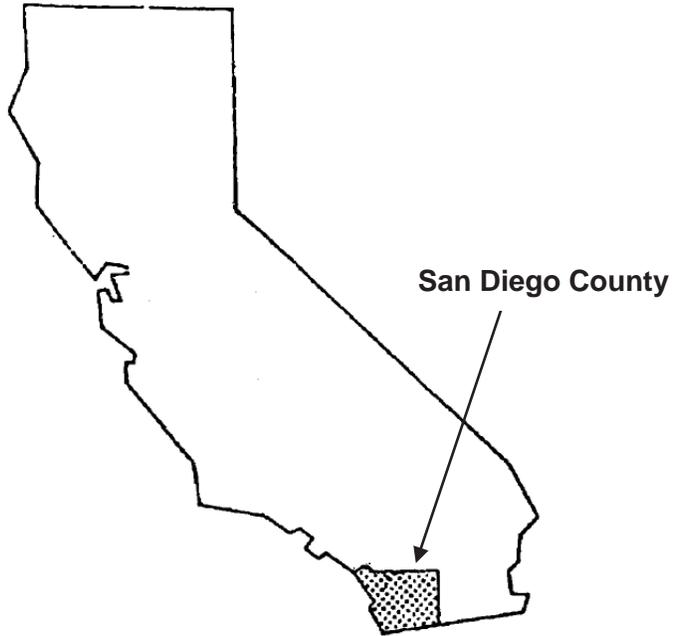
FLOOD INSURANCE STUDY



SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

VOLUME 1 OF 11

Community Name	Community Number
SAN DIEGO COUNTY, UNINCORPORATED AREAS	060284
CARLSBAD, CITY OF	060285
CHULA VISTA, CITY OF	065021
CORONADO, CITY OF	060287
DEL MAR, CITY OF	060288
EL CAJON, CITY OF	060289
ENCINITAS, CITY OF	060726
ESCONDIDO, CITY OF	060290
IMPERIAL BEACH, CITY OF	060291
LA MESA, CITY OF	060292
LEMON GROVE, CITY OF	060723
NATIONAL CITY, CITY OF	060293
OCEANSIDE, CITY OF	060294
POWAY, CITY OF	060702
SAN DIEGO, CITY OF	060295
SAN MARCOS, CITY OF	060296
SANTEE, CITY OF	060703
SOLANA BEACH, CITY OF	060725
VISTA, CITY OF	060297



REVISED
May 16, 2012



Federal Emergency Management Agency
FLOOD INSURANCE STUDY NUMBER
06073CV001C

Table of Contents – Volumes 1 & 2 – continued

FIGURES

FIGURE 1 - FLOODWAY SCHEMATIC 134

TABLES

TABLE 1 - CONTACTED AGENCIES 9
TABLE 2 - INITIAL AND FINAL CCO MEEETINGS 11
TABLE 3 - FLOODING SOURCES STUDIED BY DETAILED METHODS 15
TABLE 4 - FLOODING SOURCES STUDIED BY APPROXIMATE METHODS 16
TABLE 5 - LETTERS OF MAP CHANGE 17
TABLE 6 - SUMMARY OF ELEVATIONS 53
TABLE 7 - SUMMARY OF PACIFIC OCEAN WAVE ELEVATIONS 56
TABLE 8 - SUMMARY OF PEAK DISCHARGES 68
TABLE 9 - MANNING'S "N" VALUES 114
TABLE 10 - LIST OF LEVEES REQUIRING FLOOD HAZARD REVISIONS 122
TABLE 11 - LIST OF CERTIFIED AND ACCREDITED LEVEES 124
TABLE 12 – FLOODING SOURCE DATUM SHIFT VALUES 125
TABLE 13 - FLOODWAY DATA See Vol. 3 and 4
TABLE 14 - COMMUNITY MAP HISTORY 137

Table of Contents – Volumes 3 & 4

TABLES

TABLE 13 - FLOODWAY DATA

TABLE 8: SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. miles)	Peak Discharges (cubic feet per second)			
		10% Annual- Chance	2% Annual- Chance	1% Annual- Chance	0.2% Annual- Chance
0.3 Mile Above Mouth	7.1	1,200 ¹	3,400	5,200 ¹	10,400
At Oak Shadows Drive	4.3	700	2,100	3,200	6,500
South Las Chollas Creek					
Above Confluence with Las Chollas Creek	10.9	2,000	3,900	5,300	9,500
Above Confluence with Encanto Branch	3.3	730	1,400	1,900	3,400
At Kelton Road	2.6	580	1,100	1,500	2,700
South Tributary to Santa Maria Creek					
At Mouth	9.3	700	3,400	5,800	15,000
Spring Valley Creek					
Below Confluence with Casa de Oro Creek	7.1	1,300	2,600	3,600	9,300
Steele Canyon Creek					
At Mouth	2.7	--	--	2,980	--
Stevenson Creek					

¹Flow Partially Controlled by Turner Dam
 -- Data Not Available

South Las Chollas
 Above confluence with Chollas
 10.9 sqm

EXCEEDENCE PER HUNDRED YEARS (ie. there is a 1% chance a 100-yr storm will occur in a year)

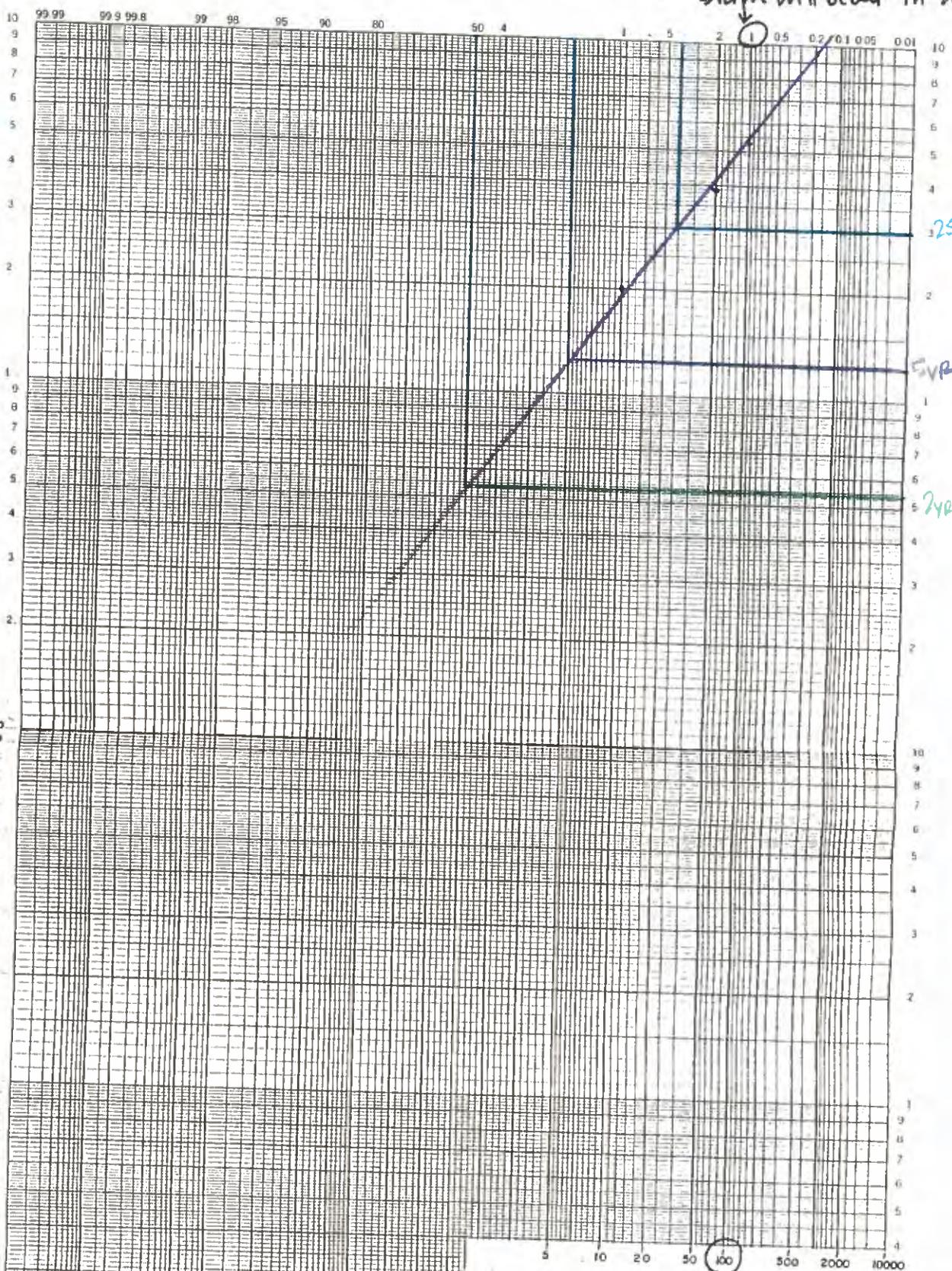
100yr = 3000 cfs

10³

DISCHARGE IN C.F.S.

10²

10¹



25yr = 3000 cfs

5yr = 1250 cfs

2yr = 540 cfs

Exceedence Interval in Years



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EXCEEDENCE INTERVAL IN YEARS

Appendix D
Hydraulic Analysis Output

Hydraulic Analysis Report

Project Data

Project Title: Project - South Chollas

Designer: Rick Engineering Company

J-17204-D

Project Date: Wednesday, July 22, 2015

Project Units: U.S. Customary Units

Channel Analysis: As-Built_S_Chollas_Map97_50-100

Notes: The cross-section of the channel on the as-built plans show a 56-foot wide earthen bottom, 7 feet high with 1.5:1 concrete side slopes. Pursuant to Table 1-104.14A of the City of San Diego Drainage Design Manual, dated April 1984, the roughness coefficients used for the channel side slopes and channel bottom are $n=0.015$ and $n=0.03$, respectively.

Input Parameters

Channel Type: Custom Cross Section

Station (ft)	Elevation (ft)	Manning's n
0.00	7.00	0.0150
10.50	0.00	0.0300
66.50	0.00	0.0150
77.00	7.00	-----

Cross Section Data

Longitudinal Slope: 0.0026 (ft/ft)

Depth: 7.0000 (ft)

Result Parameters

Flow: 4380.1521 (cfs)

Area of Flow: 465.5000 (ft²)

Wetted Perimeter: 81.2389 (ft)

Hydraulic Radius: 5.7300 (ft)

Average Velocity: 9.4096 (ft/s)

Top Width: 77.0000 (ft)

Froude Number: 0.6744

Critical Depth: 5.4630 (ft)

Critical Velocity: 12.4899 (ft/s)

Critical Slope: 0.0064 (ft/ft)

Critical Top Width: 72.3891 (ft)

Calculated Max Shear Stress: 0.0000 (lb/ft²)

Calculated Avg Shear Stress: 0.0000 (lb/ft²)

Composite Manning's n Equation: Lotter method

Manning's n: 0.0258

Channel Analysis: Current_Conditon_S_Chollas_Map97_10-25

Notes: The cross-section of the channel on the as-built plans show a 56-foot wide earthen bottom, 7 feet high with 1.5:1 concrete side slopes. Pursuant to Table 1-104.14A of the City of San Diego Drainage Design Manual, dated April 1984, the roughness coefficients used for the channel side slopes and channel bottom are $n=0.015$ and $n=0.06$, respectively. The roughness coefficient used for the side slopes reflects concrete. The roughness coefficient used for the channel bottom reflects some weeds, heavy brush.

Input Parameters

Channel Type: Custom Cross Section

Station (ft)	Elevation (ft)	Manning's n
0.00	7.00	0.0150
10.50	0.00	0.0600
66.50	0.00	0.0150
77.00	7.00	-----

Cross Section Data

Longitudinal Slope: 0.0026 (ft/ft)

Depth: 7.0000 (ft)

Result Parameters

Flow: 2568.6493 (cfs)

Area of Flow: 465.5000 (ft²)

Wetted Perimeter: 81.2389 (ft)

Hydraulic Radius: 5.7300 (ft)

Average Velocity: 5.5180 (ft/s)

Top Width: 77.0000 (ft)

Froude Number: 0.3955

Critical Depth: 3.8854 (ft)

Critical Velocity: 10.6926 (ft/s)

Critical Slope: 0.0245 (ft/ft)

Critical Top Width: 67.6562 (ft)

Calculated Max Shear Stress: 0.0000 (lb/ft²)

Calculated Avg Shear Stress: 0.0000 (lb/ft²)

Composite Manning's n Equation: Lotter method

Manning's n: 0.0440

CITY OF SAN DIEGO



**DRAINAGE DESIGN
MANUAL**

APRIL • 1984

TABLE OF CONTENTS (Continued)

1-104.12	Chart/Gutter and Roadway Discharge - Velocity Chart . .	70A
1-104.13	Channel Easements	71
1-104.14	Mannings Roughness coefficient	73
1-104.14A	Table/Design Values for Mannings Roughness	
	Coefficient (n)	74
1-104.14B	Chart/Nomograph for Solution of Manning Equation . . .	76
1-104.15	Design Guides	77
1-104-15A	Figure/Typical Channel Plan	78
1-104.15B	Figure/Typical Channel Profile	79
 APPENDIX I		
	Rational Method	80 thru 87
 APPENDIX II		
	Modified Rational Method	88 thru 92
 APPENDIX III		
	SCS Method	93 thru 119
 SEDIMENT DETENTION		
	Basin Desilting	120 thru 126
 APPENDIX IV		
	What pH Values Mean	131
	Definitions (CALTRANS-Highway Design Manual).	132 thru 138
	Department Instructionf for C.I.P.C.P.	139 thru 142
 INDEX		
	Index	143 thru 146

TABLE 1-104.14A

DESIGN VALUES FOR MANNINGS ROUGHNESS COEFFICIENT (n)

<u>TYPE OF CHANNEL</u>	<u>N VALUE</u>
Unlined Channels:	
Clay Loam;	0.023
Sand	0.020
Gravel	0.030
Rock	0.040
Lined Channels:	
Portland Cement Concrete	0.015
Air Blown Mortar	0.018
Asphalt Concrete	0.018
Grass Lined Channels: (Shallow depths)	
2 inch length	0.050
4 - 6 inch length	0.060
6 - 12 inch length	0.120
12 - 24 inch + length	0.200
Pavement and Gutters:	
Concrete	0.015
Asphalt Concrete	0.018
Natural Streams: (Less than 100 feet wide at flood stage)	
1. Regular section	
a. Some grass and weeds, little or no brush	0.030
b. Dense growth of weeds, depth of flow substantially greater than weed height	0.040
c. Some weeds, light brush on bank	0.040
d. Some weeds, heavy brush on banks	0.060
e. With trees in channel, branches submerged at flood stage, increase above values by	0.015

TABLE 1-104.14A (Continued)

2.	Irregular section, with pools, slight channel meander increase all values listed in 1. Regular Section, by	0.015
----	--	-------

Flood Plains: (adjacent to natural streams)

1.	Pasture, no brush	
	a. Short grass	0.030
	b. High grass	0.040
2.	Cultivated areas	
	a. No crop	0.040
	b. Mature row crops	0.040
	c. Mature field crops	0.050
3.	Heavy weeds, scattered brush	0.050
4.	Light brush and trees	0.060
5.	Medium to dense brush	0.090
6.	Dense willows	0.170
7.	Cleared land with tree stumps, 100-150 per acre	0.060
8.	Heavy stand of timer, little undergrowth	
	a. Flood depth below branches	0.110
	b. Flood depth reaches branches	0.140

Appendix E
Channel Prioritization Assessment Sheet

Channel Prioritization Assessment Sheet for South Chollas Creek Channel MMP Map 97

Total Channel Score: 71.8 /100

Flood Hazard (75% of total weight)			Score	factor weight	Weighted Points
Δ capacity			Sum of sub-factor a-c scores: 6	25%	7.5
a. Risk of flooding	Current Channel Normal depth capacity ¹ :	2568.6 cfs 10- to 25 -yr. storm event	(out of 15)		
b. Increase in storm event capacity	Channel As-Built normal depth capacity ¹ :	4380.2 cfs 50- to 100 -yr. storm event			
c. Net percent increase in channel capacity post-maintenance		71%			
Consequence of flooding adjacent areas			0 1 2 3 4	50%	37.5
	Surrounding area land use: (area within 100 feet of the channel or area in which more than 10,000 ft ² is impacted from flooding.)	Residential	Residential = score of 4; Commercial = score of 4; Roads = score of 2; Agriculture = score of 1; Other = score of 1		
	Is there open space surrounding the channel?	No	If yes, subtract land use score by 1		
Clogging Potential			0 1 2 3 4	25%	18.75
	Are there trees/large debris that have potential to flow D/S and clog culverts/the channel?	Yes			
			Total Weighted Flood Hazard Points		63.8

Water Quality/Channel Condition (10% of total weight)			Score	factor weight	Weighted Points
Trash/Debris	Type of trash and Source:	Light household	0 1 2 3 4	20%	1
Standing water	Ponding?	No	0 1 2 3 4	15%	0
	Noticeable odors?	No			
	Algae?	No			
Sediment	Approx. sediment coverage: (Based on information provided on City of San Diego O&M Channel Maintenance Inspection Form)	20%	0 1 2 3 4	35%	2
	Rock/debris Accumulation?	No			
Transients/encampments			0 1 2 3 4	10%	0
Culverts and Outfalls			0 1 2 3 4	10%	0
Infrastructure Issues	Culvert structure condition	Good			
	Broken concrete/gunite?	No	0 1 2 3 4	10%	0
	Broken or missing trash fence/fence poles/supports?	No			
	Slope failure?	No			
			Total Weighted Water Quality Points		3.0

Community Input (10% of total weight)			Score	factor weight	Weighted Points
Community Complaints Received			YES NO	50%	5
Community Outreach Input			0 1 2 3 4	50%	0
			Total Weighted Community Input Points		5.0

Aesthetics (5% of total weight)			Score	factor weight	Weighted Points
Aesthetics	Are the aesthetics of the channel compromised?	No	0 1 2 3 4	100%	0
			Total Weighted Aesthetics Points		0.0

1. See appendix D for geometry parameters

Scoring Legend	
0	Factor is in good condition and does not need attention
1	Factor is in good condition, but will eventually need attention
2	Factor needs attention
3	Factor is in bad condition and needs attention
4	Factor is in severe condition and needs immediate attention

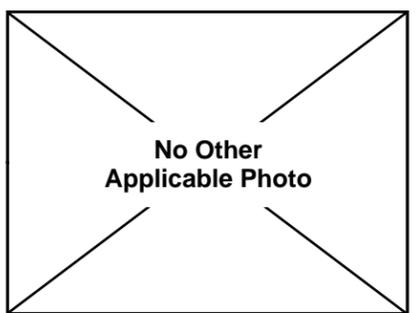
Appendix F
Channel Maintenance Prioritization Summary Sheet



Legend

- Photo Location
- Channel Survey
- City Storm Drain Structure
- City Storm Drain

Photos:



Assessment Results

- **Channel Prioritization Score:**
71.8 out of 100
 - **Flood Hazard Score:**
63.8 out of 75
 - **Water Quality Score:**
3 out of 10
 - **Community Input Score:**
5 out of 10
 - **Aesthetics Score:**
0 out of 5
- **Capacity Prior to Maintenance:**
10- to 25-year storm event
- **Capacity After Maintenance (As-built Capacity) :**
50- to 100-year storm event
- **Clogging Potential:** *HIGH*
- **Approximate Vegetation Coverage:** *HIGH*
- **Surrounding Area:** *Residential*
- **Infrastructure Failures:**
NONE
- **Site Evaluation Date:**
May 5, 2015
- **Notes/Comments:**
A high risk of vegetation flowing downstream and clogging the culvert exists. It was noted on the O&M Channel Maintenance Inspection Form completed for the channel by the City of San Diego that there is broken gunite near the foot bridge to the park.

Appendix G
Available As-built plans

No Available As-built Plans

Appendix H
Compact Disc
PDF Version of Full Report