
**10th Street Wash
Alice Ave to ACDC**

**Request for
Conditional Letter of Map Revision**

Prepared for:

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
&
CITY OF PHOENIX**

(IGA 2005A001)

Prepared by:

J2 Engineering and Environmental Design
4649 E. Cotton Gin Loop, Suite B2
Phoenix, AZ 85040
(602) 438-2221

July 2006
J2 Project No 05.0089

**10TH STREET WASH
CONDITIONAL LETTER OF MAP REVISION**

TABLE OF CONTENTS

1	INTRODUCTION.....	1
	OVERVIEW.....	1
	PROJECT AREA.....	1
	PREVIOUS STUDIES.....	4
	BACKGROUND DATA.....	5
	METHODS OF ANALYSIS.....	5
2	FEMA FORMS.....	6
	FEMA MT-2 FORM 1 – OVERVIEW AND CONCURRENCE FORM.....	6
	FEMA MT-2 FORM 2 – RIVERINE HYDROLOGY AND HYDRAULICS FORM.....	10
	FEMA MT-2 FORM 3 – RIVERINE STRUCTURES FORM.....	17
3	MAPPING AND SURVEY INFORMATION.....	21
4	HYDROLOGY.....	22
5	HYDRAULICS.....	23
6	EROSION AND SEDIMENT TRANSPORT.....	25
7	DRAFT FIS REPORT DATA.....	26

List of Figures

FIGURE 1 - PROJECT LOCATION MAP.....	2
FIGURE 2 – 10 TH STREET WASH FLOODPLAIN.....	3
FIGURE 3. NEWSPAPER NOTIFICATION OF FLOODWAY REVISION.....	16



Appendices

Appendix A: Reference Materials

- Annotated Work Map
- Annotated Flood Insurance Rate Maps 04013C1660H, 04013C1665J, and 04013C1670G
- Annotated Flood Profile 336P from Maricopa County FIS
- Annotated Floodway Data Table

Appendix B: Correspondence

Appendix C: Survey Field Notes

Appendix D: Hydrology and Supporting Documentation

- Drainage Area Map Showing 10th Street Wash and ACDC Watersheds

Appendix E: Hydraulics and Supporting Documentation

Appendix E1: Roughness Coefficient Estimation

Appendix E2: Cross Section Plots

Appendix E3: Expansion and Contraction Coefficients

Appendix E4: Analysis of Structures

Appendix E5: Hydraulics Calculations

Appendix F: Erosion / Sediment Transport Analysis

1 INTRODUCTION

Overview

J2 Engineering and Environmental Design, LLC (J2) was contracted by the Maricopa County Flood Control District and the City of Phoenix to design and analyze a closed conduit storm drain system for 10th Street Wash from Alice Avenue to the Arizona Canal Diversion Channel (ACDC). The project scope includes development of construction documents and specifications and preparation of a Conditional Letter of Map Revision (CLOMR).

The project is located in Section 33, Township 3 North, Range 3 East of the Gila and Salt River Base and Meridian in the City of Phoenix (Figure 1). More specifically, this project is bounded on the north by Alice Avenue, on the east by 12th Street, on the south by the ACDC, and on the west by 7th Street. The project alignment is from south to north along 10th Street. The beginning of the Project is the inside north wall of the ACDC, and the end of the project is at the south side of Alice Avenue.

Currently, 10th Street Wash flows through an unlined channel with a relatively steep longitudinal slope. The wash has steep, unprotected, and unstable side slopes between Alice Avenue and the ACDC. The area surrounding the 10th Street Wash between Alice Avenue and the ACDC (Figure 1) is fully developed residential properties. The proposed project is located within existing street right-of-way. The effective floodplain affects approximately 82 residential and commercial properties (Figure 2).

This project will replace the existing open channel with closed conduits and the floodplain will be contained within the storm drain.

Project Area

This project is located in Section 33, Township 3 North, Range 3 East of the Gila and Salt River Base and Meridian in the City of Phoenix (Figure 1). More specifically, this project is bounded on the north by Alice Avenue, on the east by 12th Street, on the south by the ACDC, and on the west by 7th Street. The project alignment runs from south to north along 10th Street. The beginning of the project is the inside north wall of the ACDC, and the end of the project is at the south side of Alice Avenue.

Storm water runoff contributes to this reach of 10th Street Wash primarily from the north and east. The proposed project begins at the ACDC and extends north to Alice Avenue. Storm water on the west side of 10th Street flows west/south on local streets, so this runoff will not enter the 10th Street wash. This runoff will enter the ACDC west of the subject project.



Figure 1 - Project Location Map

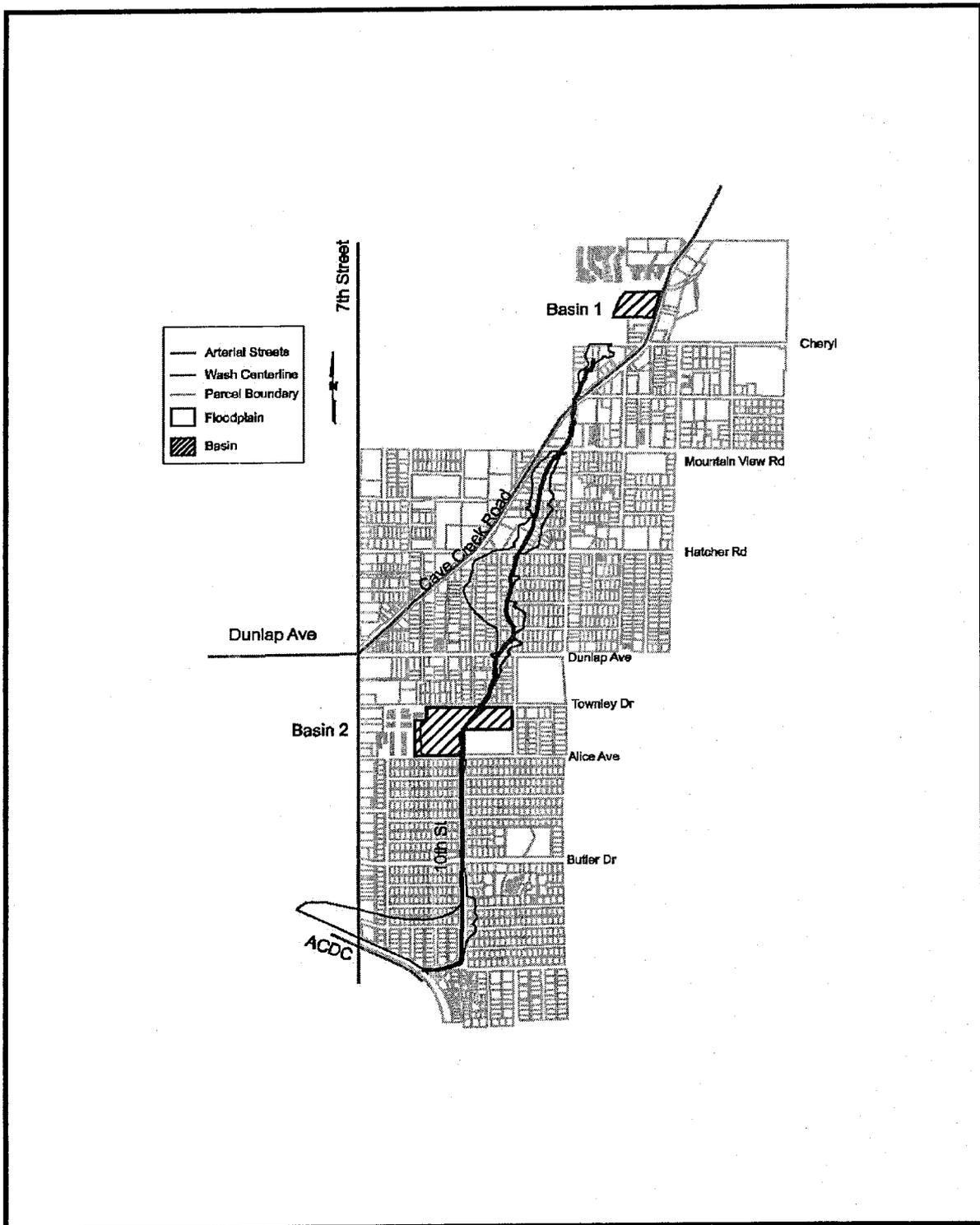


Figure 2 - 10th Street Wash Floodplain

Previous Studies

The Flood Control District of Maricopa County (District) began looking at improvements along 10th Street Wash as part of Phase 1 of the ACDC Area Drainage Master Study (ADMS). This study was prepared by Kaminski Hubbard Engineering, Inc in 1994. At that time, the FEMA floodplain for 10th Street Wash included approximately 575 residential and commercial properties. Following the ADMS, the District and the City of Phoenix partnered to bring a partial solution to the area flooding that significantly reduced the existing floodplain.

The solution included construction of two detention basins along the wash to attenuate flows followed by construction of channel/storm drain improvements where feasible. The 10th Street Wash improvements were separated into three phases: Phase 1 (10th Street Wash Detention Basin No. 1) - constructed on the west side of Cave Creek Road approximately one-quarter mile north of Cheryl Drive; Phase 2 (10th Street Wash Detention Basin No. 2) - constructed between Townley Drive and Alice Avenue; and Phase 3 (channel/storm drain improvements from Alice Avenue to the ACDC). Figure 2 shows the current floodplain delineation after the construction of 10th Street Wash Detention Basins No. 1 and 2. A LOMR request (FEMA Case number 97-09-1212P) was submitted for a change in floodplain delineation as part of the construction of the 10th Street Wash Detention Basins 1 and 2, prepared by West Consultants (June 1997).

In 1995, Daniel, Mann, Johnson, & Mendenhall (DMJM) completed a feasibility study for improvements of 10th Street Wash. The study concluded that improvements between Cheryl Drive and Townley Drive would not be feasible because of insufficient rights-of-way and the adverse impact of having to acquire/condemn property (displacing many of the property owners located in the floodplain). Improvements to the southern portion of 10th Street Wash (between Alice Avenue and the ACDC) were determined to be feasible. During the feasibility study, the District and the City of Phoenix worked closely with the community to develop an acceptable alternative for this reach. The study recommended a concrete lined rectangular section from Alice Avenue to Griswold Road and a concrete box culvert from Griswold Road to the ACDC. Although this alternative was developed with community input, it was ultimately rejected by the Sunnyslope Community and dropped in 1995.

The City of Phoenix re-submitted the 10th Street Wash Project to the District in 2004 to be considered as a cost share project. The submittal was prioritized and accepted by the District as a cost share project. To avoid developing a project that the Sunnyslope Community would again reject, the District proposed a closed conduit solution. The wash would be covered and flow conveyed in a storm drain below grade. The area between the divided 10th Street would include a trail and landscaping. This proposal was presented to the adjacent neighborhoods at a public meeting held on December 15, 2004. The overwhelming majority in attendance supported the storm drain alternative.

The District entered into an Intergovernmental Agreement (IGA 2005A001) with the City of Phoenix and agreed to cost-share in the design and construction of improvements.

Background Data

The project area is contained on three FIRM Map Panels contained in Section 7. As shown on the maps, the floodplain in the project area is delineated as Zone AE. As defined by FEMA, all areas within a Zone AE are subject to inundation by the 1-percent annual chance flood event. Base flood elevations are shown within these zones.

Methods of Analysis

Hydrology - As part of the construction of the 10th Street Wash Detention Basins 1 and 2, a LOMR for the change in floodplain delineation was prepared by West Consultants (June 1997) (FEMA Case number 97-09-1212P). The hydrology that was part of this LOMR request was used for this study without modification. Since this hydrology has been reviewed and approved by FEMA, no new hydrologic data is required for this CLOMR.

Hydraulics - West Consultants prepared a HEC-RAS model for the project area as part of the construction of the 10th Street Wash Detention Basins 1 and 2. The floodplain delineation has been reviewed and approved by FEMA. Since this project contains the open channel within two closed conduits, the hydraulic analysis was completed using Haestad Method's *StormCAD* modeling package.

2 FEMA FORMS

Form 1 – Overview & Concurrence Form provides the basic information regarding the revision request and requires the signatures of the requester, community official, and engineer. This form is required for all revision requests.

Form 2 – Riverine Hydrology & Hydraulics Form provides the basic information on the scope and methodology of hydrologic and/or hydraulic analyses that are prepared in support of the revision request. This form should be used for revision requests that involve new or revised hydrologic and/or hydraulic analyses of rivers, streams, ponds, or small lakes.

Form 3 – Riverine Structures Form provides the basic information regarding hydraulic structures constructed in the stream channel or floodplain. This form should be used for revision requests that involve new or proposed channelization, bridges/culverts, dams, and/or levees or floodwalls.

FEMA MT-2 Form 1 – Overview and Concurrence Form

The attached “Overview & Concurrence Form” is provided per FEMA requirements for CLOMR submittals. The basis for this revision request is physical change, specifically, containment in a *closed conduit storm drain*.

Note: Additional info or supplemental clarification to better answer form questions are provided after the FEMA Forms.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? Yes . Fee amount: \$4000
 No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/fhm/fhm_fees.shtm for Fee Amounts and Exemptions.

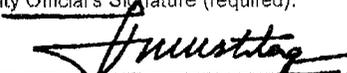
D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Hasan Mushtaq	Company: City of Phoenix, Arizona	
Mailing Address: 200 W. Washington Street, 5 th Floor Phoenix, AZ 85003-1611	Daytime Telephone No.: (602)262-4026	Fax No.: (602)262-7322
	E-Mail Address: hasan.mushtaq@phoenix.gov	

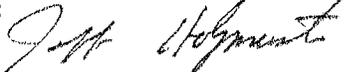
Signature of Requester (required): 	Date: 8/7/06
---	-----------------

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Hasan Mushtaq, Floodplain Manager, Street Transportation Department		Telephone No.: (602) 262-4026
Community Name: City of Phoenix	Community Official's Signature (required): 	Date: 8/7/06

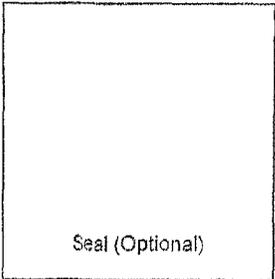
CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Jeff Holzmeister	License No.: 23170	Expiration Date: 3/31/2009
Company Name: J2 Engineering and Environmental Design, LLC	Telephone No.: (602)-438-2221	Fax No.: (602)-438-2225
Signature: 	Date: 8/4/06	

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
<input checked="" type="checkbox"/> Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
<input checked="" type="checkbox"/> Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
<input type="checkbox"/> Coastal Analysis Form (Form 4)	New or revised coastal elevations
<input type="checkbox"/> Coastal Structures Form (Form 5)	Addition/revision of coastal structure
<input type="checkbox"/> Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans



SUPPLEMENTAL INFO TO SECTION B. OVERVIEW

The existing 10th Street Wash between Alice Avenue and the ACDC is an open channel that does not have sufficient conveyance for the 100-year event. The existing open channel will be converted to a closed conduit system with a 100-year capacity between Alice Avenue and the ACDC.

FEMA MT-2 Form 2 – Riverine Hydrology and Hydraulics Form

The attached “Riverine Hydrology and Hydraulics Form” is provided per FEMA requirements for submittals.

Note: Additional info or supplemental clarification to better answer form questions are provided after the FEMA Form 81-89A, FEB06.

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, U.S. Department of Homeland Security, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: 10th Street Wash
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

- Not revised (skip to section 2)
 No existing analysis
 Improved data
 Alternative methodology
 Proposed Conditions (CLOMR)
 Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	FIS (cfs)	Revised (cfs)
----------	-------------------------	-----------	---------------

3. Methodology for New Hydrologic Analysis (check all that apply)

- Statistical Analysis of Gage Records
 Precipitation/Runoff Model [TR-20, HEC-1, HEC-HMS etc.]
 Regional Regression Equations
 Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by DHS-FEMA. This document can be found at: http://www.fema.gov/fhm/en_modi.shtm.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transport considered?
 Yes
 No
 If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.)	
			Effective	Proposed/Revised
Downstream Limit	Confluence with ACDC	0	1220.7	1220.7
Upstream Limit	10 th Street Wash at Alice Ave.	0.57	1257.87	1254.53

2. Hydraulic Method Used

Hydraulic Analysis: StormCAD [HEC-2, HEC-RAS, Other (Attach description)]

SUPPLEMENTAL INFO TO SECTION A. HYDROLOGY

A.1. Reason for New Hydrologic Analysis: *Hydrology not revised:*

The basis of the hydrology is the LOMR request for a change in floodplain delineation as part of the construction of the 10th Street Wash Detention Basins 1 and 2, prepared by West Consultants (June 1997). The hydrology that was part of this LOMR request was used for this study without modification. Since this hydrology has been reviewed and approved by FEMA, no new hydrologic study is required for this CLOMR.

During the 100-year storm event, there are inflows into 10th Street Wash at Alice Avenue from the following sources: 430 cfs from 10th Street Wash upstream of Alice Avenue through a double-barrel 6' x 4' RCBC, 155 cfs from Detention Basin No. 2 through a 48-inch RCP, and 255 cfs from overland flows down a spillway at Alice Avenue for a total of 840 cfs. These flows will be collected by the inlet structure at Alice Avenue. The 100-year design discharge for the storm drain at Alice Avenue is 840 cfs.

Team members identified 24 existing inlet locations for the 10th Street Wash between Alice Avenue and the ACDC. The existing inlets are located on the east side of 10th Street Wash primarily at street and alley intersections. The proposed inlets are at the same locations as the existing curb opening/scupper locations. During the 100-year storm event, 253 cfs enters the storm drain system through these inlets and 192 cfs enters through a 60-inch storm drain at El Caminito Drive. Therefore, the storm drain conveys a maximum of 1285 cfs into the ACDC (840 + 253 + 192).

Note that the existing hydrology study referenced above used the 10th Street Wash as its westernmost drainage basin boundary. The area west of 10th Street Wash drains generally towards the south-southwest, away from 10th Street Wash itself. Specifically, runoff from individual lots is carried towards the west in east-west oriented streets. Once it reaches north-south oriented streets, it flows towards the south, where it spills directly into the ACDC through spillways designed for that purpose. Therefore the area west of 10th Street Wash makes no contribution to the flows in the proposed 10th Street Wash storm drain.

SUPPLEMENTAL INFO FOR SECTION B. HYDRAULICS

B.1 Reach to be Revised: Water Surface Elevations under Effective and Proposed Conditions:

The existing open channel does not provide conveyance for the 100-year event. The existing open channel will be converted to a closed conduit system with a 100-year capacity.

The 10th Street Wash drainage area is considerably smaller than the drainage area for the ACDC at the proposed 10th Street Wash storm drain outfall point into the ACDC. Therefore non-coincidental flow condition is assumed. See the Drainage Area Map in

Appendix D for an illustration of the relative drainage areas. When the peak flow in the 10th Street Wash storm drain occurs, it is assumed that there will be no flow in the ACDC. As such, the hydraulic model for the proposed 10th Street Wash storm drain was started using normal depth.

The water surface elevation in the ACDC will not be altered by this project. The water surface elevation at Alice Avenue will decrease from the open channel water surface of 1257.87 ft to a hydraulic grade line elevation of 1253.90 ft within the storm drain.

As discussed above in the Hydrology section, the 24 inlets need to collect a total of 253 cfs of flow as it approaches 10th Street from the east in the area south of Alice Avenue and north of the ACDC. The inlets are generally located across from side streets and alleys, where the majority of the offsite flow will come from. Calculations were performed to verify that the inlets have the capacity to capture this flow. These calculations are included in Appendix E5.

The inlet capacity calculations use the orifice equation to determine the flow into each curb opening at an assumed flow depth of 6 inches at each inlet. This corresponds to a gutter flow depth of 4 inches due to the 2 inch local inlet depression. The results of the calculations show that with the 4 inch gutter flow depth, the inlets collectively have the capacity to capture 256 cfs, which is more than the 253 cfs of flow that reaches them in the 100-year event. The calculations used a clogging factor of 20 percent for the curb opening inlets (80 percent open).

The inlet system has considerable redundancy built in to it. The above paragraph describes how a gutter flow depth of less than 4 inches is necessary to collect all of the 253 cfs of flow. The street cross section is capable of carrying 8 inches of gutter flow depth before flow overtops the west curb. If flow does overtop the west curb, it will pass into the median swale, where it will be collected in several grates that are located on top of the proposed storm drain junction structures. Note that in addition to this, the swale itself has conveyance capacity, and can carry excess flows to the south, where they would discharge directly into the ACDC.

The inlet and storm drain system have considerably more capacity than necessary to capture and convey the 100-year runoff to the ACDC, at flow depths much less than one foot. Therefore the effective 100-year floodplain along the 10th Street Wash will be completely eliminated by the proposed project.

B.2 Hydraulic Method Used

Haestad Methods *StormCAD* v5.5 was used to model the hydraulic grade line within the closed conduit.

B.3 Pre-Submittal Review of Hydraulic Models

Neither HEC-2 nor HEC-RAS was used for the hydraulic analysis, so this is not applicable.

B.4 Models Submitted

Existing or Pre-Project Conditions Model: The output from the HEC-RAS existing conditions model is attached in Appendix E5.

Other: StormCAD model output for the project storm drain system is attached in Appendix E5. The StormCAD model is also included on the enclosed CD in Appendix E5. The 100-year hydraulic grade line is also shown on the construction plans attached in the Exhibit Maps section at the end of the report.

SUPPLEMENTAL INFO FOR SECTION C. MAPPING REQUIREMENTS

The effective floodplain is shown on the FIRMs attached in Section 7.

With the installation of the proposed storm drain system, the project area bounded on the north by Alice Avenue, on the east by 12th Street, on the south by the ACDC, and on the west by 7th Street will be removed from the effective FEMA floodplain. The 1 percent chance annual flood will be contained within the storm drain.

SUPPLEMENTAL INFO FOR SECTION D. COMMON REGULATORY REQUIREMENTS

D.1 For CLOMR requests, do Base Flood Elevations (BFEs) increase? *No*

Base Flood Elevations will no longer be applicable due to the installation of the storm drain.

D.3 For CLOMR requests, is the regulatory floodway being revised? *Yes*

A copy of the newspaper notification of floodway revision is attached on the following page.

Reference/PO #
02

6300004400

Arizona Business Gazette

The business resource

PO BOX 194
Phoenix, Arizona 85001-0194
(602) 444-7315 FAX (602) 444-7364

The City of Phoenix and the Flood Control District of Maricopa County, under the authority of the National Flood Insurance Act of 1968 (P.L. 90-448), as amended and the Flood Protection Act of 1973 (P.L. 93-234) has contracted with J2 Engineering and Environmental Design, to restudy the floodplain of the 10th Street Wash. The study boundary extends from south of Alice Avenue to the Arizona Canal Diversion Channel (ACDC) along 10th Street. The restudy is warranted due to a storm drain construction project between the limits of the study area. The current FEMA flood hazard zones within the area are based on a floodplain study that was conducted in June 1997. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during the 100-year storm event. The study and the resulting mapping will be used for floodplain management purposes and submitted to the Federal Emergency Management Agency (FEMA) for flood insurance information and revision of Flood Insurance Rate Maps (FIRM's). This announcement is intended to inform all interested persons to bring any relevant technical information to the attention of the City of Phoenix staff at 602-262-4960. Your comments may also be addressed to, Mr. Hasan Mushtaq, Ph.D., P.E., CFM, Floodplain Manager, City Of Phoenix, 200 West Washington Street, 5th Floor, Phoenix, Arizona 85003-1611 phone number 602-262-4960, Fax number 602-262-7322. Published: June 22, 2006

STATE OF ARIZONA }
COUNTY OF MARICOPA } SS.

Ondrea Sheppard, being first duly sworn, upon oath deposes and says: That she is the marketing/advertising lead of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published weekly at Phoenix, Arizona, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates indicated.

6/22/2006

Ondrea Sheppard

Sworn to before me this
22ND day of
JUNE 2006



Marilyn Greenwood
Notary Public

Arizona Business Gazette

The business resource

PO BOX 194
Phoenix, Arizona 85001-0194
(602) 271-7300

The City of Phoenix and the Flood Control District of Maricopa County, under the authority of the National Flood Insurance Act of 1968 (P.L. 90-448), as amended and the Flood Protection Act of 1973 (P.L. 93-234), has contracted with J2 Engineering and Environmental Design, to restudy the floodplain of the 10th Street Wash. The study boundary extends from south of Alice Avenue to the Arizona Canal Diversion Channel (ACDC) along 10th Street. The restudy is warranted due to a storm drain construction project between the limits of the study area. The current FEMA flood hazard zones within the area are based on a floodplain study that was conducted in June 1997. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during the 100-year storm event. The study and the resulting mapping will be used for floodplain management purposes and submitted to the Federal Emergency Management Agency (FEMA) for flood insurance information and revision of Flood Insurance Rate Maps (FIRM'S). This announcement is intended to inform all interested persons to bring any relevant technical information to the attention of the City of Phoenix staff at 602-262-4960. Your comments may also be addressed to, Mr. Hasan Mushtaq, Ph.D., P.E., CFM, Floodplain Manager, City of Phoenix, 200 West Washington Street, 5th Floor, Phoenix, Arizona 85003-1611, phone number 602-262-4960, Fax number 602-262-7322. Published: June 22, 2006

STATE OF ARIZONA }
COUNTY OF MARICOPA } SS.

Kelly Howard, being first duly sworn, upon oath deposes and says: That he is a legal advertising representative of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published weekly at Phoenix, Arizona, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates indicated.

6/22/2006

Kelly Howard

Sworn to before me this
28TH day of
JUNE A.D. 2006



Marilyn Greenwood
Notary Public

FEMA MT-2 Form 3 – Riverine Structures Form

The attached “Riverine Structures Form” is provided per FEMA requirements for submittals. This project consists of replacing a 100-yr surface channel with a storm drain, and as such, the “Riverine Structures Form” was modified to best fit this project. Only pages 1 and 2 of 10 are included (pages 3-10 do not apply).

Note: Additional info or supplemental clarification to better answer form questions are provided after the FEMA Form 81-89B, FEB06.



B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- Levees [Attach Section E (Levee/Floodwall)]
Superelevated sections
Debris basin/detention basin
Other (Describe):
Drop structures
Transitions in cross sectional geometry
Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

- Subcritical flow
Critical flow
Supercritical flow
Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

- Inlet to channel
Outlet of channel
At Drop Structures
At Transitions
Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? Yes No If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT STORM DRAIN

Flooding Source: 10th Street Wash

Name of Structure: 10th Street Storm Drain, Alice Ave to ACDC

1. This revision reflects (check one):

- New bridge/culvert not modeled in the FIS (new storm drain)
Modified bridge/culvert previously modeled in the FIS
New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): StormCAD
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- Dimensions (height, width, span, radius, length)
Shape (culverts only)
Material
Beveling or Rounding
Wing Wall Angle
Skew Angle
Distances Between Cross Sections
Erosion Protection
Low Chord Elevations - Upstream and Downstream
Top of Road Elevations - Upstream and Downstream
Structure Invert Elevations - Upstream and Downstream
Stream Invert Elevations - Upstream and Downstream
Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? Yes No If yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why sediment transport was not considered.

SUPPLMENTAL INFO TO SECTION A. GENERAL

This project involves installation of a storm drain. Since this type of structure is not listed on the form, Section C for Bridges and Culverts was modified as necessary.

SUPPLEMENTAL INFO TO SECTION C. Bridge/Culvert

C.2 Hydraulic model used to analyze the structure

Since the structure will be a closed storm drain system, Haestad Methods *StormCAD* v5.5 was used to analyze the hydraulic grade line within the system.

C.3 Plans for the storm drain system are attached in the Exhibit Maps section at the end of this report.

C.4 Was sediment transport considered? *No.*

Sediment transport was not considered because the system will no longer function as an open channel.

3 MAPPING AND SURVEY INFORMATION

No additional mapping or survey information was provided for this project.



4 HYDROLOGY

The basis of the hydrology is the LOMR request for a change in floodplain delineation as part of the construction of the 10th Street Wash Detention Basins 1 and 2, prepared by West Consultants (June 1997). The hydrology that was part of this LOMR request was used for this study without modification. Since this hydrology has been reviewed and approved by FEMA, no new hydrologic study is required for this CLOMR.

During the 100-year storm event, there are inflows into 10th Street Wash at Alice Avenue from the following sources: 430 cfs from 10th Street Wash upstream of Alice Avenue through a double-barrel 6' x 4' RCBC, 155 cfs from Detention Basin No. 2 through a 48-inch RCP, and 255 cfs from overland flows down a spillway at Alice Avenue for a total of 840 cfs. These flows will be collected by the inlet structure at Alice Avenue. The 100-year design discharge for the storm drain at Alice Avenue is 840 cfs.

Team members identified 24 existing inlet locations for the 10th Street Wash between Alice Avenue and the ACDC. The existing inlets are located on the east side of 10th Street Wash primarily at street and alley intersections. The proposed inlets are at the same locations as the existing curb opening/scupper locations. During the 100-year storm event, 253 cfs enters the storm drain system through these inlets and 192 cfs enters through a 60-inch storm drain at El Caminito Drive. Therefore, the storm drain conveys a maximum of 1285 cfs into the ACDC (840 + 253 + 192).

Note that the existing hydrology study referenced above used the 10th Street Wash as its westernmost drainage basin boundary. The area west of 10th Street Wash drains generally towards the south-southwest, away from 10th Street Wash itself. Specifically, runoff from individual lots is carried towards the west in east-west oriented streets. Once it reaches north-south oriented streets, it flows towards the south, where it spills directly into the ACDC through spillways designed for that purpose. Therefore the area west of 10th Street Wash makes no contribution to the flows in the proposed 10th Street Wash storm drain.



5 HYDRAULICS

5.1 Method Description

The existing open channel known as 10th Street Wash does not provide conveyance for the 100-year event. The existing open channel will be converted to a closed conduit system with a 100-year capacity.

The 10th Street Wash drainage area is considerably smaller than the drainage area for the ACDC at the proposed 10th Street Wash storm drain outfall point into the ACDC. Therefore non-coincidental flow condition is assumed. See the Drainage Area Map in Appendix D for an illustration of the relative drainage areas. When the peak flow in the 10th Street Wash storm drain occurs, it is assumed that there will be no flow in the ACDC. As such, the hydraulic model for the proposed 10th Street Wash storm drain was started using normal depth.

The water surface elevation in the ACDC will not be altered by this project. The water surface elevation in the 10th Street Wash at Alice Avenue will decrease from the open channel water surface of 1257.87 ft to a hydraulic grade line elevation of 1253.90 ft within the storm drain.

As discussed above in the Hydrology section, the 24 inlets need to collect a total of 253 cfs of flow as it approaches 10th Street from the east in the area south of Alice Avenue and north of the ACDC. The inlets are generally located across from side streets and alleys, where the majority of the offsite flow will come from. Calculations were performed to verify that the inlets have the capacity to capture this flow. These calculations are included in Appendix E5.

The inlet capacity calculations use the orifice equation to determine the flow into each curb opening at an assumed flow depth of 6 inches at each inlet. This corresponds to a gutter flow depth of 4 inches due to the 2 inch local inlet depression. The results of the calculations show that with the 4 inch flow gutter flow depth, the inlets collectively have the capacity to capture 256 cfs, which is more than the 253 cfs of flow that reaches them in the 100-year event. The calculations used a clogging factor of 20 percent for the curb opening inlets (80 percent open).

Additionally, the inlet capacity of the inlet structure to be constructed at Alice Avenue is estimated. The proposed structure contains a grated inlet that is elevated about 1 ft above the low flow elevation. The structure also contains several openings located below the grate at the low flow elevation. The structure detail sheet (sheet S7) is provided in Appendix E5. Using a 50 percent clogging factor on the grate and a 20% clogging factor on the low flow openings in the wall, the amount of flow passing into the structure is estimated. Three flow equations are used. To estimate the flow through the grate, an orifice flow and a weir flow equation is used. The amount of flow passing the grate is denoted in the grate flow column. The low flow openings are evaluated using the orifice

flow equation for curb openings. The grate flow is added to the curb opening orifice flow and reported in the “total Q into inlet structure” column.

The inlet system has considerable redundancy built in to it. The above paragraph describes how a gutter flow depth of less than 4 inches is necessary to collect all of the 253 cfs of flow. The street cross section is capable of carrying 8 inches of gutter flow depth before flow can overtop the low spot, which is the west curb. If flow does overtop the west curb, it will pass into the median swale, where it will be collected in several grates that are located on top of the proposed storm drain junction structures. Note that in addition to this, the swale itself has conveyance capacity, and can carry excess flows to the south, where they would discharge directly into the ACDC.

The inlet and storm drain system have considerably more capacity than necessary to capture and convey the 100-year runoff to the ACDC, at flow depths much less than one foot. Therefore the effective 100-year floodplain along the 10th Street Wash will be completely eliminated by the proposed project.

The existing condition 10th Street Wash floodplain is modeled using HEC-RAS v3.13. HEC-RAS output is provided in Appendix E5.

The proposed storm drain was modeled using StormCAD v5.5.

Digital copies of both the existing condition HEC-RAS model and the proposed condition StormCAD model are located in Appendix E5.

5.2 Work Study Maps

See Exhibit Maps at the end of this report for a hydraulic work map.

6 EROSION AND SEDIMENT TRANSPORT

No erosion and / or sediment transport was determined as part of this project.

7 DRAFT FIS REPORT DATA

7.1 Summary of Discharges

No modification is proposed for the Summary of Discharges table.

7.2 Floodway Data

See the Annotated Floodway Data Table on the following page.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Tenth Street Wash								
A	0.16	623	581	5.3	1,241.0	1,241.0	1,241.0	0.0
B	0.41	33	122	6.9	1,248.1	1,248.1	1,248.1	0.0
C	0.57	79	120	7.0	1,257.9	1,257.9	1,257.9	0.0
D	0.79	33	47	7.3	1,270.2	1,270.2	1,270.2	0.0
E	0.93	519	111	3.1	1,277.6	1,277.6	1,277.6	0.0
F	1.18	308	387	4.9	1,289.5	1,289.5	1,289.5	0.0
G	1.35	193	228	5.2	1,296.5	1,296.5	1,296.5	0.0
H	1.55	25	105	5.7	1,306.0	1,306.0	1,306.0	0.0

¹Miles Above Mouth

T A B L E 5	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	MARICOPA COUNTY, AZ AND INCORPORATED AREAS	TENTH STREET WASH

7.3 Annotated Flood Insurance Rate Maps

See the Annotated Flood Insurance Rate Maps 04013C1660H, 04013C1665J, and 04013C1670G on the following page.

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updates or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **Floodway Data** and/or **Summary of Stillwater Elevations** tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0'. National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **Floodways** were computed at cross sections and interpreted between cross sections. The floodways were based on hydraulic considerations, with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Area may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was **Arizona State Plane Zone 3176** (central Arizona). The horizontal datum was **NAD83, GRS80 spheroid**. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **National Geodetic Vertical Datum of 1929**. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1215 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at <http://www.ngs.noaa.gov>

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:5000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

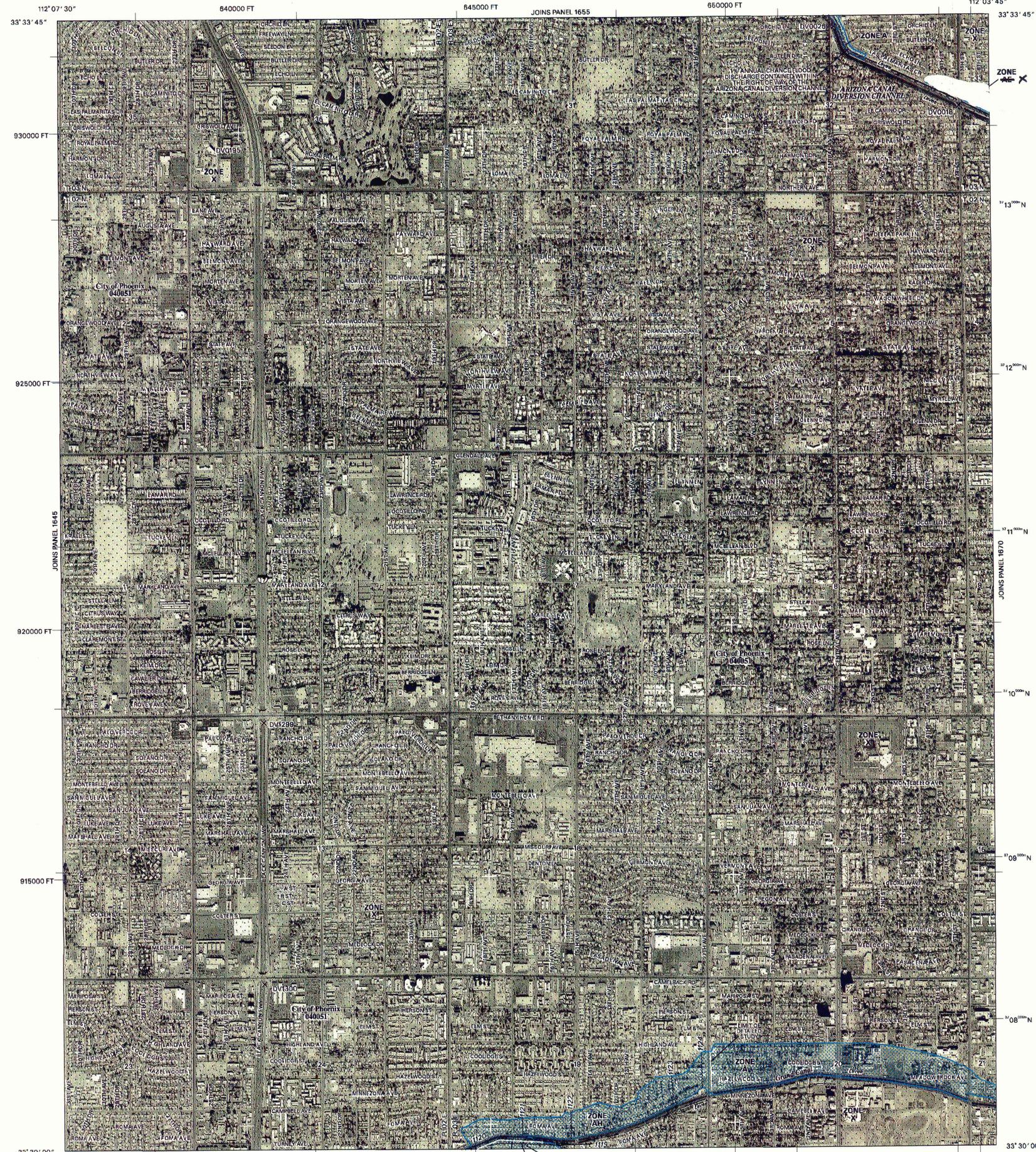
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at <http://www.fema.gov>.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMAMAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov>.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood) also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE AE No Base Flood Elevations determined.

ZONE AH Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AR Flood depths of 1 to 3 feet (usually shear flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE A99 Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently determined. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE V Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The Floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flow velocities.
- Base Flood Elevation line and value, above or in foot
- Base Flood Elevation on value where uniform within zone; elevation in feet

* Referenced to the National Geodetic Vertical Datum of 1929

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
April 16, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 4, 1991, December 3, 1993, September 30, 1995, July 19, 2001

September 30, 2005 - to update corporate limits; to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-358-9620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1665J

FIRM FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

PANEL 1665 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
PHOENIX, CITY OF	04001	1665	J

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

MAP NUMBER
04013C1665J

MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **Floodways** have been determined, users are encouraged to consult the **Flood Profiles, Floodway Data and/or Summary of Stillwater Elevations** tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was **Arizona State Plane Zone 3176 (central Arizona)**. The horizontal datum was **NAD83, GRS80 spheroid**. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **National Geodetic Vertical Datum of 1929**. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NGA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov>

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:5000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the **Flood Profiles and Floodway Data** tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

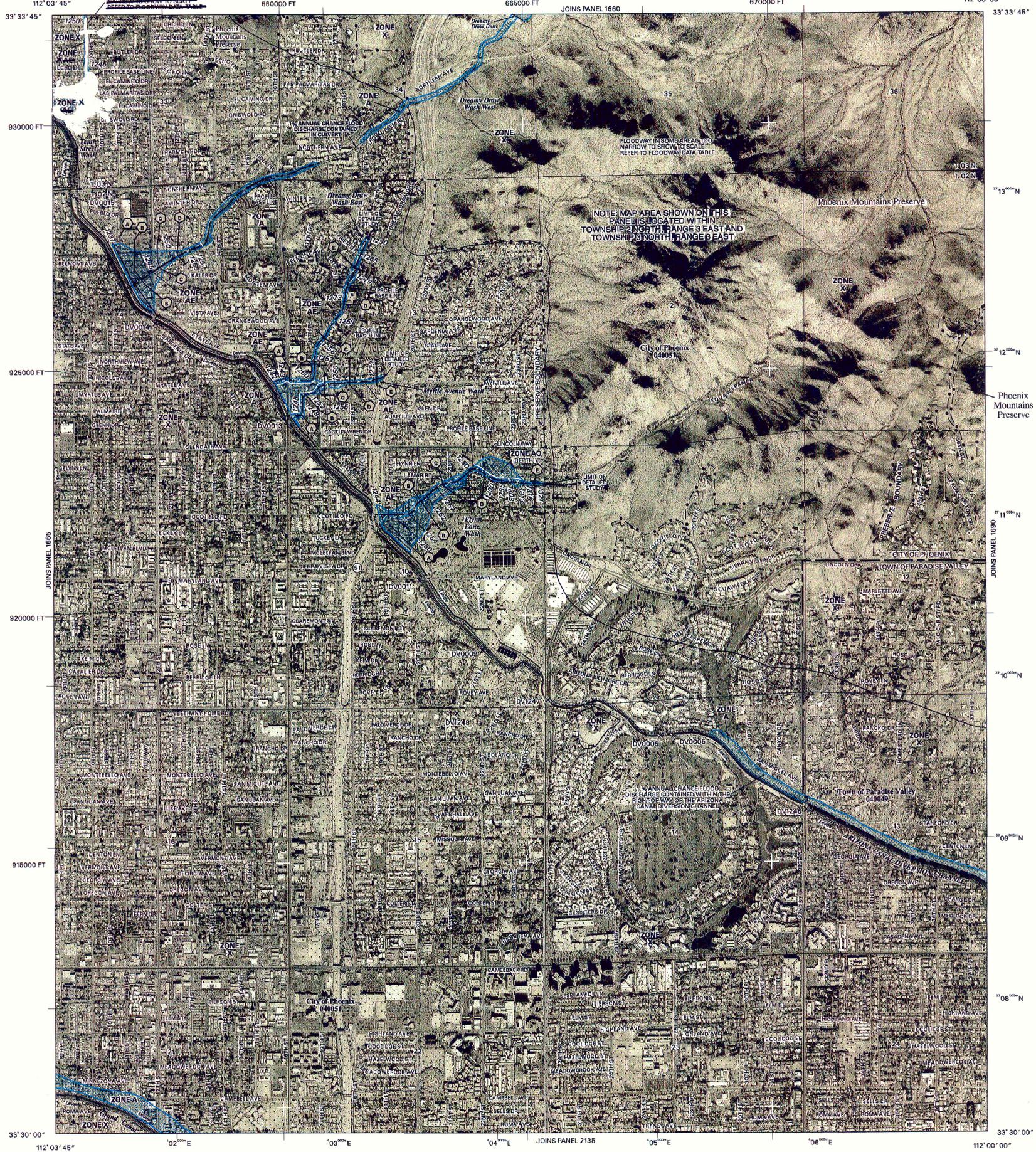
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-6616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at <http://www.fema.gov>

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMAMAP (1 877 336 2627) or visit the FEMA website at <http://www.fema.gov>

THE 1% ANNUAL CHANCE FLOOD WILL BE CONTAINED IN THE PROPOSED STORM DRAIN ALONG 10TH ST.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zone A, AE, AH, AO, AR, A99, and VE. The Base Flood Elevation is the vertical-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 2 feet (usually areas of ponding). Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of elevated fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently demolished. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater.

ZONE A99 Areas to be protected from the 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachments so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE XA Areas determined to be outside the 0.2% annual chance floodplain.

ZONE XD Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary defining Special Flood Hazard Areas, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
Base Flood Elevation line and value, shown in feet *
Bench mark (see explanation in Notes to Users section of this FIRM panel)
River/Mile

* Referenced to the National Geodetic Vertical Datum of 1929

MAP REPOSITORY
Refer to Repertoire Listing on Map Index
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
April 16, 1988
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 30, 1996, July 16, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-658-0620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1670G

FIRM FLOOD INSURANCE RATE MAP MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1670 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PARADISE VALLEY/TOWN OF	04006	1670	G
PHOENIX, CITY OF	04051	1670	G

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

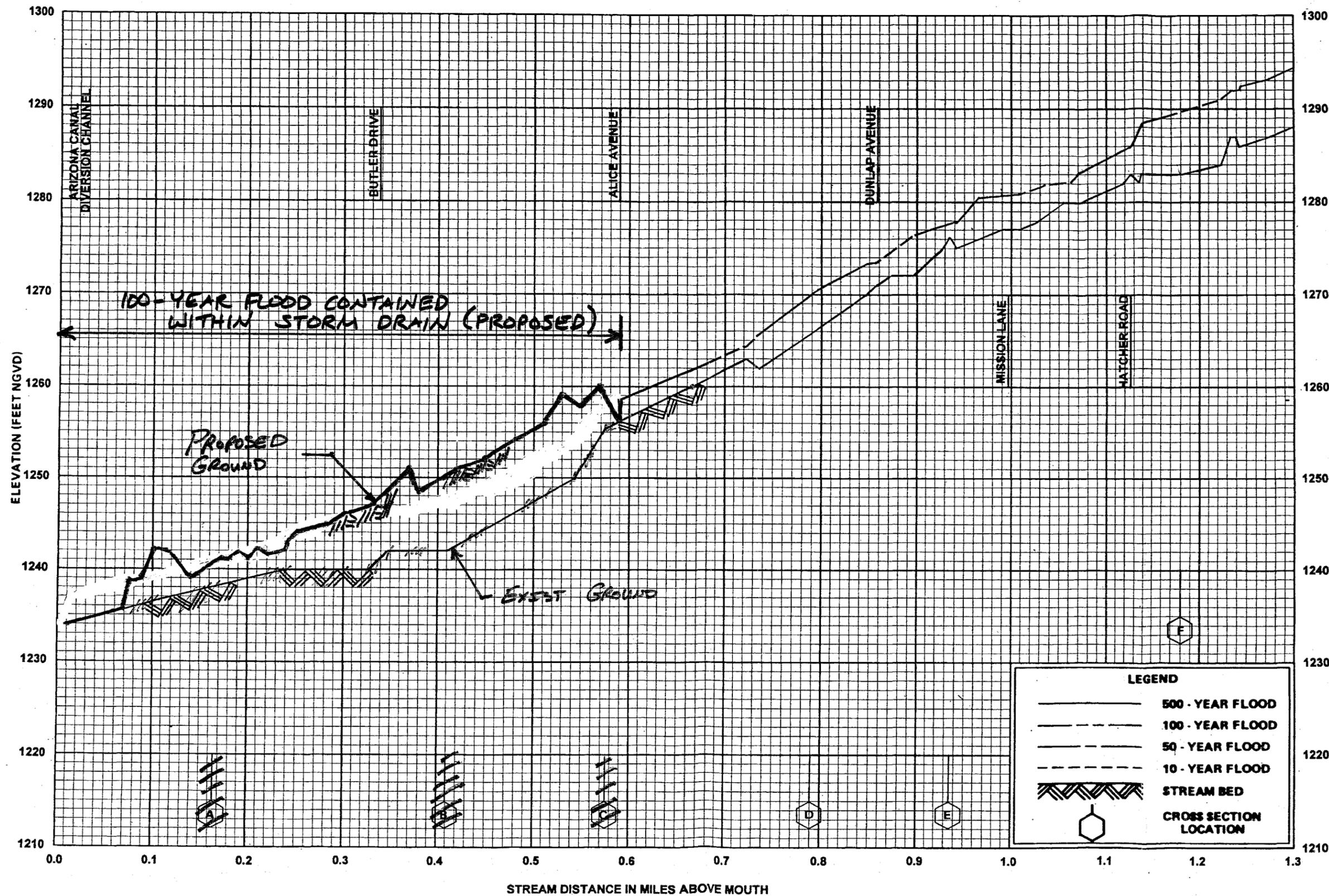
MAP NUMBER 04013C1670G

MAP REVISED SEPTEMBER 30, 2005

Federal Emergency Management Agency

7.4 Flood Profiles

See the Annotated Flood Profile 336P from Maricopa County FIS on the following page.



FLOOD PROFILES
TENTH STREET WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

Appendix A: References

REFERENCES

10th Street Wash Feasibility Study, DMJM, August 1, 1995

Drainage Design Manual, Volume II Hydraulics, Flood Control District of Maricopa County, January 1996.

FlowMaster, version 7.0, Haestad Methods, Inc., June 2003

StormCad, version 5.5, Haestad Methods, Inc., June 2003

10th Street Wash to Cave Creek Watershed, Vol 1.6., Kaminski Hubbard Engineering, Inc., November 1994

GILA RIVER BASIN, Design Memorandum No. 2, U.S. Army Corps of Engineers, Los Angeles District, 1982

HEC-RAS, River Analysis System, version 3.1.1., U.S. Army Corps of Engineers, Hydrologic Engineering Center, May 2003

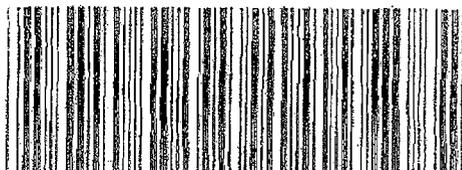
10th Street Wash Request For LOMR – Technical Data Notebook, West Consultants, Inc., June 1997.

Urban Drainage Design Manual, Hydraulic Engineering Circular No. 22, Federal Highway Administration, November 1996.

Appendix B: General Documentation and Correspondence

(copies of project correspondence are included)

CLERK OF THE BOARD
BASKET PICK UP



OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
HELEN PURCELL
2005-0916513 07/01/05 16:05
18 OF 18

REITZD

INTERGOVERNMENTAL AGREEMENT
for the
**Design, Utility Relocation, Rights-of-Way Acquisition,
Construction, Construction Management,
and Operation and Maintenance**
of the
10th Street Wash Improvement – Alice Avenue to Arizona Canal Diversion Channel (ACDC)
between the
Flood Control District of Maricopa County,
and the
City of Phoenix

FCD 2005A001

Agenda Item C-69-05-127-2-00

This Intergovernmental Agreement (IGA) is entered into by and between the Flood Control District of Maricopa County, a municipal corporation and political subdivision of the State of Arizona, acting by and through its Board of Directors hereinafter called DISTRICT; and the City of Phoenix, a municipal corporation, acting by and through its City Manager, hereinafter called the CITY.

This Agreement shall become effective as of the date it has been executed by all parties.

DATE FILED WITH MARICOPA COUNTY RECORDER

July 1, 2005

STATUTORY AUTHORIZATION

1. The DISTRICT is empowered by Arizona Revised Statutes Section 48-3603, as revised, to enter into this Agreement and has authorized the undersigned to execute this Agreement on behalf of the DISTRICT.

2. The CITY is empowered by Arizona Revised Statutes Section 11-951 and Article II, Chapter II, and Section 2 of the Phoenix City Charter to enter into this Agreement, and has authorized the undersigned to execute this Agreement on behalf of the CITY.

BACKGROUND

3. The Board of Directors (Board) for the DISTRICT adopted Resolution FCD 93-10 (CS-94-116-5) on December 8, 1993. The Resolution authorizes and directs the Chief Engineer and General Manager to negotiate IGA(s) with the CITY and other parties, as necessary, to define obligations and responsibilities for developing, cost-sharing, constructing and maintaining a project or projects to protect the residents along 10th Street Wash from flooding during a 100-yr storm event.
4. The DISTRICT and the CITY entered into an IGA FCD 94014, approved by the Board on May 17, 1995 (CS-05-116-1). This IGA authorizes the DISTRICT to cost share the design, rights-of-way acquisition, construction and operation and maintenance of two (2) basin features within the 10th Street Wash Watershed System.
5. 10th Street Wash Improvements, hereinafter called the PROJECT, begin at Alice Avenue, continues south along the 10th Street alignment, and turns west into the ACDC just south of Griswold Street. The PROJECT will be designed to convey the 100-yr storm flows. The PROJECT provides an ultimate outfall for the 10th Street Wash watershed and for the two (2) basins. The existing outfall channel has steep side slopes, is overgrown with vegetation, and is unsafe and under capacity. The limits of the PROJECT are as defined in Exhibit A: Site Map.
6. The CITY submitted the PROJECT to the DISTRICT for consideration in its Fiscal Year 2005/2006 Capital Improvement Program Prioritization Procedure Process. The PROJECT scored well and was recommended by the Flood Control Advisory Board (FCAB) for inclusion into the DISTRICT's Five-Year Capital Improvement Program.
7. A public meeting was conducted by DISTRICT and CITY staff on December 15, 2004. The citizens in attendance were in favor of completing this project.
8. The PROJECT will remove approximately eighty-four (84) properties from an existing Federal Emergency Management Agency (FEMA) designated floodplain within the PROJECT vicinity and south of Butler Drive.

PURPOSE OF THE AGREEMENT

9. The purpose of this IGA is to identify and define the responsibilities of the DISTRICT and the CITY (collectively identified as PROJECT PARTNERS), for the design, rights-of-way acquisition, utility relocations, 404-permit mitigation, construction, construction management, and operation and maintenance of the PROJECT.

TERMS OF AGREEMENT

10. The PROJECT PARTNERS shall share in the costs for design, utility relocations, rights-of-way acquisition, 404-permit mitigation, construction, and construction management, hereinafter called the total PROJECT COST, estimated to be \$3,100,000.

- 10.1. Construction management shall be assigned a value of eight percent (8%) of the actual construction cost of the PROJECT plus actual costs for materials testing and survey work associated with construction management. If construction management services are accomplished under contract, the construction management costs shall be the actual cost for the contracted construction management services plus the actual costs for materials testing and survey work.
- 10.2. The PROJECT COST shall include landscaping and aesthetic features as allowed by the DISTRICT's "Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects" (Policy). Additional landscape features and park amenities, if compatible with the PROJECT function, may be included in the PROJECT construction at the request of the CITY, and solely at the CITY's cost plus the associated construction management costs.

11. The DISTRICT shall:

- 11.1. Fund fifty percent (50%) of the PROJECT cost, estimated to be \$3,100,000, making the DISTRICT's estimated cost share \$1,550,000. DISTRICT funds will be from the DISTRICT's secondary tax levy revenues and the DISTRICT funding shall be based on the availability of the DISTRICT Capital Improvement Program budget funding.
- 11.2. Serve as lead agency for the design using in-house design staff, utility relocations, rights-of-way acquisitions, construction and construction management of the PROJECT.
 - 11.2.1. Upon completion and acceptance of the design of the PROJECT, invoice the CITY for their cost share obligation for design.
 - 11.2.2. Upon award of a contract for construction of the PROJECT, invoice the CITY for one-half (1/2) of their cost share obligation for construction and construction management, plus their cost share for rights-of-way acquired by the DISTRICT and utilities relocated to date. The DISTRICT shall invoice the CITY for the costs for requested non-flood control or additional landscaping features, as described in paragraph 11.2 no more frequently than quarterly, as the costs are incurred.
 - 11.2.3. Non-flood control related features, if compatible with the PROJECT function, may be included in the PROJECT at the request of the CITY, with the associated design, rights-of-way, utility relocation, construction and construction management costs paid solely by the CITY.
 - 11.2.4. Upon completion and acceptance of construction of the PROJECT, prepare a final accounting including change orders and construction management costs not previously paid, and invoice the CITY for the remainder of their cost share for construction, construction management, and additional rights-of-way acquired by the DISTRICT and utilities relocated. The DISTRICT shall invoice the CITY for the remaining costs for requested non-flood control or landscaping features, covered by paragraph 11.2.
 - 11.2.5. Participate in the final inspection of the constructed PROJECT with the CITY.
- 11.3. Obtain rights-of-way required for the PROJECT, and convey to the CITY rights-of-way acquired for the PROJECT upon completion and acceptance of the PROJECT. Any land and/or property purchased by the DISTRICT and conveyed to the CITY shall be for specific flood control purposes, and should that land and/or property cease to be used for flood control purposes, said

land and/or property shall revert to the DISTRICT. Upon said reversion, all amounts paid by the CITY for such parcel(s) shall be reimbursed to the CITY. Said reversion shall be effectuated through judicial proceedings instituted by the DISTRICT in a court of general jurisdiction in the State of Arizona. As required by Arizona Revised Statutes Section 48-3603.1, if all or a part of this property is subsequently sold by the CITY as undeveloped property for a price exceeding the original sale price, the DISTRICT shall be reimbursed for the pro-rata amount of the cost share paid by the DISTRICT for such parcel(s).

- 11.4. Coordinate utility relocations required for the PROJECT. Utilities without prior rights shall be relocated at the owner's expense. Costs for those relocated utilities with prior rights shall be a PROJECT COST.
- 11.5. Elect to do the design work for the PROJECT in-house. The DISTRICT's actual cost of the design will be included in the total PROJECT COST. The DISTRICT will document its actual cost and provide it to the CITY.
- 11.6. Provide the 30%, 60%, 90%, 100% and final plans and specifications as well as all change orders for both design and construction of the PROJECT elements to the CITY for review, comment and concurrence before final approval. The CITY will review and return these submittals within no more than 3 weeks from date of submittal.
- 11.7. May participate with the CITY in an annual inspection of the PROJECT. Any deficiencies relating to flood control that can be corrected by the CITY using available resources shall be corrected within the sixty (60) calendar days. If the CITY has not taken corrective action within this time, the DISTRICT reserves the right to perform the corrective action and the CITY shall reimburse the DISTRICT for all actual costs incurred by the DISTRICT within thirty (30) calendar days of receipt of an invoice from the DISTRICT.
- 11.8. Reserves the right to review and comment on the design and/or construction of any future changes or modifications to the PROJECT that may affect the hydraulic function of the PROJECT, as determined by the DISTRICT.
- 11.9. Agree that the language shall be included in the DISTRICT's contract documents for the construction of this PROJECT to name the CITY as an additional insured to the same extent as the DISTRICT; To indemnify and hold the CITY harmless to the same extent as the DISTRICT; and the CITY shall be named a third party beneficiary of the agreement between the Contractor and the DISTRICT.
- 11.10. Implement the United States Army Corps of Engineer's (USACOE) Section 404 Environmental Permit mitigation requirements.
- 11.11. Provide record drawings ("As-Built" Plans) of all new construction for the PROJECT to the CITY upon completion and acceptance of construction.
- 11.12. Conduct public meetings, information campaigns, or other public involvement activities as may be required for the design and construction of the PROJECT.
- 11.13. Issue invitation of bids, receive, protect and open bids; determine the lowest responsible and qualified bidder; award the contract and issue the Notice to Proceed for construction of the PROJECT. Construct the project in accordance with Title 34.

12. The CITY shall:

- 12.1. Fund fifty percent (50%) of the PROJECT COST, estimated to be \$3,100,000, making the CITY'S estimated share to be \$1,550,000.
 - 12.1.1. Reimburse the DISTRICT within thirty days (30) of receipt of an invoice in accordance with paragraphs 12.2.1 through 12.2.4.
 - 12.1.2. The CITY's funding will be provided from its general fund.
- 12.2. Participate in the plan and special provision review and approval process within the allocated time frame. Also, participate in review and approval of change orders during design and construction of the PROJECT.
- 12.3. Participate in all public involvement activities for the PROJECT.
- 12.4. Provide all CITY owned and controlled rights-of-way necessary for the PROJECT, and not specifically purchased for this PROJECT, at no cost to the PROJECT.
- 12.5. Be solely responsible for, and assume ownership, liability, operation, and maintenance of the PROJECT upon completion and acceptance of the PROJECT.
- 12.6. Be responsible for the operation and maintenance for the PROJECT to conform to the Phoenix Street Maintenance Division Policy and Procedure 4.14. The CITY is also responsible for repair or replacement as necessary of all features or structures of the PROJECT at no cost to the DISTRICT.
- 12.7. Be responsible to schedule and invite the DISTRICT to participate in an annual inspection of the PROJECT. Any deficiencies relating to flood control that can be corrected by the CITY, using available resources shall be corrected within sixty (60) calendar days. If the CITY has not taken corrective action within this time the DISTRICT reserves the right to perform the corrective action and the CITY shall reimburse the DISTRICT for all actual costs incurred by the DISTRICT within thirty (30) calendar days of receipt of an invoice from the DISTRICT.
- 12.8. Obtain DISTRICT's review and comment on the design and/or construction of any future changes or modifications to the PROJECT that may affect the hydraulic function of the PROJECT and resolve and/or incorporate the DISTRICT's comments into the future PROJECT modification.
- 12.9. Cause to be relocated at no cost to the PROJECT all utilities within its jurisdiction that are in place by permit and/or without prior rights.
- 12.10. Identify a CITY employee to participate in the construction inspection process and coordinate the construction with the DISTRICT.
- 12.11. Upon completion of the PROJECT, be responsible for preparing and submitting Letter of Map Revision (LOMR) to the regulated floodplain in the PROJECT area to Federal Emergency Management Agency (FEMA), at no cost to the PROJECT

13. Any permits required by a PROJECT PARTNER for the PROJECT shall be issued by the appropriate PROJECT PARTNER, at no cost to the PROJECT.
14. Each party to this Agreement may with mutual written agreement of all parties delegate responsibilities to another party. Any delegation, however, shall not relieve the delegating party of its original responsibilities as defined herein.
15. In the case of any dispute over any items in this Agreement, the parties agree to use their best efforts and enter into good faith negotiations to resolve the disputed matters. However, this shall not limit the rights of the parties to seek any remedies provided by law.
16. Both parties to this Agreement shall take reasonable and necessary actions within their authority to ensure that only storm water is discharged into the PROJECT, and that such discharges into the PROJECT comply at the point of discharge with any applicable requirements of the Clean Water Act, Arizona Pollutant Discharge Elimination System (AZPDES) or any other applicable discharge requirements, including any permit requirements.
17. Each of the PROJECT PARTNERS to this Agreement (indemnitor) shall, to the extent permissible by law, indemnify, defend and save harmless the others (indemnitees) including agents, officers, directors, governors and employees thereof, from and against any loss or expense incurred as a result of any claim or suit of any nature whatsoever, which arises out of indemnitor's negligent or wrongful acts or omissions pursuant to this Agreement. Such indemnification obligation shall encompass any personal injury, death or property damages resulting from the indemnitor's negligent or wrongful acts or omissions, as well as reasonable attorney's fees, court costs, and other expenses relating to the defense against claims or litigation, incurred by the indemnitee. Indemnitee shall be liable for their own negligence or wrongful acts as provided by law.
18. All notices or demands upon any party to this Agreement shall be in writing and shall be delivered in person or sent by mail addressed as follows:

Flood Control District of Maricopa County
Chief Engineer and General Manager
2801 West Durango Street
Phoenix, AZ 85009-6399

City of Phoenix
Attn: Street Transportation Department, Director
200 West Washington Street, 5th Floor
Phoenix, AZ. 85003-1611
19. Each PROJECT PARTNER to this Agreement will pay for and not seek reimbursement for its own personnel and administrative costs associated with this PROJECT, including but not limited to the following unless specifically identified otherwise in this Agreement: operation, maintenance, permitting, management and administration.
20. This Agreement shall expire in ten (10) years from the date of recording with the Maricopa County Recorder, or upon completion of the PROJECT and after all funding obligations and reimbursements have been satisfied in accordance with this Agreement, whichever is the first to occur. The operation and maintenance responsibilities of this Agreement shall survive expiration of the Agreement. However, by mutual written agreement of all parties, this Agreement may be amended or terminated.

21. This Agreement is subject to cancellation by any party pursuant to the provisions of Arizona Revised Statutes Section 38-511.
22. Attached to this Agreement or contained herein are the written determinations by the appropriate attorneys for the parties to this Agreement, that these agencies are authorized under the laws of the State of Arizona to enter into this Agreement and that it is in proper form.
23. If legislation is enacted after the effective date of this Agreement, which changes the relationship, or structure of one or more parties to this Agreement, the parties agree that this Agreement shall be renegotiated at the written request of either party.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
A Municipal Corporation

Recommended by:

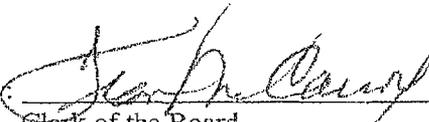


Timothy S. Phillips, P.E. Date
Acting Chief Engineer and General Manager

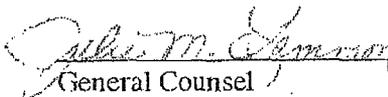
Approved and Accepted:

By:  JUN 22 2005
Chairman, Board of Directors Date

Attest:

By:  JUN 22 2005
Clerk of the Board Date

The foregoing Intergovernmental Agreement FCD 2005A001 has been reviewed pursuant to Arizona Revised Statutes Section 11-952, as amended, by the undersigned General Counsel, who has determined that it is in proper form and within the powers and authority granted to the Flood Control District of Maricopa County under the laws of the State of Arizona.

 5/19/05
General Counsel Date

CITY OF PHOENIX

City of Phoenix, a Municipal Corporation
Frank Fairbanks, City Manager

By: Ross D. Blakley, Jr. 5/17/05
Ross D. Blakley, Jr., P.E. Date
Acting Street Transportation Department Director



Attest:

By: Raymond M. Minton 5-17-05
~~ACTING~~ City Clerk Date

The foregoing Intergovernmental Agreement FCD 2005A001 has been reviewed pursuant to Arizona Revised Statutes Section 11-952, as amended, by the undersigned attorney who has determined that it is in proper form and within the power and authority granted to the City of Phoenix under the laws of the State of Arizona.

By: Jesse W. Searcy
ACTING City Attorney Date
MS

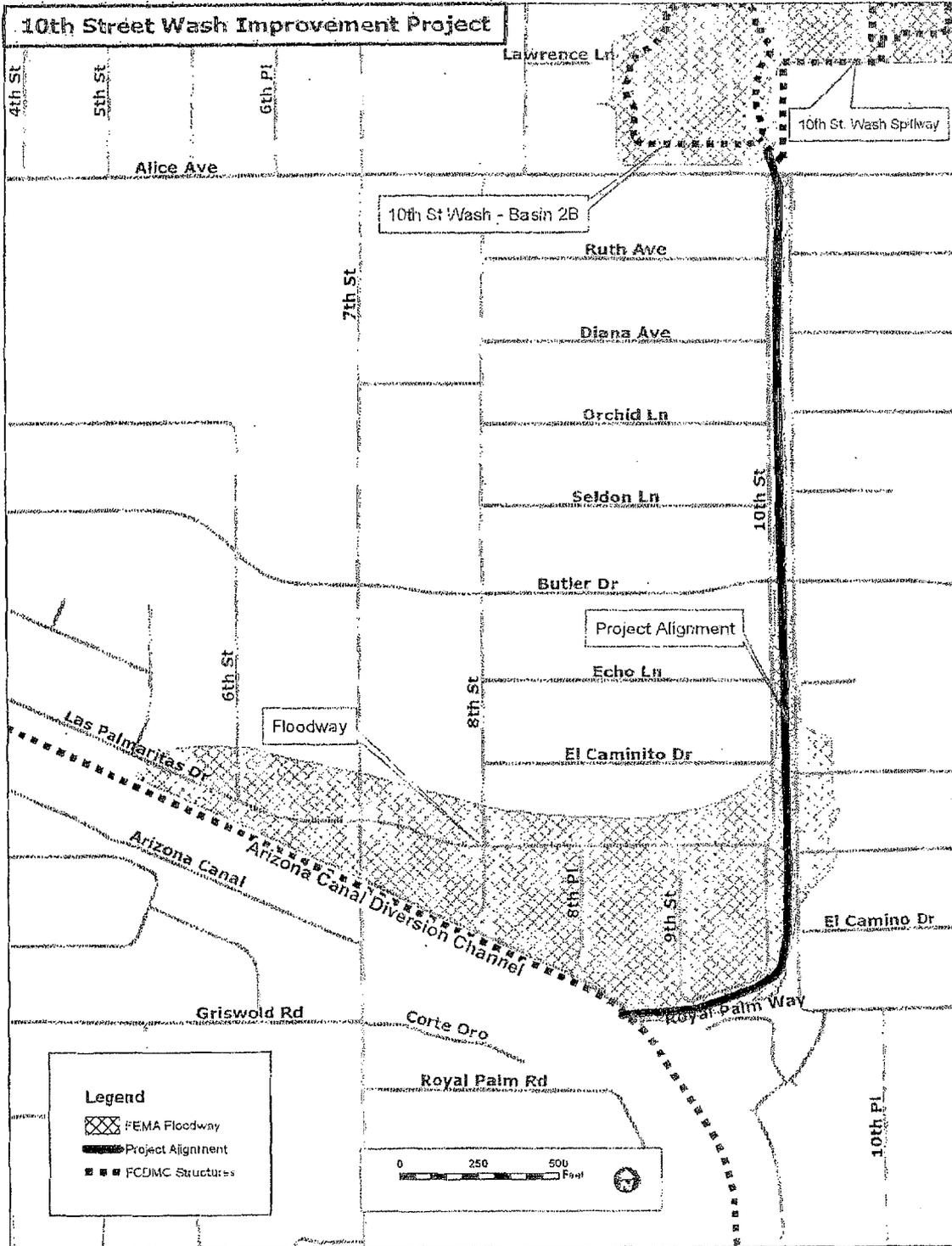
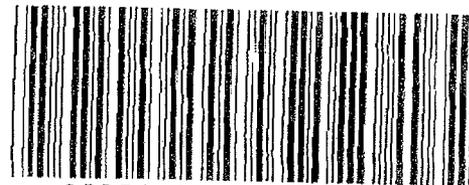


Exhibit A: Site Map
IGA FCD 2005A001



OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
HELEN PURCELL
2005-1917236 12/20/05 14:27
5 OF 6

YORKII

CLERK OF THE BOARD

BOOKET PICK UP

AMENDMENT NO. 1
FCD 2005A001A

TO

INTERGOVERNMENTAL AGREEMENT
FCD 2005A001

for the

10th Street Wash Improvements,
Alice Avenue to Arizona Canal Diversion Channel (ACDC)

between the

Flood Control District of Maricopa County,

and the

City of Phoenix

Amendment No. 1
IGA FCD 2005A001A

Agenda Item: C-69-05-127-2-012

This Amendment No. 1, also known as, Intergovernmental Agreement (IGA) FCD 2005A001A (Amendment No. 1) to IGA FCD 2005A001 (the Agreement), is entered into by and between the Flood Control District of Maricopa County, a municipal corporation and political subdivision of the State of Arizona, acting by and through its Board of Directors, hereinafter called the DISTRICT; and the City of Phoenix, a municipal corporation, acting by and through its City Manager, hereinafter called the CITY. The CITY and the DISTRICT are collectively referred to as "PARTIES".

This Amendment No. 1 IGA FCD 2005A001A to IGA FCD 2005A001 shall become effective as of the date it has been executed by all parties.

DATE FILED WITH MARICOPA COUNTY RECORDER 12-20-2005

STATUTORY AUTHORIZATION

The DISTRICT is empowered by Arizona Revised Statutes Section 48-3603, as revised, to enter into this Amendment No. 1 and has authorized the undersigned to execute this Amendment No. 1 on behalf of the DISTRICT.

The CITY is empowered by Arizona Revised Statutes Section 11-951 and Article II, Chapter II, and Section 2 of the Phoenix City Charter to enter into this Amendment No. 1, and has authorized the undersigned to execute this Amendment No. 1 on behalf of the CITY.

BACKGROUND

The 10th Street Wash Improvements, Alice Avenue to ACDC, hereinafter called the PROJECT, was authorized by the original Agreement FCD 2005A001 on June 22, 2005 (C69-05-127-2-00). The PROJECT is currently under final design. The Agreement identified the DISTRICT as the lead agency for design, which includes associated landscaping design. The Agreement also identified that the actual cost of design, including design work performed by DISTRICT staff, would be included in the total PROJECT cost. The total PROJECT cost will be shared 50/50 between the DISTRICT and the CITY.

In order to expedite the design process the DISTRICT and the CITY have determined that outside engineering consulting services could be used for the design of the PROJECT. The original intent for design of the PROJECT was to utilize DISTRICT "in-house" design staff to prepare the design, plans and specifications. The DISTRICT and the CITY have identified that the landscape design for the PROJECT could best be provided by CITY staff. The original intent for design of the PROJECT was to utilize a DISTRICT "On-call" Landscape Architect to assist in the landscape design.

This Amendment No. 1 shall authorize the DISTRICT to utilize outside engineering consulting services for the preparation of the design, plans, and specifications for the PROJECT. The actual costs for the outside engineering consulting services will be shared between the CITY and the DISTRICT in accordance with the original IGA. This amendment shall also authorize the CITY to be the lead agency responsible for the landscape design for the PROJECT. The CITY's actual costs for the landscape design including, in-house staff performing such design, will be included in the total PROJECT cost, and will be shared between the CITY and the DISTRICT in accordance with the original IGA. The estimated cost of the landscape design is \$30,000. This Amendment No. 1 does not change the estimated total PROJECT cost of \$3,100,000.

PURPOSE OF THE AGREEMENT

The purpose of this Amendment No. 1 is to allow the CITY to perform the landscape design for this PROJECT and receive credit for its cost and to authorize the DISTRICT to utilize outside engineering consulting services for the preparation of the design, plans and special provisions for the PROJECT.

TERMS OF AGREEMENT

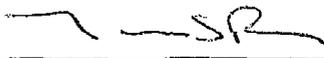
1. The DISTRICT shall:
 - 1.1. Coordinate with the CITY's Landscape Architect staff to prepare construction documents for the PROJECT.
 - 1.2. Incorporate landscape plans, special provisions, and bid items received from the CITY into the overall PROJECT construction documents.

- 1.3. Review and comment on the landscape design, plans and special provisions prepared by the CITY.
 - 1.4. Review the CITY's actual cost for the landscape design and account for that cost by providing a credit to the CITY for fifty percent (50%) of the landscape design costs incurred by the CITY towards the CITY's overall total PROJECT cost.
 - 1.5. Utilize the DISTRICT's procurement process to solicit outside engineering consulting services in order to expedite and complete the PROJECT design, plans and specifications. The cost of the outside consultant services will be shared between the CITY and the DISTRICT in accordance with the original IGA cost share percentages.
2. The CITY shall:
- 2.1. Provide the landscape design using "in-house" staff.
 - 2.1.1. Utilize base sheets provided by the DISTRICT to prepare the landscape plans.
 - 2.1.2. Estimated cost for the landscape design is \$30,000.
 - 2.2. Provide 60%, 90% and 100% landscape plans, special provisions and cost estimates to the DISTRICT for review and approval.
 - 2.3. Resolve and/or incorporate any comments received from the DISTRICT into the landscape plans and special provisions.
 - 2.4. Document the actual cost incurred by the CITY for the landscape design and provide it to the DISTRICT for inclusion in calculating the total PROJECT cost and the CITY's credit.
 - 2.5. Receive a credit of fifty percent (50%) of the landscape design costs incurred and such credit shall be applied to the CITY's final construction cost share payment.
 - 2.6. Reimburse the DISTRICT, fifty percent (50%) of the total cost for all engineering design services.
3. This Amendment No. 1 governs where terms conflict with the Agreement. However, the Agreement is applicable unless specifically changed by this Amendment No. 1. The paragraph numbering in this Amendment No. 1 is coincidental and is not intended to indicate that these same numbered paragraphs in the Agreement are being replaced in their entirety.
4. This Amendment No. 1 shall expire five (5) years from the date of recording with the County Recorder or upon completion of the PROJECT and after all funding obligations and reimbursements have been satisfied in accordance with this Amendment No. 1, whichever is the first to occur. However, by mutual written agreement of all parties, this Amendment No. 1 may be amended or terminated. If this PROJECT is terminated for any reason, funds already paid to the DISTRICT and not contractually obligated for the PROJECT, shall be reimbursed to the appropriate parties.
5. This Amendment No. 1 is subject to cancellation by either party pursuant to the provisions of Arizona Revised Statutes Section 38-511.

6. Attached to this Amendment No. 1 or contained herein are the written determinations by the appropriate attorneys for the parties to this Amendment No. 1, that these agencies are authorized under the laws of the State of Arizona to enter into this Amendment No. 1 and that it is in proper form.
7. If legislation is enacted after the effective date of this Amendment No. 1, which changes the relationship or structure of one or more parties to this Amendment No. 1, the parties agree that this Amendment No. 1 shall be renegotiated at the written request of any party.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
A Municipal Corporation

Recommended by:

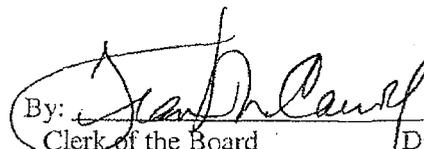
 11/08/05

Timothy S. Phillips, P.E. Date
Chief Engineer and General Manager

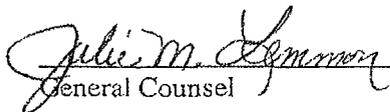
Approved and Accepted:

By: 
Chairman, Board of Directors

Attest:

By:  DEC 07 2005
Clerk of the Board Date

The foregoing Amendment IGA FCD 2005A001A has been reviewed pursuant to Arizona Revised Statutes Section 11-952, as amended, by the undersigned General Counsel, who has determined that it is in proper form and within the powers and authority granted to the Flood Control District of Maricopa County under the laws of the State of Arizona.

 9/23/05
General Counsel Date

CITY OF PHOENIX

CITY OF PHOENIX, a Municipal Corporation
Frank Fairbanks, City Manager

By: Ross D. Blakley, Jr. 10/26/05
Ross D. Blakley, Jr., P.E. Date
Acting Street Transportation Director

Attest:



By: C. A. Meya 10/28/05
ACTING City Clerk Date

The foregoing Amendment IGA FCD 2005A001A has been reviewed pursuant to Arizona Revised Statutes Section 11-952, as amended, by the undersigned attorney who has determined that it is in proper form and within the power and authority granted to the City of Phoenix under the laws of the State of Arizona.

By: Jesse W. Sears 10/25/05
ACTING City Attorney Date
MBS

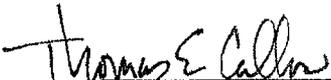
- III. Construction management will be assigned a value of 8% of actual construction costs plus actual costs for material testing, surveying etc. during construction.
- IV. DISTRICT and CITY funding of their respective cost share could occur as late as FY06/07 or FY07/08 as CIP budgets permit.
- V. Based on input received from citizens at the public meeting held on December 15, 2004, the storm drain system is the preferred alternative selected by citizens to be carried forward for final design.

- 7. The DISTRICT staff will prepare the design and construction documents for the PROJECT. Actual costs for design will be part of the PROJECT shared cost in accordance with paragraph 6.
- 8. The rights-of-way already owned by the PROJECT PARTNERS will not be included as a PROJECT cost. Any additional rights-of-way and/or temporary construction easements acquired for the PROJECT will be included in the PROJECT cost and will be shared in accordance with paragraph 6.
- 9. PROJECT PARTNERS will utilize prior-rights to relocate conflicting utilities. In the case of "no prior rights", the relocation costs will be included in the total PROJECT costs and will be shared in accordance with paragraph 6.
- 10. Because of the history of public interest on the previous 10th Street Wash projects, the CITY and the DISTRICT will conduct public meetings for the PROJECT as required. Public involvement costs will be considered an actual design cost.
- 11. The CITY and the DISTRICT acknowledge and understand that this document is not binding on:

The CITY Council, or
The Board of Directors of the DISTRICT.

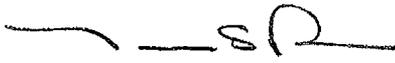
IN WITNESS WHEREOF, the parties hereto have executed this Memorandum of Understanding,

Street Transportation Director, City of Phoenix

 1-4-05

Thomas E. Callow, P.E. Date

Acting Chief Engineer and General Manager, Flood Control District of Maricopa County

 1/12/05

Timothy S. Phillips, P.E. Date

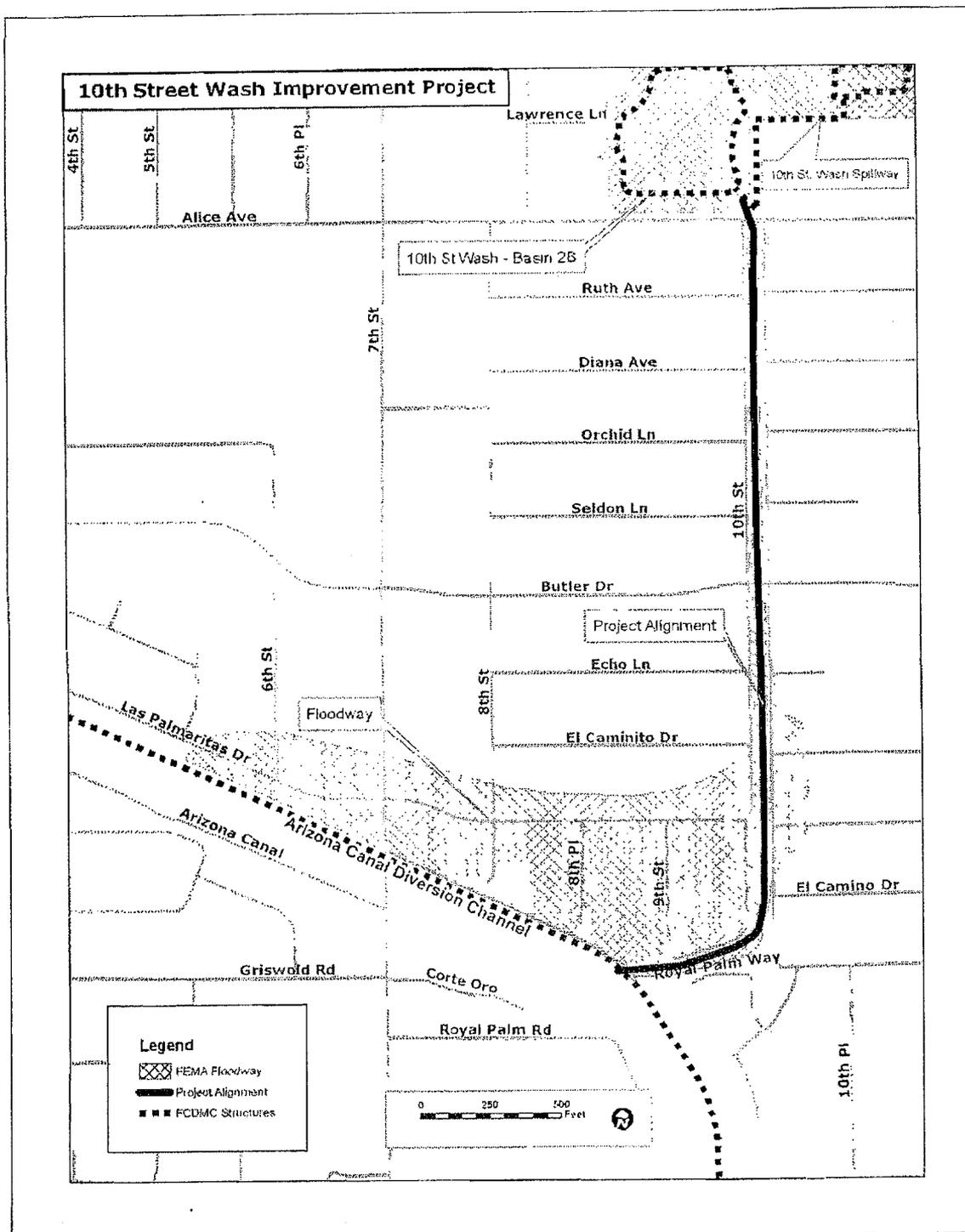


Exhibit "A"; MOU FCD 2004U004

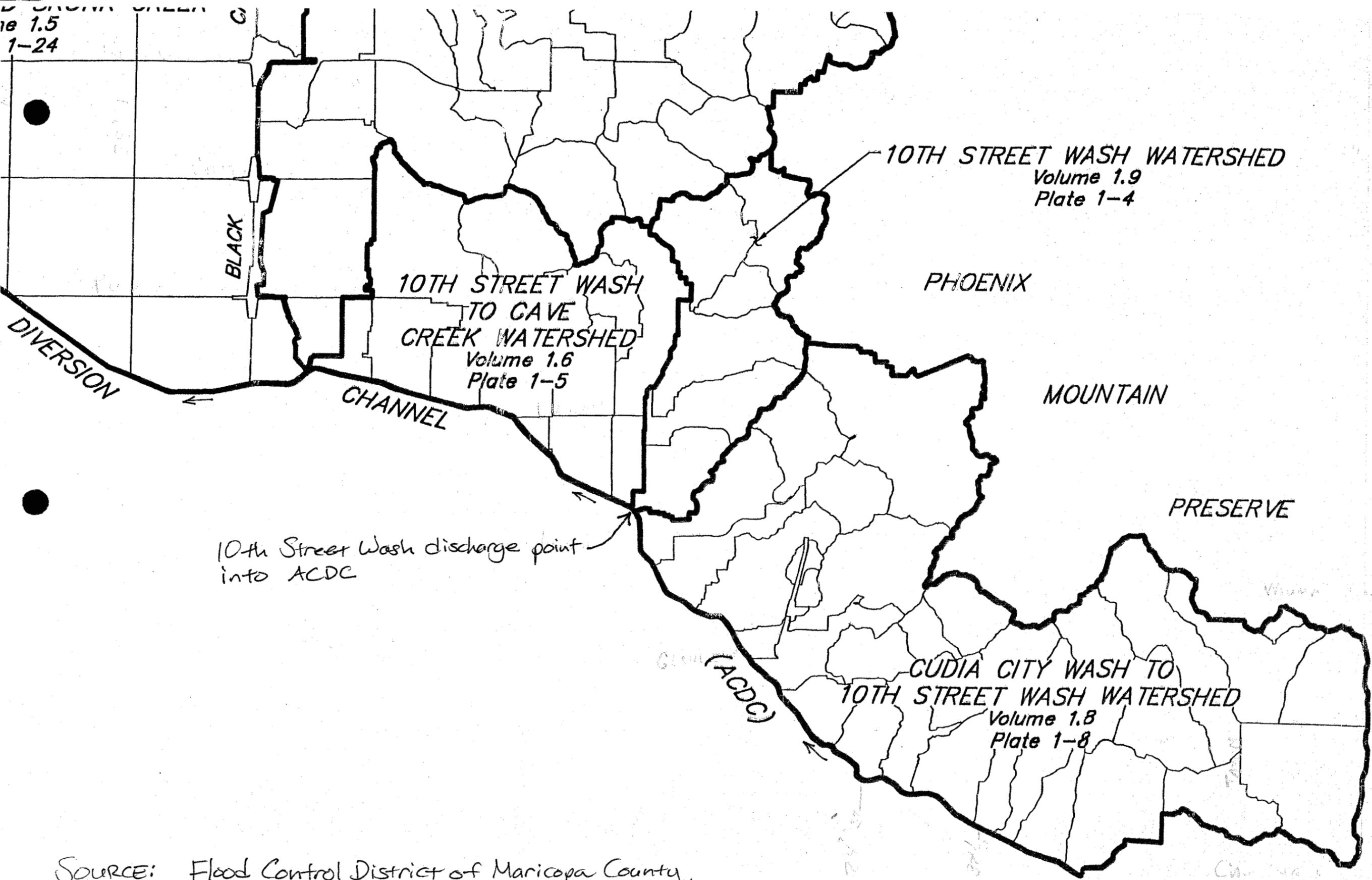
Appendix C: Survey Field Notes

No additional survey was performed as part of this project

Appendix D: Hydrologic Analysis Supporting Documentation

- Drainage Area Map Showing 10th Street Wash and ACDC Watersheds

Volume 1.5
Plate 1-24



SOURCE: Flood Control District of Maricopa County, "Arizona Canal Diversion Channel Area Drainage Master Study Phase I", 1991.

Appendix E: Hydraulic Analysis Supporting Documentation

Appendix E1: Roughness coefficient estimation

Not applicable for storm drain analysis.

Appendix E2: Cross Section Plots

Not applicable for storm drain analysis.

Appendix E3: Expansion and contraction coefficients

Not applicable to storm drain model. See Appendix E5 for storm drain hydraulic calculations.

Appendix E4: Analysis of Structures

No separate modeling of structures was performed.

Appendix E5: Hydraulic Calculations

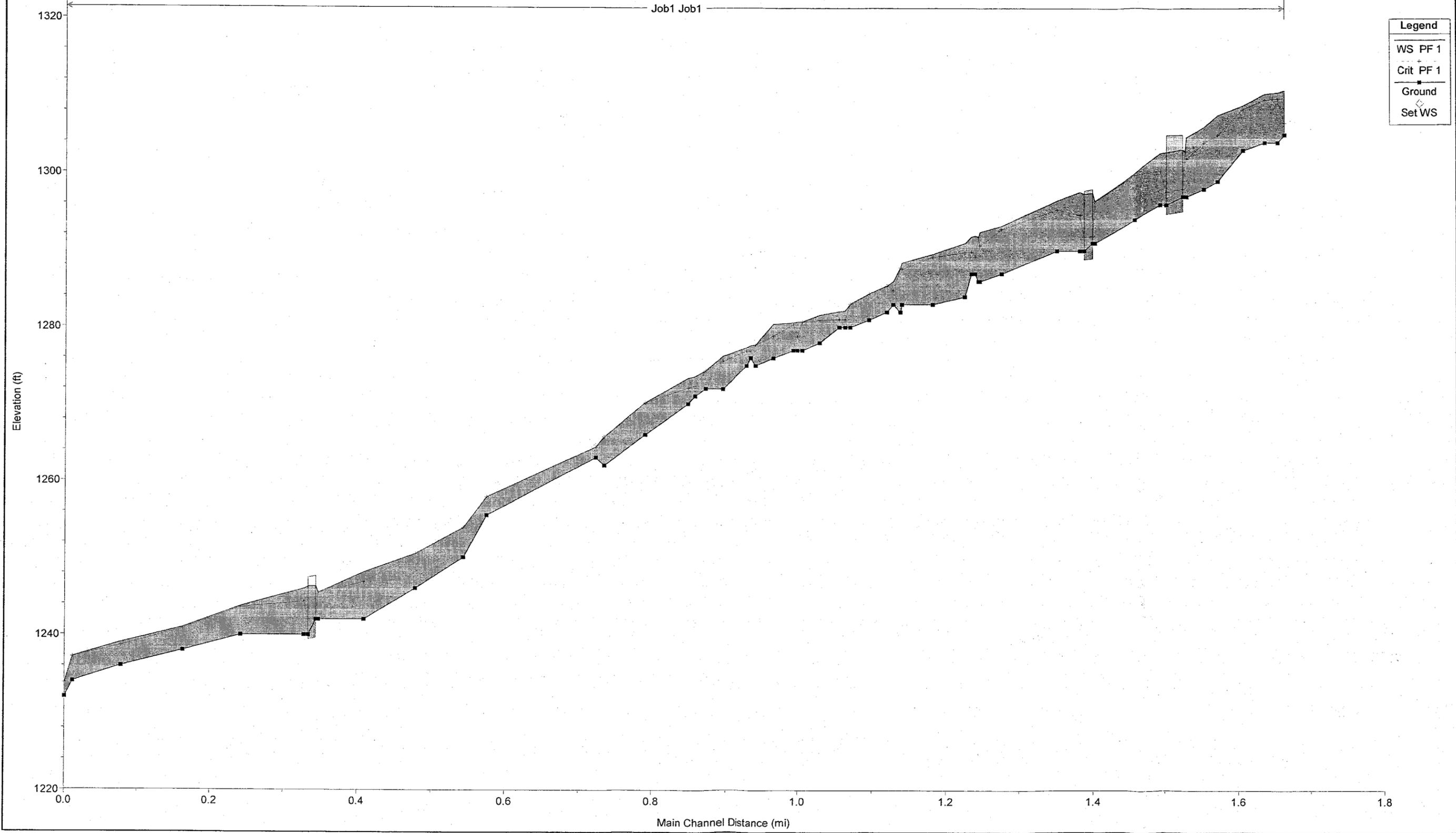
- Effective FEMA HEC-RAS Output
- Proposed Condition HEC-RAS Output
- Proposed Condition StormCad Output
- Hydraulic Computations for catch basins and inlet structure
- CD containing electronic files of above analyses

HEC-RAS Plan: Plan 05 River Job1 Reach: Job1 Profile: PF 1

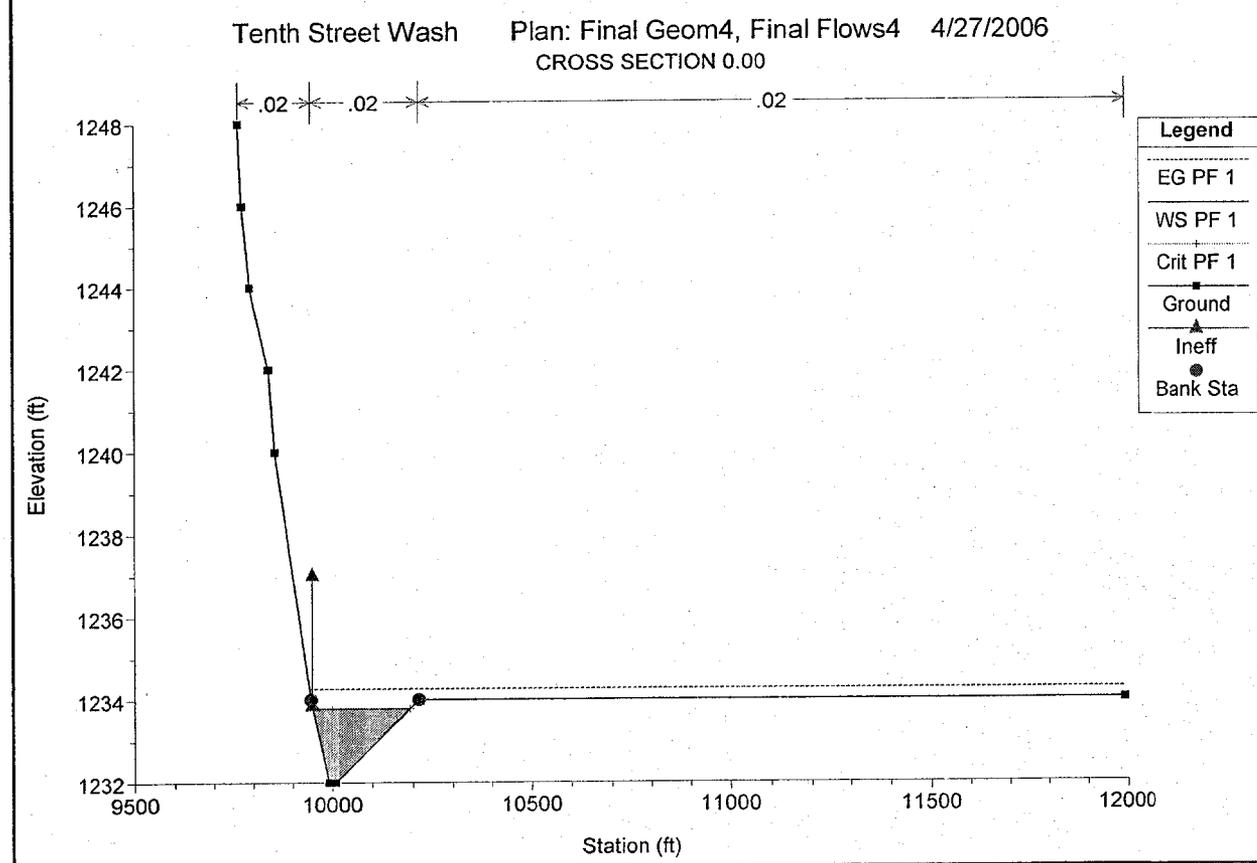
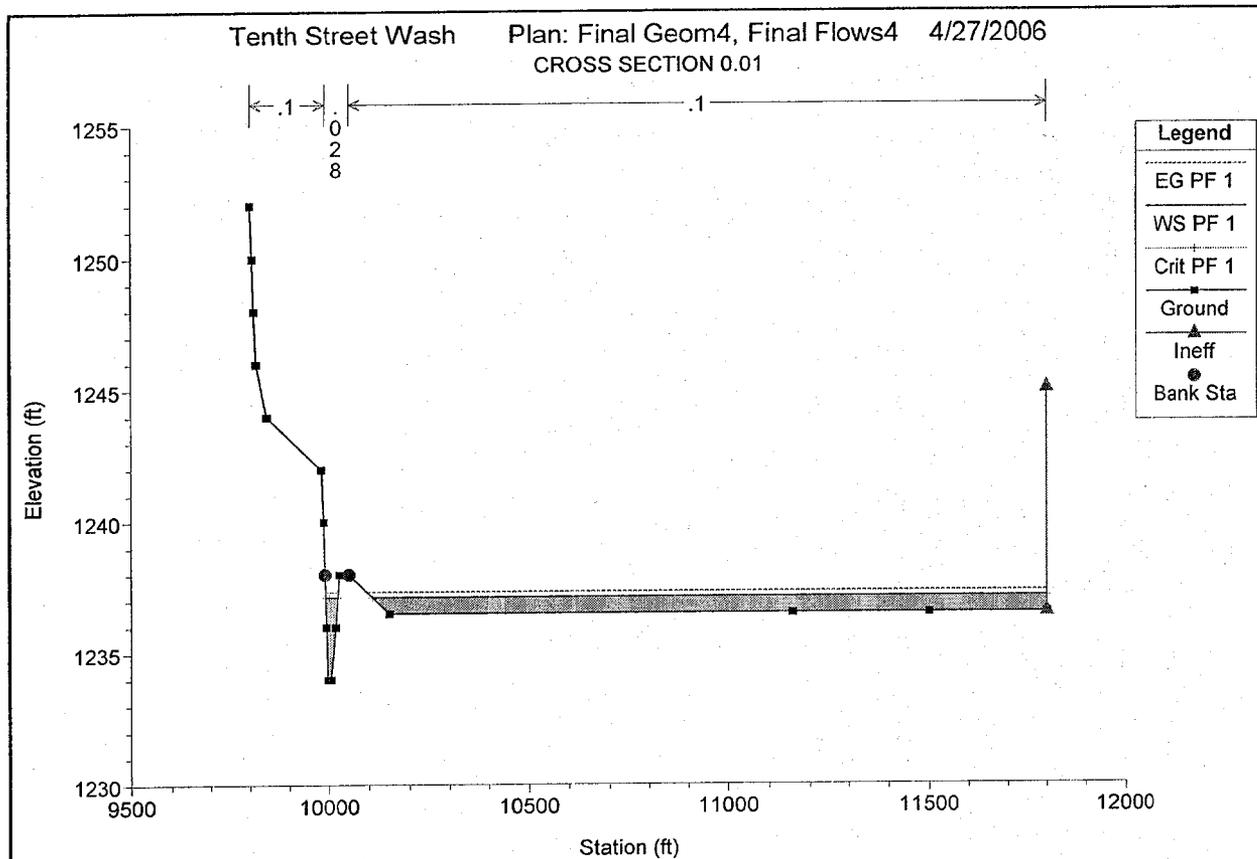
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Job1	1.66	PF 1	600.00	1305.00	1310.73	1306.55	1310.74	0.000017	0.86	695.93	384.29	0.07
Job1	1.65	PF 1	600.00	1304.00	1310.45	1309.85	1310.66	0.002511	4.51	316.13	325.43	0.41
Job1	1.64	PF 1	600.00	1304.00	1310.27	1309.57	1310.43	0.002127	3.95	381.91	379.70	0.37
Job1	1.61	PF 1	600.00	1303.00	1308.80	1308.36	1309.48	0.008858	6.65	100.53	63.36	0.73
Job1	1.57	PF 1	600.00	1299.00	1307.53	1304.96	1307.77	0.008827	4.18	183.86	105.18	0.37
Job1	1.55	PF 1	600.00	1298.00	1305.99	1303.97	1306.50	0.015935	5.76	104.20	24.90	0.50
Job1	1.528	PF 1	600.00	1297.00	1304.68	1301.90	1304.95	0.007627	4.19	143.08	34.22	0.36
Job1	1.527	PF 1	840.00	1297.00	1302.85	1302.85	1304.46	0.063819	10.19	82.47	25.45	1.00
Job1	1.509		Culvert									
Job1	1.49	PF 1	840.00	1296.00	1302.66	1300.37	1303.06	0.010796	5.04	166.59	40.64	0.44
Job1	1.46	PF 1	840.00	1294.00	1299.99	1299.78	1301.03	0.009916	8.19	102.62	41.35	0.92
Job1	1.40	PF 1	840.00	1291.00	1296.47	1296.39	1297.97	0.010844	9.84	85.33	26.92	0.97
Job1	1.39		Culvert									
Job1	1.38	PF 1	840.00	1290.00	1297.62	1294.65	1297.85	0.003262	3.93	248.62	156.53	0.32
Job1	1.35	PF 1	840.00	1290.00	1296.50	1295.36	1296.88	0.007976	5.22	227.66	192.64	0.49
Job1	1.27	PF 1	760.00	1287.00	1293.17	1292.76	1293.51	0.009094	5.25	265.77	288.23	0.51
Job1	1.244	PF 1	720.00	1286.00	1292.38	1290.58	1292.52	0.002920	3.43	361.58	247.19	0.30
Job1	1.242	PF 1	980.00	1286.00	1291.79	1291.73	1292.37	0.017860	7.03	239.00	219.80	0.70
Job1	1.238	PF 1	940.00	1287.00	1291.93	1289.22	1291.96	0.000074	1.64	698.75	337.89	0.14
Job1	1.23	PF 1	920.00	1287.00	1291.78	1289.83	1291.92	0.002196	3.60	462.92	254.46	0.30
Job1	1.22	PF 1	920.00	1284.00	1290.95	1289.77	1291.59	0.009330	6.67	205.70	195.31	0.57
Job1	1.18	PF 1	880.00	1283.00	1289.50	1289.12	1289.75	0.005787	4.87	387.03	307.91	0.45
Job1	1.138	PF 1	820.00	1283.00	1288.41	1287.81	1288.47	0.005343	2.43	445.72	327.33	0.37
Job1	1.136	PF 1	960.00	1282.00	1287.78	1287.78	1288.32	0.015625	7.21	277.42	261.34	0.72
Job1	1.13	PF 1	880.00	1283.00	1285.97	1284.80	1286.01	0.000155	1.76	629.37	423.14	0.19
Job1	1.12	PF 1	560.00	1282.00	1285.43	1285.43	1285.87	0.004471	5.99	248.04	361.49	0.70
Job1	1.09	PF 1	420.00	1281.00	1284.40	1284.40	1284.73	0.005124	5.67	223.66	361.35	0.72
Job1	1.07	PF 1	380.00	1280.00	1283.05	1283.05	1283.31	0.004643	5.25	238.25	370.09	0.69
Job1	1.06	PF 1	380.00	1280.00	1282.15	1281.01	1282.17	0.000270	1.55	475.85	419.40	0.23
Job1	1.05	PF 1	380.00	1280.00	1282.06	1281.03	1282.10	0.003702	2.61	288.65	237.12	0.39
Job1	1.03	PF 1	380.00	1278.00	1281.59	1280.94	1281.66	0.002878	2.98	330.24	323.62	0.36
Job1	1.005	PF 1	380.00	1277.00	1280.72	1280.69	1280.97	0.009006	4.88	211.43	411.66	0.62
Job1	0.998	PF 1	380.00	1277.00	1280.68	1278.79	1280.70	0.000121	1.38	471.16	598.44	0.16
Job1	0.99	PF 1	380.00	1277.00	1280.59	1280.34	1280.65	0.003011	2.83	412.73	660.04	0.33
Job1	0.96	PF 1	340.00	1276.00	1280.39	1278.85	1280.39	0.000254	0.97	992.77	864.93	0.10
Job1	0.94	PF 1	340.00	1275.00	1277.71	1277.71	1278.60	0.029135	7.58	44.86	25.25	1.00
Job1	0.935	PF 1	340.00	1276.00	1277.61	1276.93	1277.75	0.000909	3.05	111.36	519.11	0.43
Job1	0.929	PF 1	340.00	1275.00	1277.36	1276.93	1277.54	0.005893	4.28	85.21	86.93	0.61
Job1	0.89	PF 1	340.00	1272.00	1276.28	1275.62	1276.63	0.005342	4.75	88.48	194.62	0.60
Job1	0.87	PF 1	340.00	1272.00	1274.37	1274.37	1274.92	0.022791	6.03	70.02	116.34	0.83
Job1	0.86	PF 1	340.00	1271.00	1273.54	1272.29	1273.58	0.000373	1.60	213.02	181.48	0.26
Job1	0.85	PF 1	340.00	1270.00	1273.35	1272.08	1273.48	0.003232	3.07	145.11	134.12	0.34
Job1	0.79	PF 1	340.00	1266.00	1270.16	1270.16	1271.00	0.012571	7.35	46.32	31.09	1.02
Job1	0.73	PF 1	340.00	1262.00	1265.72	1265.72	1266.71	0.011667	7.99	42.53	21.81	1.01
Job1	0.72	PF 1	340.00	1263.00	1264.37	1264.37	1264.84	0.005333	5.49	63.73	74.08	0.96
Job1	0.57	PF 1	840.00	1255.50	1257.87	1257.87	1258.63	0.011340	6.96	120.61	78.99	0.99
Job1	0.54	PF 1	840.00	1250.00	1253.86	1253.86	1255.19	0.008689	9.28	90.53	33.57	1.00
Job1	0.48	PF 1	840.00	1246.00	1250.47	1250.47	1251.97	0.008662	9.82	85.57	28.42	1.00
Job1	0.41	PF 1	840.00	1242.00	1248.08	1246.83	1248.81	0.003336	6.89	121.95	33.19	0.63
Job1	0.35	PF 1	840.00	1242.00	1245.46	1245.46	1246.77	0.008715	9.18	91.53	34.90	1.00
Job1	0.34		Culvert									
Job1	0.33	PF 1	840.00	1240.00	1245.96	1244.29	1246.44	0.002290	5.57	150.85	44.10	0.53
Job1	0.24	PF 1	1280.00	1240.00	1243.71	1243.56	1244.41	0.006516	6.84	227.11	174.56	0.84
Job1	0.16	PF 1	1280.00	1238.00	1240.96	1240.80	1241.21	0.008093	5.27	583.59	623.61	0.86
Job1	0.08	PF 1	1280.00	1236.00	1238.99	1238.61	1239.02	0.001899	3.63	1771.45	1821.28	0.45
Job1	0.01	PF 1	1280.00	1234.00	1237.13	1237.13	1237.33	0.006093	6.41	1116.31	1721.91	0.80
Job1	0.00	PF 1	1280.00	1232.00	1233.79	1233.79	1234.27	0.005963	5.56	230.11	240.97	1.00

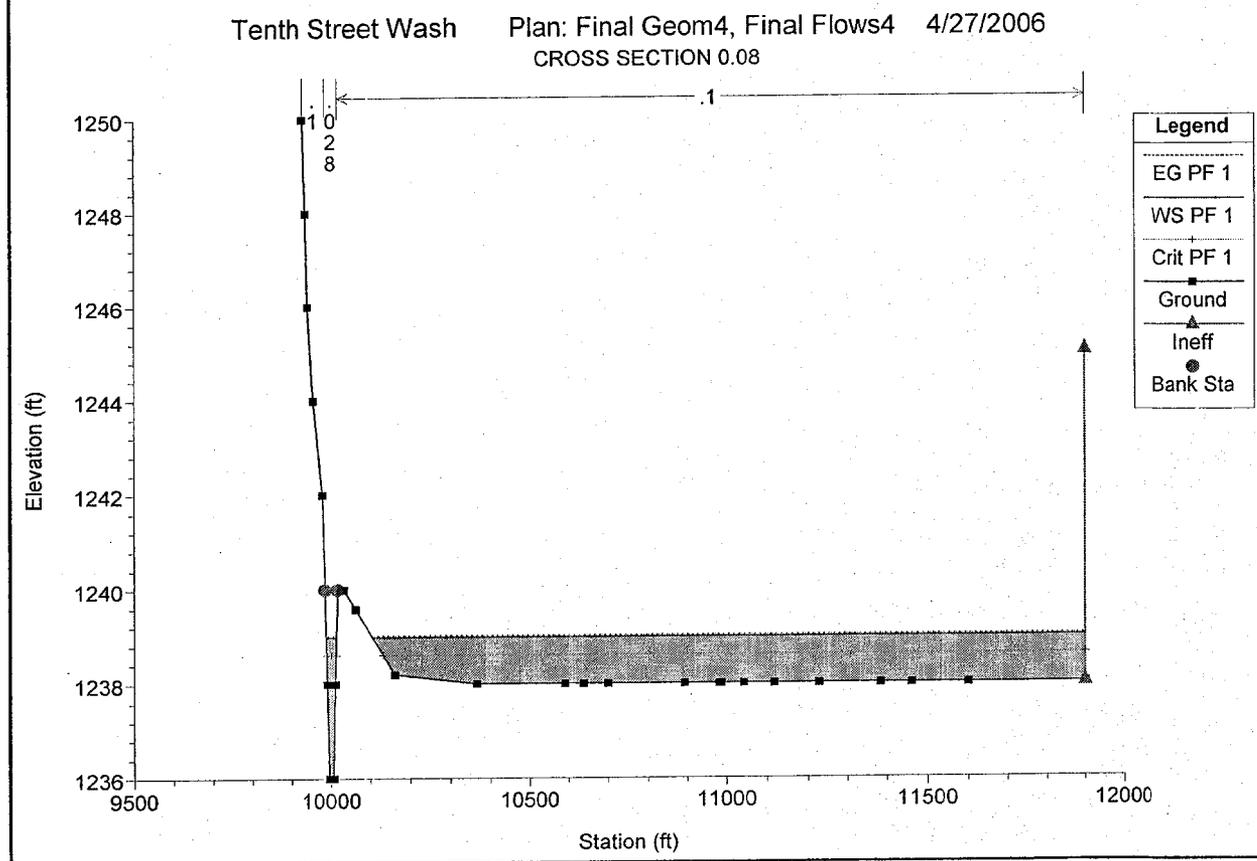
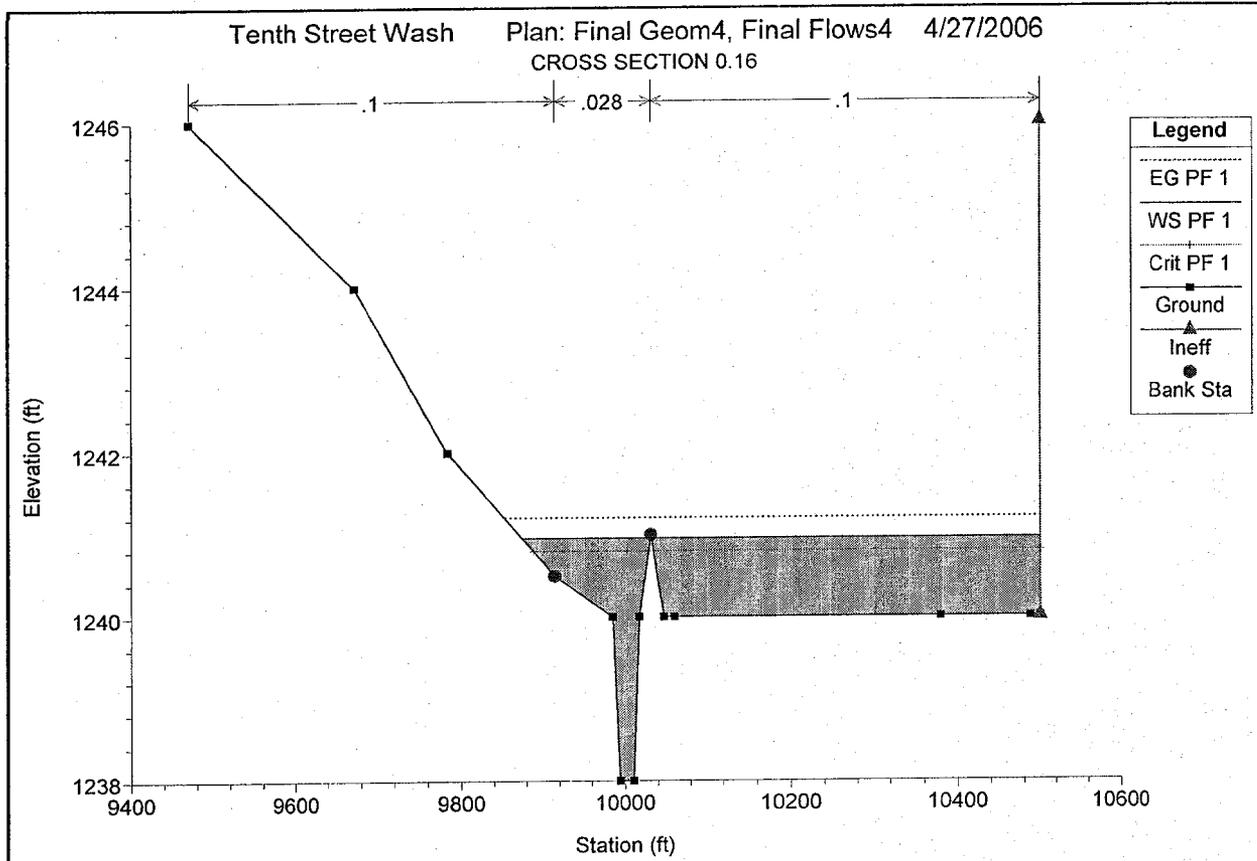
Tenth Street Wash Plan: Final Geom4, Final Flows4 3/7/2005

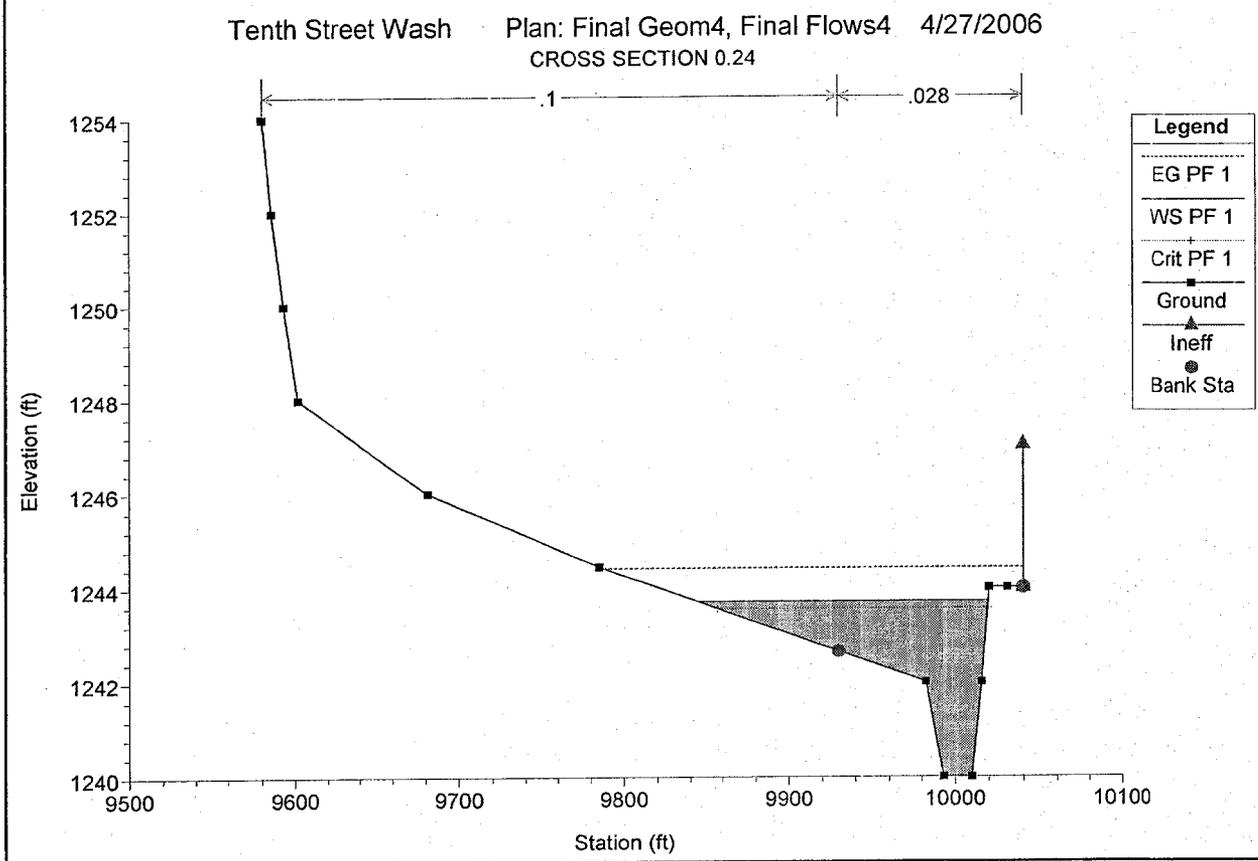
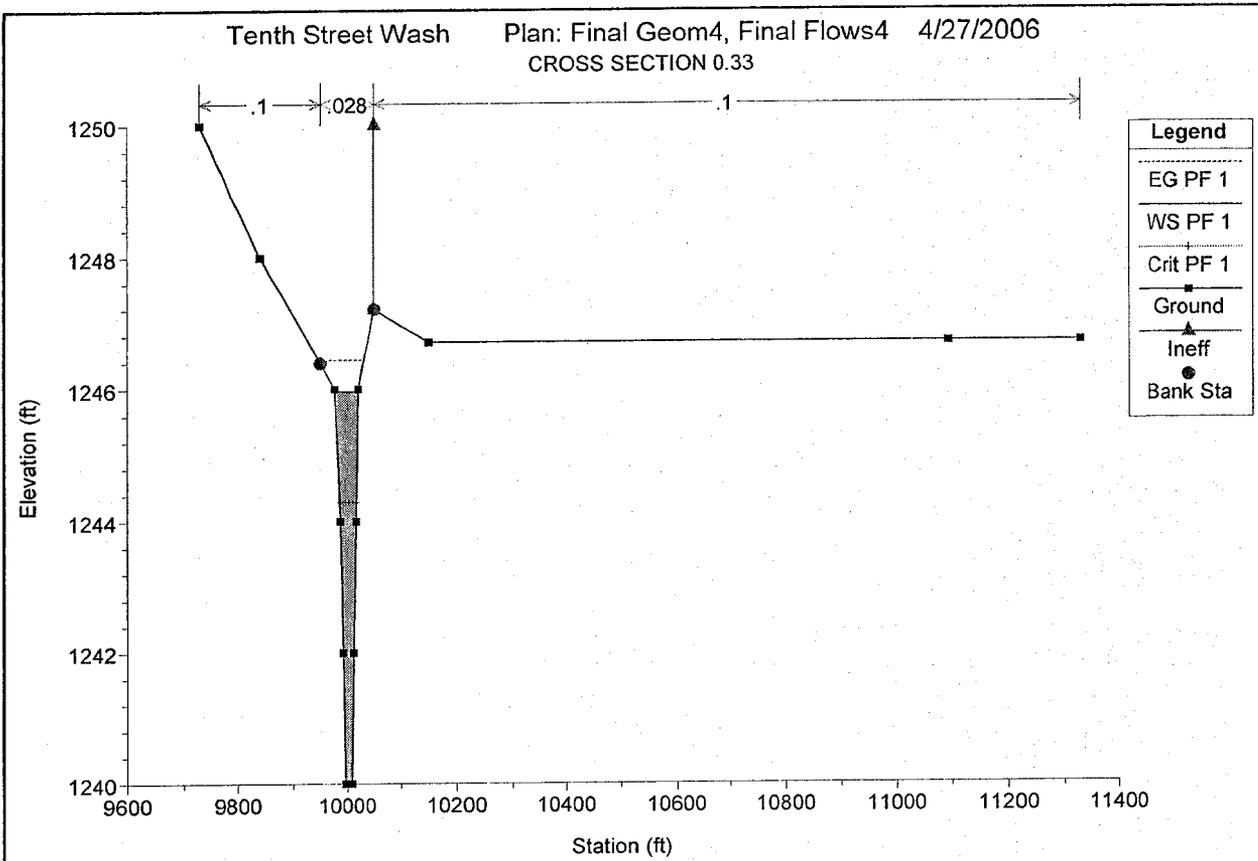
Job1 Job1



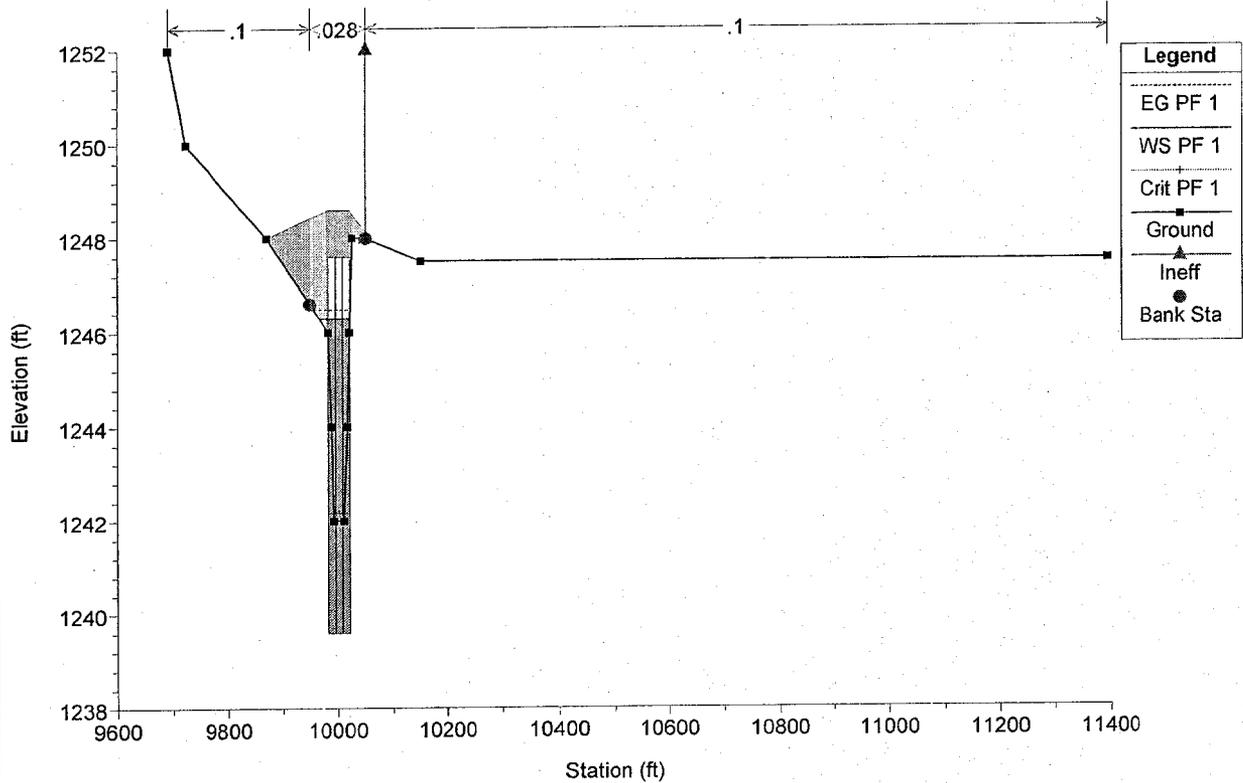
- Legend
- WS PF 1
 - Crit PF 1
 - Ground
 - Set WS



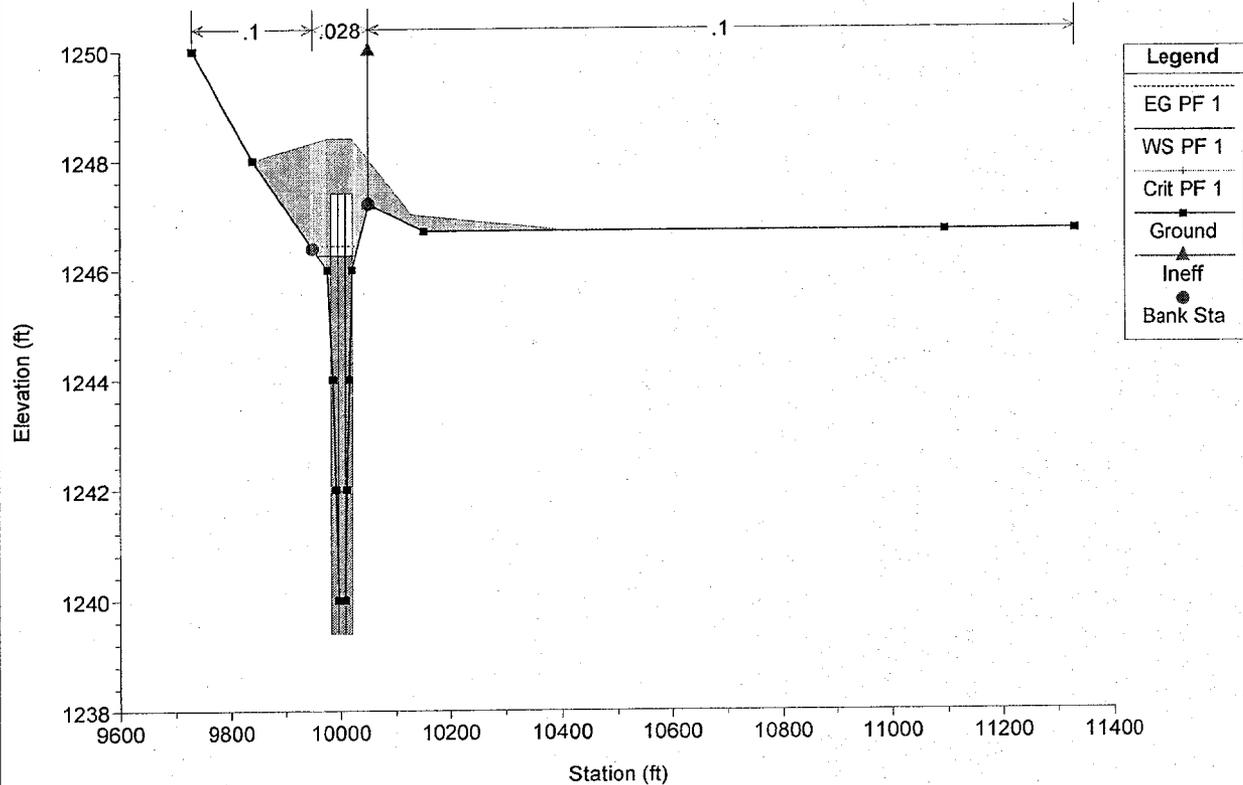


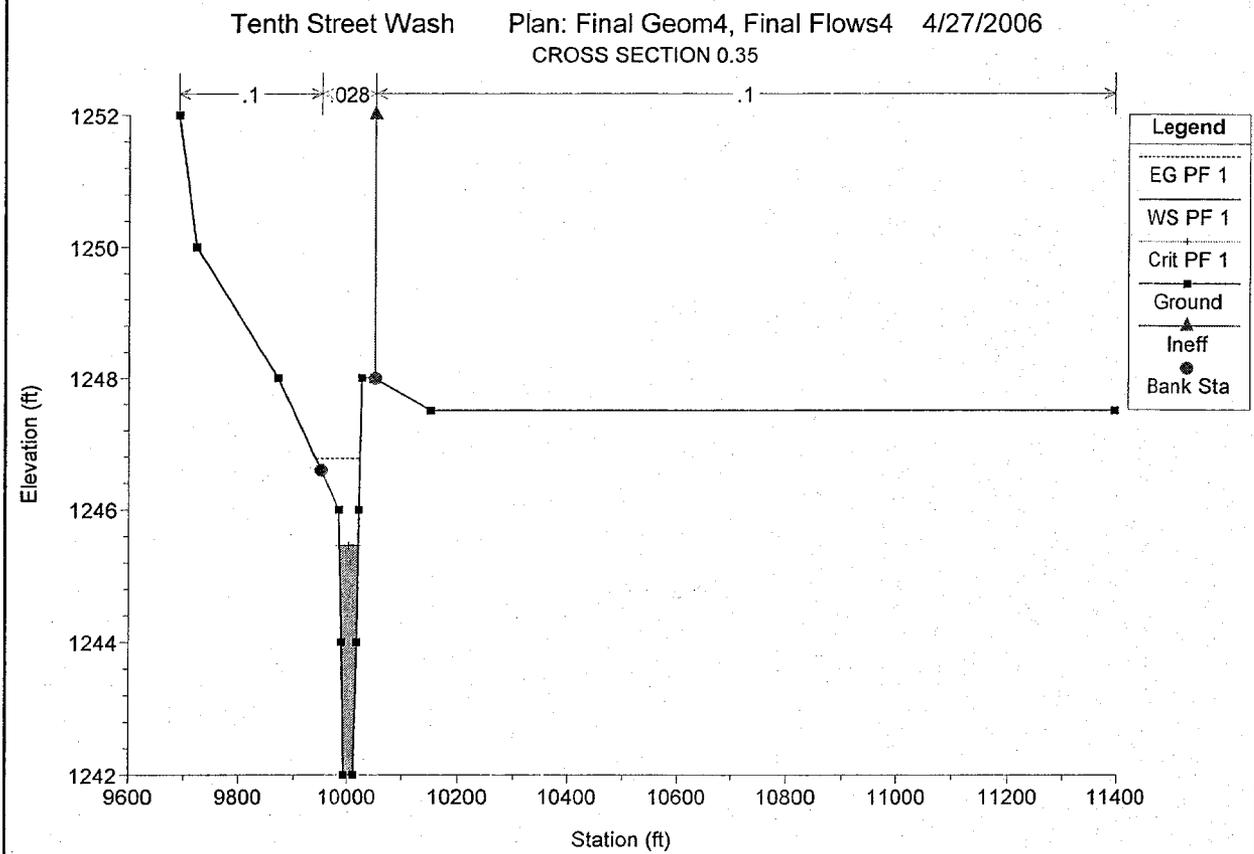
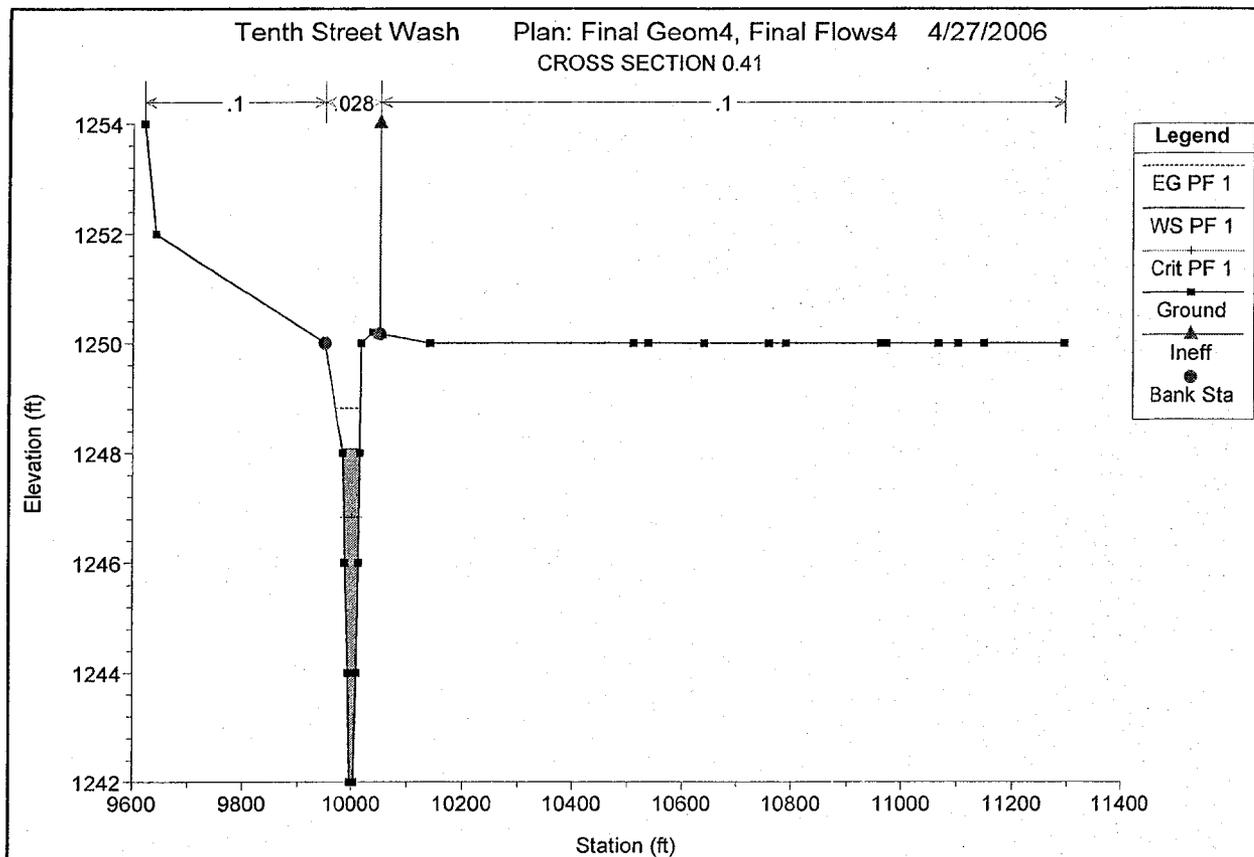


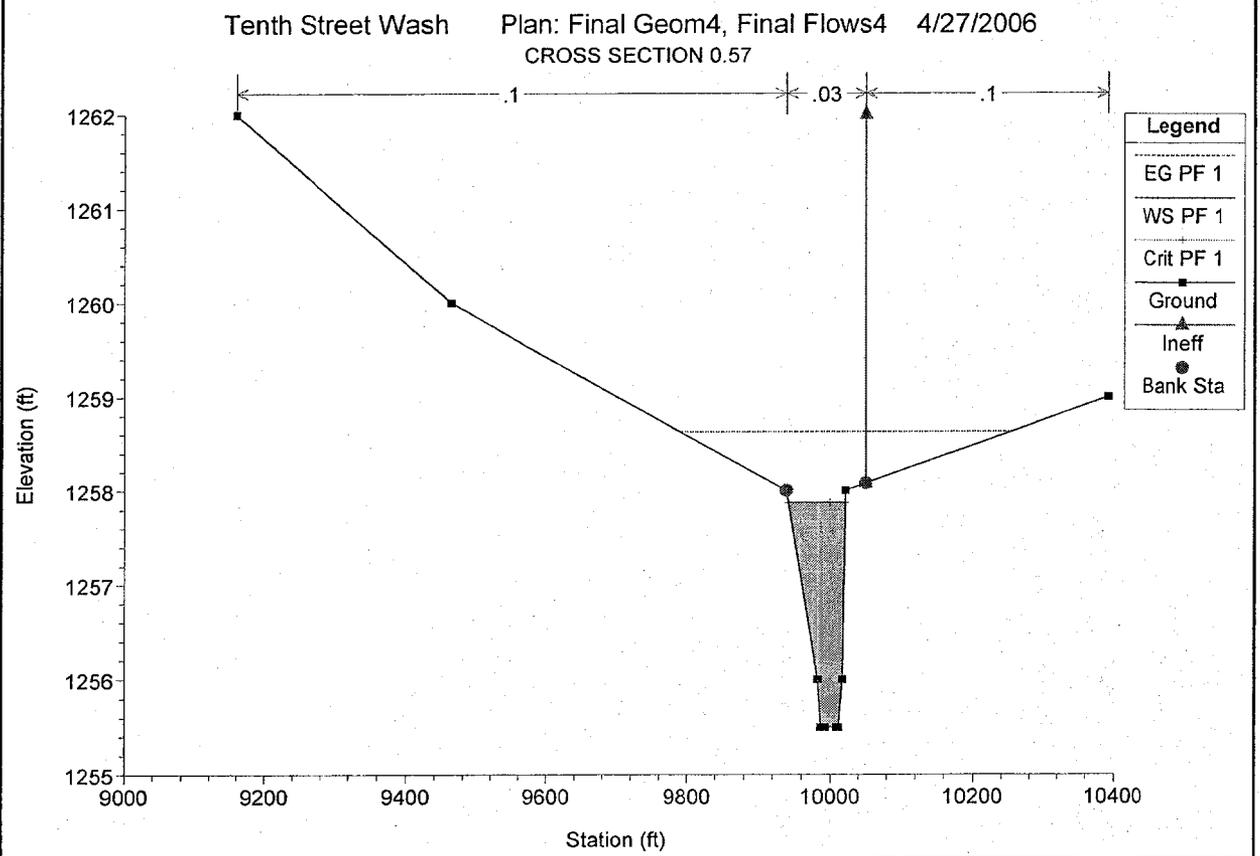
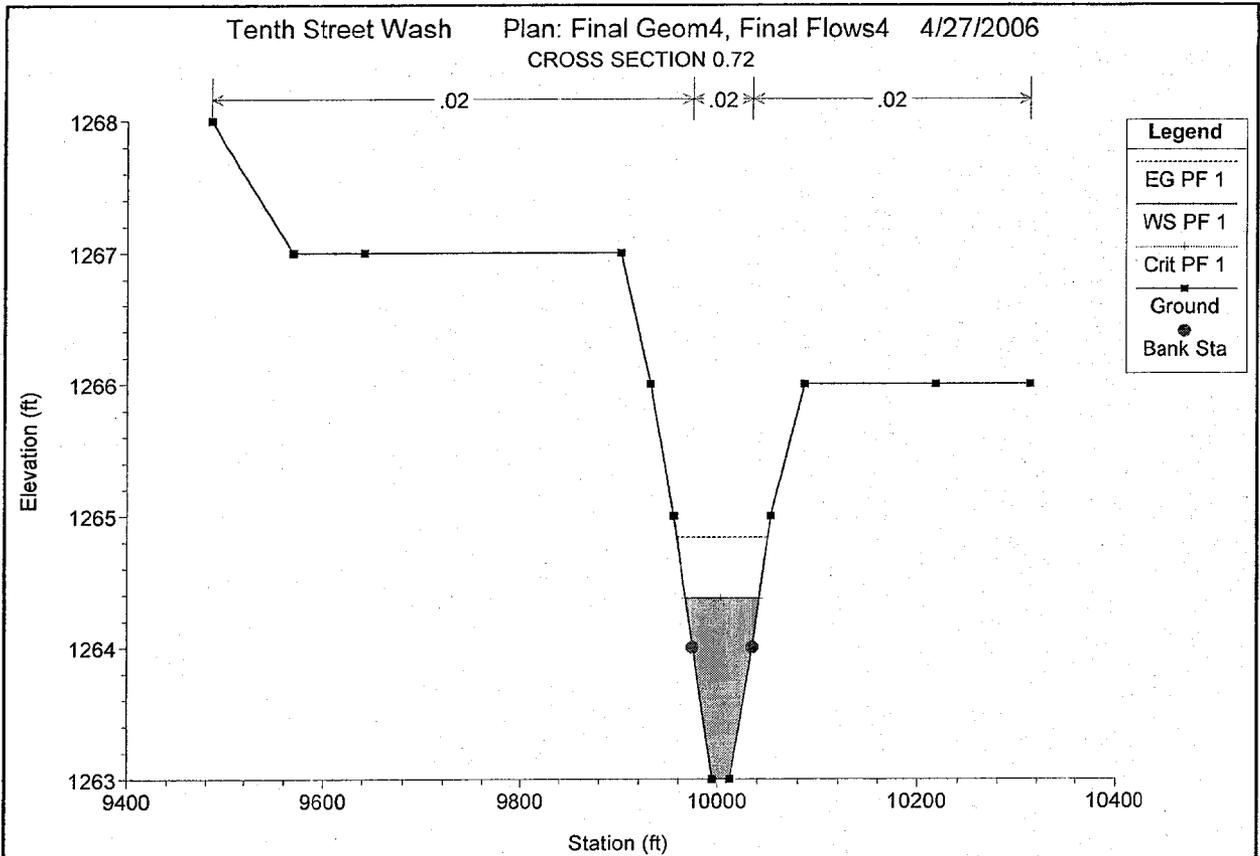
Tenth Street Wash Plan: Final Geom4, Final Flows4 4/27/2006
Butler Ave.



Tenth Street Wash Plan: Final Geom4, Final Flows4 4/27/2006
Butler Ave.







HEC-RAS Plan: Proposed River: Job1 Reach: Job1 Profile: PF 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chi
Job1	1.66	PF 1	600.00	1305.00	1310.73	1306.55	1310.74	0.000017	0.86	695.93	384.29	0.07
Job1	1.65	PF 1	600.00	1304.00	1310.45	1309.65	1310.66	0.002511	4.51	316.13	325.43	0.41
Job1	1.64	PF 1	600.00	1304.00	1310.27	1309.57	1310.43	0.002127	3.95	381.91	379.70	0.37
Job1	1.61	PF 1	600.00	1303.00	1308.80	1308.36	1309.48	0.008858	6.65	100.53	63.36	0.73
Job1	1.57	PF 1	600.00	1299.00	1307.53	1304.96	1307.77	0.008827	4.18	183.86	105.18	0.37
Job1	1.55	PF 1	600.00	1298.00	1305.99	1303.97	1306.50	0.015935	5.76	104.20	24.90	0.50
Job1	1.528	PF 1	600.00	1297.00	1304.68	1301.90	1304.95	0.007627	4.19	143.08	34.22	0.36
Job1	1.527	PF 1	840.00	1297.00	1302.85	1302.85	1304.46	0.063819	10.19	82.47	25.45	1.00
Job1	1.509		Culvert									
Job1	1.49	PF 1	840.00	1296.00	1302.66	1300.37	1303.06	0.010796	5.04	166.59	40.64	0.44
Job1	1.46	PF 1	840.00	1294.00	1299.99	1299.78	1301.03	0.009916	8.19	102.62	41.35	0.92
Job1	1.40	PF 1	840.00	1291.00	1296.47	1296.39	1297.97	0.010844	9.84	85.33	26.92	0.97
Job1	1.39		Culvert									
Job1	1.38	PF 1	840.00	1290.00	1297.62	1294.65	1297.85	0.003262	3.93	248.62	156.53	0.32
Job1	1.35	PF 1	840.00	1290.00	1296.50	1295.36	1296.88	0.007976	5.22	227.66	192.64	0.49
Job1	1.27	PF 1	760.00	1287.00	1293.17	1292.76	1293.51	0.009094	5.25	265.77	268.23	0.51
Job1	1.244	PF 1	720.00	1286.00	1292.38	1290.58	1292.52	0.002920	3.43	361.58	247.19	0.30
Job1	1.242	PF 1	980.00	1286.00	1291.79	1291.73	1292.37	0.017860	7.03	239.00	219.80	0.70
Job1	1.238	PF 1	940.00	1287.00	1291.93	1289.22	1291.96	0.000074	1.64	698.75	337.89	0.14
Job1	1.23	PF 1	920.00	1287.00	1291.78	1289.83	1291.92	0.002196	3.60	462.92	254.46	0.30
Job1	1.22	PF 1	920.00	1284.00	1290.95	1289.77	1291.59	0.009330	6.67	205.70	195.31	0.57
Job1	1.18	PF 1	880.00	1283.00	1289.50	1289.12	1289.75	0.005787	4.87	387.03	307.91	0.45
Job1	1.138	PF 1	820.00	1283.00	1288.41	1287.61	1288.47	0.005343	2.43	445.72	327.33	0.37
Job1	1.136	PF 1	960.00	1282.00	1287.78	1287.78	1288.32	0.015625	7.21	277.42	261.34	0.72
Job1	1.13	PF 1	880.00	1283.00	1285.97	1284.80	1286.01	0.000155	1.76	629.37	423.14	0.19
Job1	1.12	PF 1	560.00	1282.00	1285.43	1285.43	1285.87	0.004471	5.99	248.04	361.49	0.70
Job1	1.09	PF 1	420.00	1281.00	1284.40	1284.40	1284.73	0.005124	5.67	223.66	361.35	0.72
Job1	1.07	PF 1	380.00	1280.00	1283.05	1283.05	1283.31	0.004643	5.25	238.25	370.09	0.69
Job1	1.06	PF 1	380.00	1280.00	1282.15	1281.01	1282.17	0.000270	1.55	475.85	419.40	0.23
Job1	1.05	PF 1	380.00	1280.00	1282.06	1281.03	1282.10	0.003702	2.61	288.65	237.12	0.39
Job1	1.03	PF 1	380.00	1278.00	1281.59	1280.94	1281.66	0.002878	2.98	330.24	323.62	0.36
Job1	1.005	PF 1	380.00	1277.00	1280.72	1280.69	1280.97	0.009006	4.88	211.43	411.66	0.62
Job1	0.998	PF 1	380.00	1277.00	1280.68	1278.79	1280.70	0.000121	1.38	471.16	598.44	0.16
Job1	0.99	PF 1	380.00	1277.00	1280.59	1280.34	1280.65	0.003011	2.83	412.73	660.04	0.33
Job1	0.96	PF 1	340.00	1276.00	1280.39	1278.85	1280.39	0.000254	0.97	992.77	864.93	0.10
Job1	0.94	PF 1	340.00	1275.00	1277.71	1277.71	1278.60	0.029135	7.58	44.86	25.25	1.00
Job1	0.935	PF 1	340.00	1276.00	1277.61	1276.93	1277.76	0.000909	3.05	111.36	519.11	0.43
Job1	0.929	PF 1	340.00	1275.00	1277.36	1276.93	1277.64	0.005893	4.28	85.21	86.93	0.61
Job1	0.89	PF 1	340.00	1272.00	1276.28	1275.62	1276.63	0.005342	4.75	88.48	194.62	0.60
Job1	0.87	PF 1	340.00	1272.00	1274.37	1274.37	1274.92	0.022791	6.03	70.02	116.34	0.83
Job1	0.86	PF 1	340.00	1271.00	1273.54	1272.29	1273.58	0.000373	1.60	213.02	181.48	0.26
Job1	0.85	PF 1	340.00	1270.00	1273.35	1272.08	1273.48	0.003232	3.07	145.11	134.12	0.34
Job1	0.79	PF 1	340.00	1266.00	1270.16	1270.16	1271.00	0.012571	7.35	46.32	31.09	1.02
Job1	0.73	PF 1	340.00	1262.00	1265.72	1265.72	1266.71	0.011668	7.99	42.53	21.81	1.01
Job1	0.72	PF 1	340.00	1263.00	1264.37	1264.37	1264.84	0.005380	5.50	63.54	73.99	0.96
Job1	0.57	PF 1	255.00	1255.80	1258.55	1256.94	1258.58	0.000403	1.38	217.80	416.67	0.19

35

16

STEEL F

16



4" GATE POST

4' GATE POST

GRAVEL DRIVE

BOLLARDS

37.19°

(NW) = 1244.58 (24")

(N) = 1243.65 (36")

(S) = 1242.88 (48")

SDMH

RIM 1259.17

INV 1246.58 NW

INV 1244.76 S

APPROXIMATE LOCATION OF VAULT

ELEC VAULT

NORTH CURB LINE

SMIH

RIM 1258.59 NE

INV 1252.85 E

INV 1252.56 W

INV 1252.52 W

INV 1252.36 S

CONC

ALICE

85013
x 1259.280
PAVEMENT ELEVATION

36+87

2-6' x 4' BOX CULVERT

APPROXIMATE FLOODING LIMITS BASED ON PROPOSED WSE = 1258.55 (CONTAINED WITHIN STREET)

AVENUE

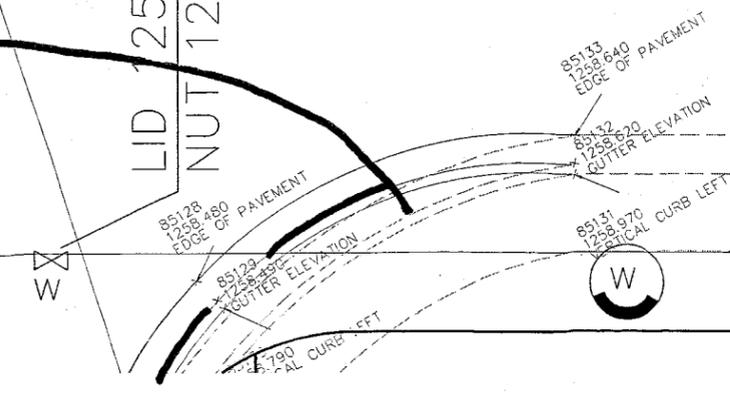
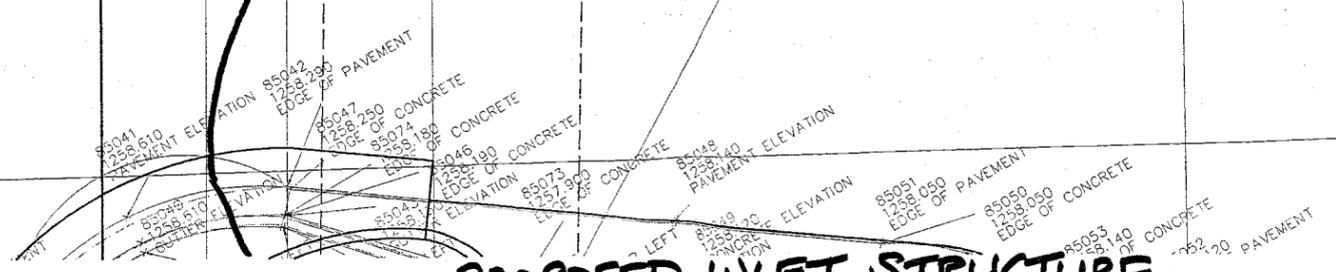
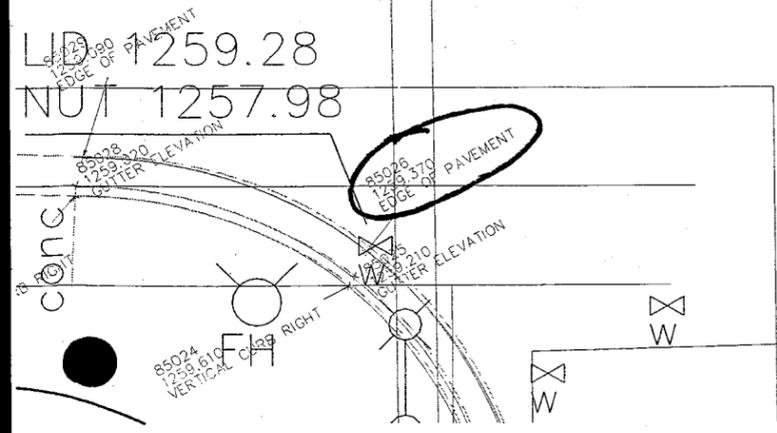
LID 1258.45

NUT 1256.37

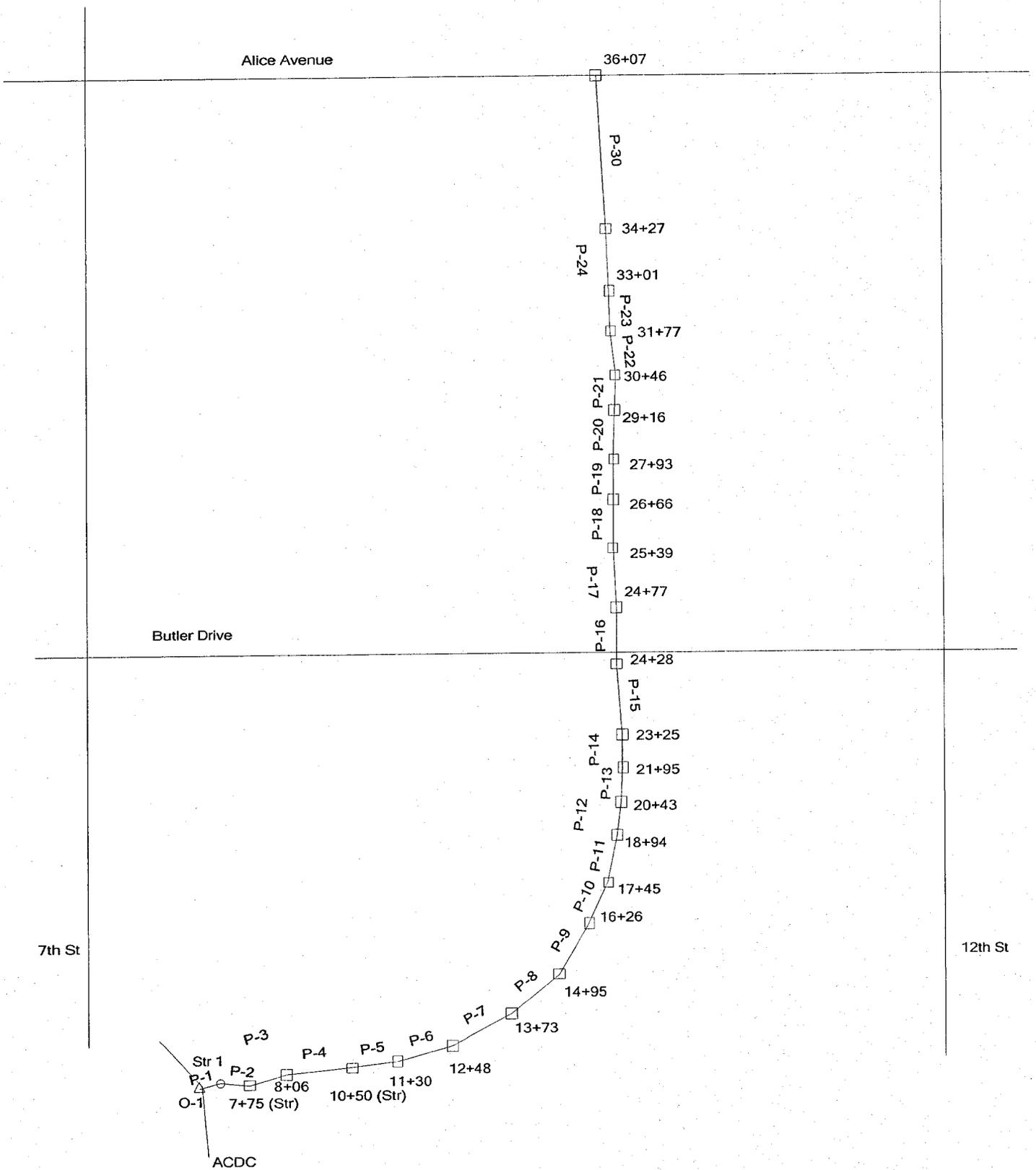
LID 1259.28

NUT 1257.98

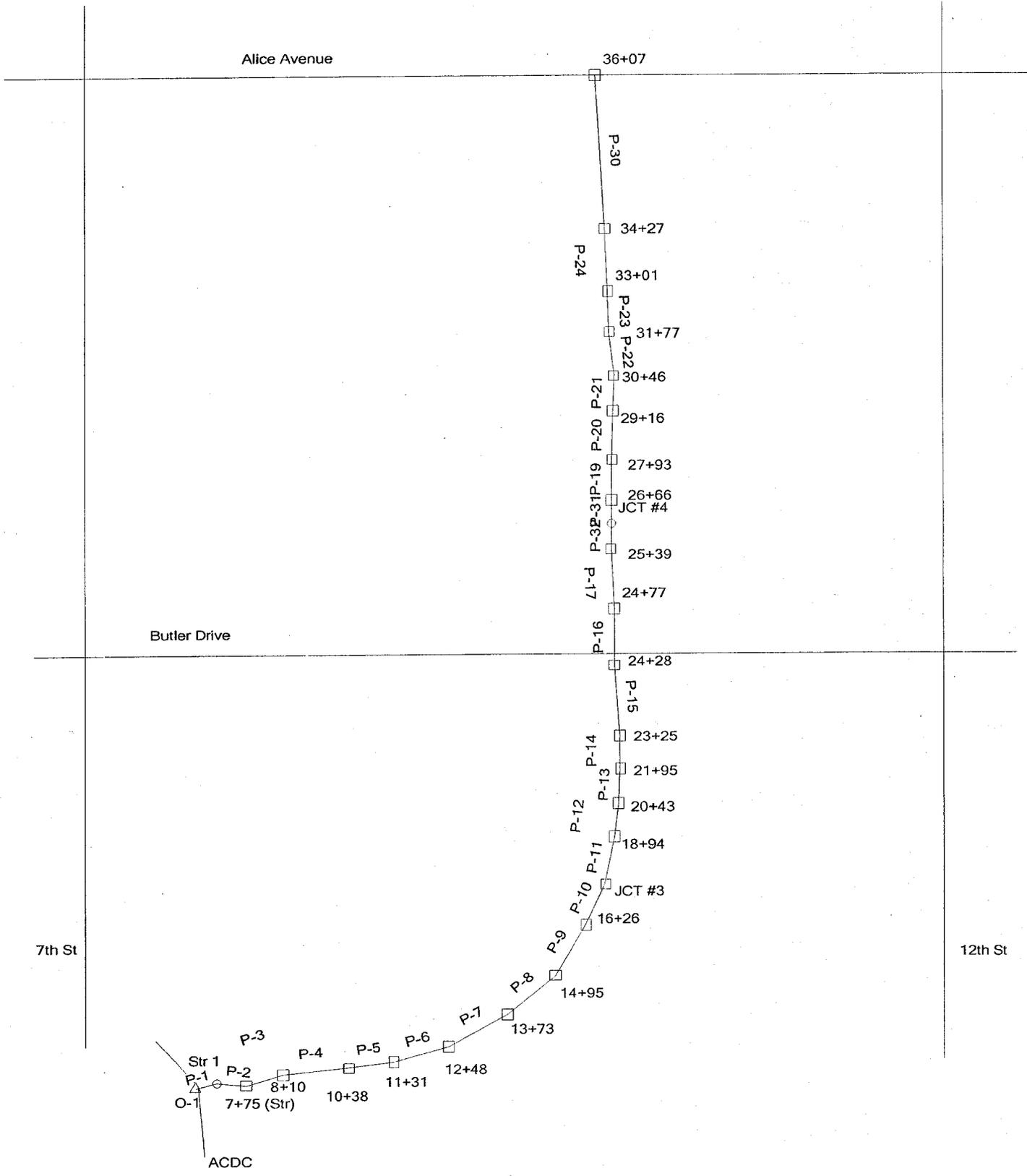
PROPOSED INLET STRUCTURE



Scenario: 100-yr Storm Event

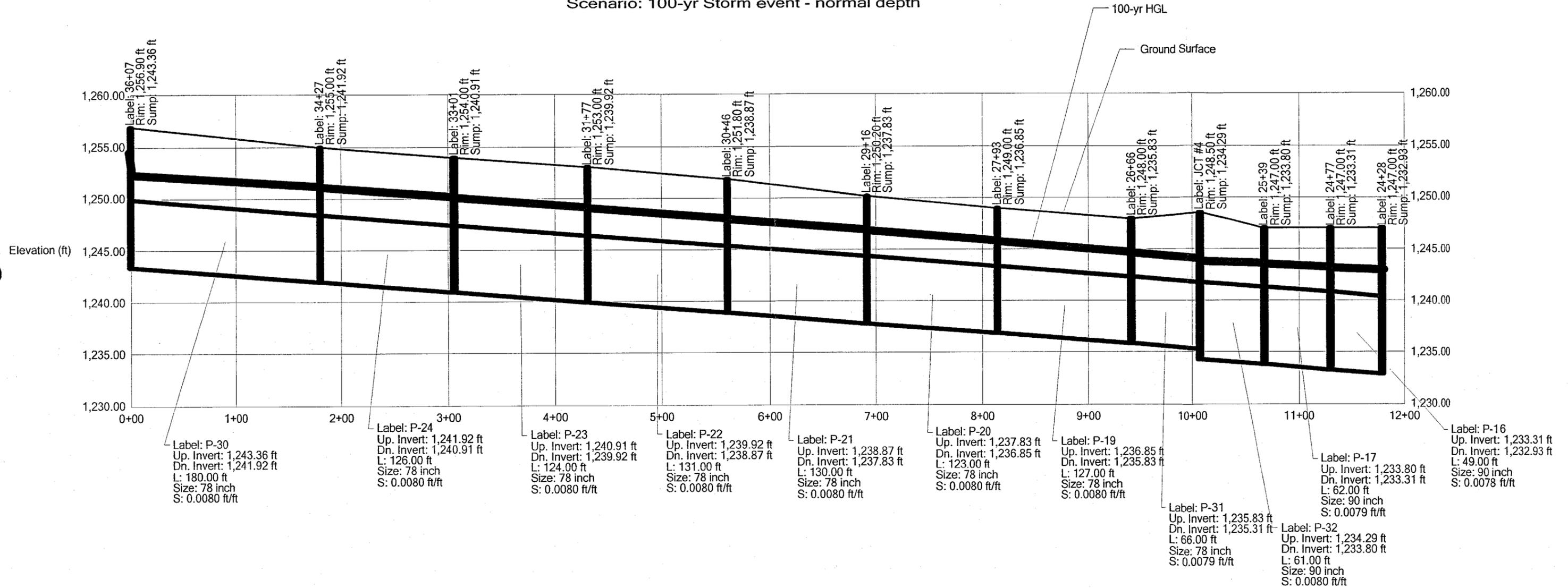


Scenario: 100-yr Storm event - normal depth



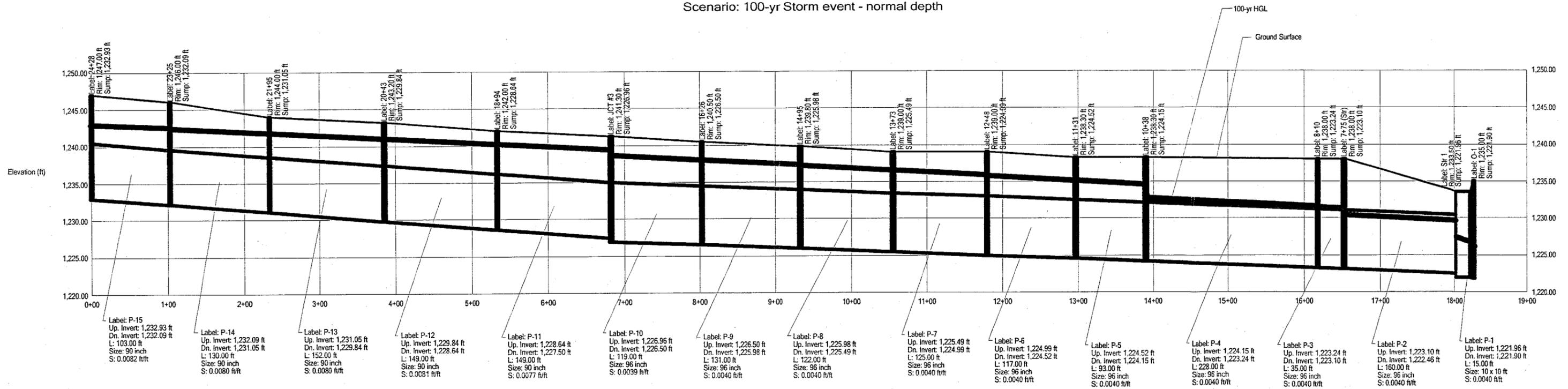
Profile
Scenario: 100-yr Storm event - normal depth

Profile: Alice Avenue to Butler Drive
Scenario: 100-yr Storm event - normal depth



Profile
Scenario: 100-yr Storm event - normal depth

Profile: Butler Drive to ACDC
Scenario: 100-yr Storm event - normal depth



Scenario: 100-yr Storm event - normal depth

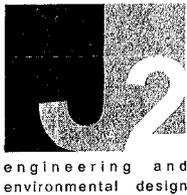
Combined Pipe\Node Report

Label	Upstream Node	Downstream Node	Length (ft)	Upstream Inlet Area (acres)	Upstream Inlet Rational Coefficient	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	Upstream Inlet Rational Flow (cfs)	Section Size	Full Capacity (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Description
P-4	10+38	8+10	228.00	0.00	0.00	0.00	0.00	0.00	96 inch	1,070.06	12.63	1,224.15	1,223.24	0.0040	
P-3	8+10	7+75 (Str)	35.00	0.00	0.00	0.00	0.00	0.00	96 inch	1,153.63	12.72	1,223.24	1,223.10	0.0040	
P-2	7+75 (Str)	Str 1	160.00	0.00	0.00	0.00	0.00	0.00	96 inch	1,153.63	12.81	1,223.10	1,222.46	0.0040	
P-1	Str 1	O-1	15.00	N/A	N/A	N/A	0.00	N/A	10 x 10 ft	2,663.21	13.20	1,221.96	1,221.90	0.0040	
P-14	23+25	21+95	130.00	0.00	0.00	0.00	0.00	0.00	90 inch	1,275.43	11.02	1,232.09	1,231.05	0.0080	
P-13	21+95	20+43	152.00	0.00	0.00	0.00	0.00	0.00	90 inch	1,272.28	11.09	1,231.05	1,229.84	0.0080	
P-12	20+43	18+94	149.00	0.00	0.00	0.00	0.00	0.00	90 inch	1,279.70	11.16	1,229.84	1,228.64	0.0081	
P-11	18+94	JCT #3	149.00	0.00	0.00	0.00	0.00	0.00	90 inch	1,247.30	11.23	1,228.64	1,227.50	0.0077	
P-10	JCT #3	16+26	119.00	0.00	0.00	0.00	0.00	0.00	96 inch	1,053.07	12.05	1,226.96	1,226.50	0.0039	
P-9	16+26	14+95	131.00	0.00	0.00	0.00	0.00	0.00	96 inch	1,067.14	12.11	1,226.50	1,225.98	0.0040	
P-8	14+95	13+73	122.00	0.00	0.00	0.00	0.00	0.00	96 inch	1,073.43	12.24	1,225.98	1,225.49	0.0040	
P-7	13+73	12+48	125.00	0.00	0.00	0.00	0.00	0.00	96 inch	1,071.23	12.29	1,225.49	1,224.99	0.0040	
P-6	12+48	11+31	117.00	0.00	0.00	0.00	0.00	0.00	96 inch	1,073.52	12.35	1,224.99	1,224.52	0.0040	
P-17	25+39	24+77	62.00	0.00	0.00	0.00	0.00	0.00	90 inch	1,267.69	10.23	1,233.80	1,233.31	0.0079	
P-16	24+77	24+28	49.00	0.00	0.00	0.00	0.00	0.00	90 inch	1,255.75	10.46	1,233.31	1,232.93	0.0078	
P-15	24+28	23+25	103.00	0.00	0.00	0.00	0.00	0.00	90 inch	1,386.81	10.76	1,232.93	1,232.09	0.0082	
P-5	11+31	10+38	93.00	0.00	0.00	0.00	0.00	0.00	96 inch	1,150.53	12.49	1,224.52	1,224.15	0.0040	
P-24	34+27	33+01	126.00	0.00	0.00	0.00	0.00	0.00	78 inch	871.68	12.75	1,241.92	1,240.91	0.0080	
P-23	33+01	31+77	124.00	0.00	0.00	0.00	0.00	0.00	78 inch	869.94	12.84	1,240.91	1,239.92	0.0080	
P-22	31+77	30+46	131.00	0.00	0.00	0.00	0.00	0.00	78 inch	871.65	13.05	1,239.92	1,238.87	0.0080	
P-21	30+46	29+16	130.00	0.00	0.00	0.00	0.00	0.00	78 inch	870.82	13.14	1,238.87	1,237.83	0.0080	
P-20	29+16	27+93	123.00	0.00	0.00	0.00	0.00	0.00	78 inch	869.05	13.35	1,237.83	1,236.85	0.0080	
P-19	27+93	26+66	127.00	0.00	0.00	0.00	0.00	0.00	78 inch	872.53	13.44	1,236.85	1,235.83	0.0080	
P-30	36+07	34+27	180.00	0.00	0.00	0.00	0.00	0.00	78 inch	937.80	12.66	1,243.36	1,241.92	0.0080	
P-31	26+66	JCT #4	66.00	0.00	0.00	0.00	0.00	0.00	78 inch	864.20	13.53	1,235.83	1,235.31	0.0079	
P-32	JCT #4	25+39	61.00	N/A	N/A	N/A	0.00	N/A	90 inch	1,278.04	10.16	1,234.29	1,233.80	0.0080	

Scenario: 100-yr Storm event - normal depth

DOT Report

Label	-Node- Upstream Downstream	Upstream Inlet Area (acres)	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	Section Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-4	10+38	0.00	0.00	0.00	1,238.30	1,232.83	1,270.00	Circular	228.00	12.63	
	8+10				1,238.00	1,231.55	1,070.06	96 inch			
P-3	8+10	0.00	0.00	0.00	1,238.00	1,231.50	1,279.00	Circular	35.00	12.72	
	7+75 (Str)				1,238.00	1,231.33	1,153.63	96 inch			
P-2	7+75 (Str)	0.00	0.00	0.00	1,238.00	1,230.48	1,287.70	Circular	160.00	12.81	
	Str 1				1,233.50	1,229.68	1,153.63	96 inch			
P-1	Str 1	N/A	N/A	0.00	1,233.50	1,226.84	1,287.70	Box	15.00	13.20	
	O-1				1,235.00	1,226.78	2,663.21	10 x 10 ft			
P-14	23+25	0.00	0.00	0.00	1,246.00	1,242.39	974.00	Circular	130.00	11.02	
	21+95				1,244.00	1,241.74	1,275.43	90 inch			
P-13	21+95	0.00	0.00	0.00	1,244.00	1,241.74	980.00	Circular	152.00	11.09	
	20+43				1,243.20	1,241.02	1,272.28	90 inch			
P-12	20+43	0.00	0.00	0.00	1,243.20	1,240.97	986.00	Circular	149.00	11.16	
	18+94				1,242.00	1,240.26	1,279.70	90 inch			
P-11	18+94	0.00	0.00	0.00	1,242.00	1,240.21	992.00	Circular	149.00	11.23	
	JCT #3				1,241.30	1,239.49	1,247.30	90 inch			
P-10	JCT #3	0.00	0.00	0.00	1,241.30	1,238.65	1,211.00	Circular	119.00	12.05	
	16+26				1,240.50	1,238.04	1,053.07	96 inch			
P-9	16+26	0.00	0.00	0.00	1,240.50	1,237.99	1,217.00	Circular	131.00	12.11	
	14+95				1,239.80	1,237.31	1,067.14	96 inch			
P-8	14+95	0.00	0.00	0.00	1,239.80	1,237.21	1,230.00	Circular	122.00	12.24	
	13+73				1,239.00	1,236.57	1,073.43	96 inch			
P-7	13+73	0.00	0.00	0.00	1,239.00	1,236.52	1,236.00	Circular	125.00	12.29	
	12+48				1,239.00	1,235.85	1,071.23	96 inch			
P-6	12+48	0.00	0.00	0.00	1,239.00	1,235.80	1,242.00	Circular	117.00	12.35	
	11+31				1,238.30	1,235.17	1,073.52	96 inch			
P-17	25+39	0.00	0.00	0.00	1,247.00	1,243.54	904.00	Circular	62.00	10.23	
	24+77				1,247.00	1,243.30	1,267.69	90 inch			
P-16	24+77	0.00	0.00	0.00	1,247.00	1,243.20	924.00	Circular	49.00	10.46	
	24+28				1,247.00	1,242.99	1,255.75	90 inch			
P-15	24+28	0.00	0.00	0.00	1,247.00	1,242.89	951.00	Circular	103.00	10.76	
	23+25				1,246.00	1,242.49	1,386.81	90 inch			
P-5	11+31	0.00	0.00	0.00	1,238.30	1,235.07	1,256.00	Circular	93.00	12.49	
	10+38				1,238.30	1,234.63	1,150.53	96 inch			
P-24	34+27	0.00	0.00	0.00	1,255.00	1,251.11	846.00	Circular	126.00	12.75	
	33+01				1,254.00	1,250.16	871.68	78 inch			
P-23	33+01	0.00	0.00	0.00	1,254.00	1,250.11	852.00	Circular	124.00	12.84	
	31+77				1,253.00	1,249.16	869.94	78 inch			
P-22	31+77	0.00	0.00	0.00	1,253.00	1,249.06	866.00	Circular	131.00	13.05	
	30+46				1,251.80	1,248.03	871.65	78 inch			
P-21	30+46	0.00	0.00	0.00	1,251.80	1,247.98	872.00	Circular	130.00	13.14	
	29+16				1,250.20	1,246.93	870.82	78 inch			
P-20	29+16	0.00	0.00	0.00	1,250.20	1,246.83	886.00	Circular	123.00	13.35	
	27+93				1,249.00	1,245.81	869.05	78 inch			
P-19	27+93	0.00	0.00	0.00	1,249.00	1,245.76	892.00	Circular	127.00	13.44	
	26+66				1,248.00	1,244.70	872.53	78 inch			
P-30	36+07	0.00	0.00	0.00	1,256.90	1,252.32	840.00	Circular	180.00	12.66	
	34+27				1,255.00	1,251.16	937.80	78 inch			
P-31	26+66	0.00	0.00	0.00	1,248.00	1,244.65	898.00	Circular	66.00	13.53	
	JCT #4				1,248.50	1,244.09	864.20	78 inch			
P-32	JCT #4	N/A	N/A	0.00	1,248.50	1,243.84	898.00	Circular	61.00	10.16	
	25+39				1,247.00	1,243.59	1,278.04	90 inch			



engineering and
environmental design

SHEET NO 1 OF 8

JOB NUMBER 05.0089

TITLE 10th Street Wash Storm Drain

SUBJECT Headlosses in Storm Drain

MADE BY FLU DATE _____ CHECKED BY jit DATE _____

Headlosses were assigned and calculated as follows:

1. Minor contributions to the storm drain (≤ 10 cfs) were assigned an absolute headloss of 0.05-ft at each location. In HEC-22, these losses are not even considered, so this headloss is conservative.
2. Contributions to the storm drain (between 10-30 cfs) were assigned an absolute headloss of 0.10-ft.

A sample calculation for the inlet at 24+2515 is included in the pages that follow. Again HEC-22, does not consider losses at junctions where the flow is ≤ 30 cfs (or less than 10% of the trunk line flow) so this headloss is also conservative.

3. Calculations for headlosses at:

- Transition Structure #1
- Transition Structure #2
- Jet Structure #3 (at El Caminito)
- Jet Structure #4
- Jet Structure #6 (at Alice Ave)
- outlet structure to ACDC

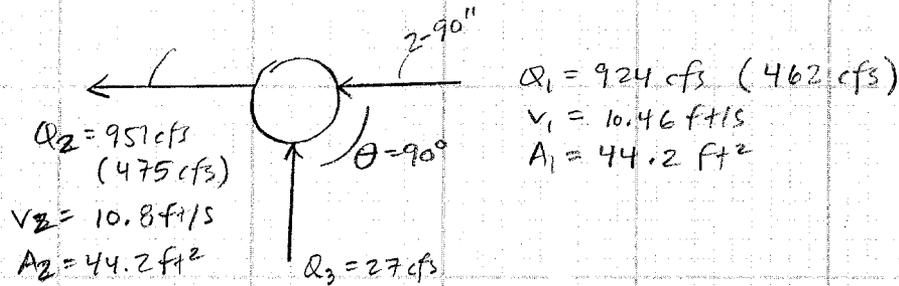
are included on separate sheets. All calculations presented follow a HEC-22-type of analysis.

TITLE 10th Street Storm Drain

SUBJECT Headloss at 24+25

MADE BY HLU DATE _____ CHECKED BY JH DATE _____

At 24+25:



$$h_j = \Delta y + \frac{v_1^2}{2g} - \frac{v_2^2}{2g}$$

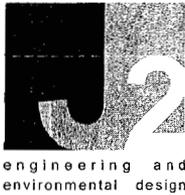
$$\Delta y = \frac{Q_2 v_2 - Q_1 v_1 - Q_3 v_3 \cos \theta}{\frac{1}{2} (A_1 + A_2) g} + \frac{1}{2} (S_{f_1} + S_{f_2}) L$$

$$\Delta y = \frac{(475 \text{ cfs})(10.8 \text{ ft/s}) - (462 \text{ cfs})(10.5 \text{ ft/s}) - 0}{\frac{1}{2} (44.2 + 44.2) (32.2 \text{ ft/s}^2)}$$

$$\Delta y = 0.20 \text{ ft}$$

$$h_j = 0.20 \text{ ft} + \frac{10.5^2}{2(32.2)} - \frac{10.8^2}{2(32.2)}$$

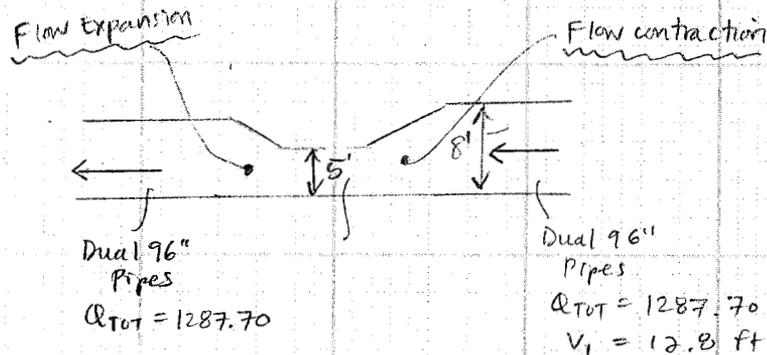
$$h_j = 0.10 \text{ ft}$$



TITLE 10th St. Wash
 SUBJECT Headloss at Transition Structure #1

MADE BY FLU DATE _____ CHECKED BY JH DATE _____

Transition Structure #1



From HEC-22:

Contraction Loss: $H_c = K_c \left(\frac{V_1^2}{2g} \right)$

V_1 = velocity upstream of transition

Expansion Loss: $H_e = K_e \left(\frac{V_2^2}{2g} \right)$

V_2 = velocity D/S of transition

From tables in HEC-22: (Table 7-4e)

Contraction loss:

$\frac{D_2}{D_1} = \frac{8'}{5'} = 1.6$

(ratio of larger pipe to smaller pipe)

$V_1 = \frac{0.5(1287.7 \text{ cfs})}{(5 \text{ ft} \times 13.63 \text{ ft})} = 9.5 \text{ ft/s.}$

$K_c = 0.26$

$H_c = 0.26 \left(\frac{9.5 \text{ ft/s}^2}{2(32.2)} \right)$ $H_c = 0.36 \text{ ft}$

Expansion loss:

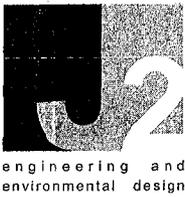
HEC-22 (Table 7-4e):

$\frac{D_2}{D_1} = 1.6, V_1 = 9.5 \text{ ft/s} \quad K_e = 0.35$

$H_e = 0.35 \left(\frac{9.5 \text{ ft/s}^2}{2(32.2)} \right)$ $H_e = 0.49 \text{ ft}$

$H_{TOT} = H_c + H_e = 0.36 + 0.49$

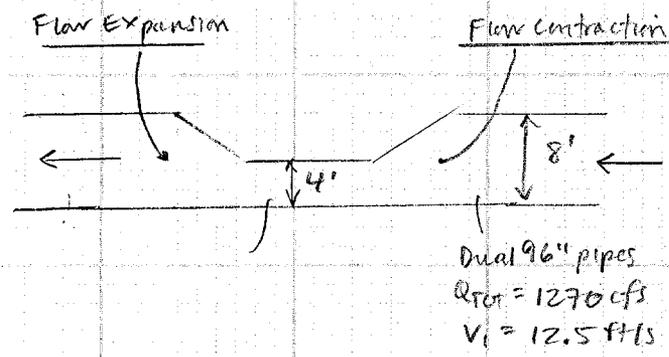
$H_{TOT} = 0.85 \text{ ft}$



TITLE 10th St. Storm Drain
 SUBJECT Headloss at Transition Structure #2

MADE BY HLU DATE _____ CHECKED BY JH DATE _____

Transition Structure #2 :



width of structure = 13.6'

Contraction Loss: (Table 7-4e, HEC-22)

$$\frac{D_2}{D_1} = \frac{8'}{4'} = 2$$

$$V_1 = \frac{0.5 (1270 \text{ cfs})}{(4 \text{ ft} \times 13.6 \text{ ft})} = 11.7 \text{ ft/s}$$

$$K_c = 0.35$$

$$H_c = 0.35 \left(\frac{(11.7 \text{ ft/s})^2}{2(32.2)} \right)$$

$$H_c = 0.74 \text{ ft}$$

Expansion Loss: (Table 7-4c, HEC-22)

$$\frac{D_2}{D_1} = 2$$

$$V_1 = 11.7 \text{ ft/s}$$

$$K_e = 0.52$$

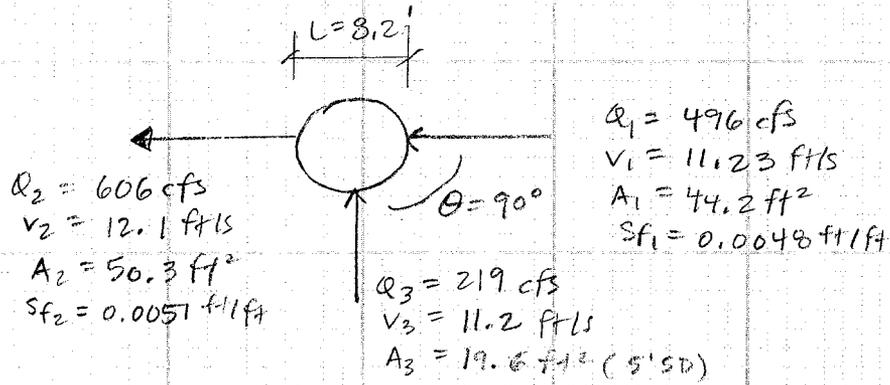
$$H_e = 0.52 \left(\frac{(11.7 \text{ ft/s})^2}{2(32.2)} \right)$$

$$H_e = 1.1 \text{ ft}$$

$$H_{TOT} = H_c + H_e = 0.74 \text{ ft} + 1.1 \text{ ft}$$

$$H_{TOT} = 1.8 \text{ ft}$$

At El Caminito :-



$$h_j = \Delta y + \frac{V_1^2}{2g} - \frac{V_2^2}{2g}$$

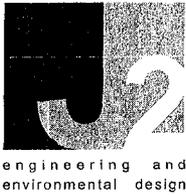
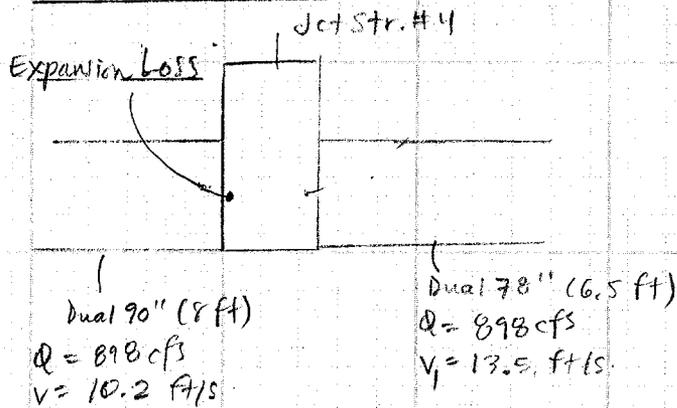
$$\Delta y = \frac{Q_2 V_2 - Q_1 V_1 - Q_3 V_3 \cos \theta}{\frac{1}{2}(A_1 + A_2)g} + \frac{1}{2}(S_{f1} + S_{f2})L$$

$$\Delta y = \frac{(606 \text{ cfs})(12.1 \text{ ft/s}) - (496 \text{ cfs})(11.2 \text{ ft/s}) - 0}{\frac{1}{2}(44.2 \text{ ft}^2 + 50.3 \text{ ft}^2)(32.2 \text{ ft/s}^2)} + \frac{1}{2}(0.0048 + 0.0051)(8.2)$$

$$\Delta y = 1.16 \text{ ft}$$

$$h_j = 1.2 + \frac{(11.2)^2}{2(32.2)} - \frac{(12.1)^2}{2(32.2)}$$

$$h_j = 0.84 \text{ ft}$$

TITLE 10th St. Storm DrainSUBJECT Headloss at Jet Str. #4MADE BY FLU DATE _____ CHECKED BY JH DATE _____Jet. Structure #4

$$Q = 898 \text{ cfs}$$

$$V = 10.2 \text{ ft/s}$$

$$Q = 898 \text{ cfs}$$

$$V_1 = 13.5 \text{ ft/s}$$

Expansion Loss

$$H_e = k_e \left(\frac{V_1^2}{2g} \right)$$

$V_1 =$ velocity upstream of the transition
(13.5 ft/s)

$$\frac{D_2}{D_1} = \frac{8'}{6.5'} = 1.2$$

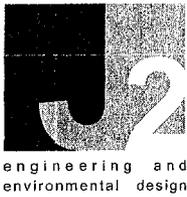
$$k_e = 0.09$$

$$V_1 = 13.5 \text{ ft/s}$$

$$H_e = k_e \left(\frac{V_1^2}{2g} \right)$$

$$H_e = 0.09 \left(\frac{(13.5 \text{ ft/s})^2}{2(32.2 \text{ ft/s}^2)} \right)$$

$$H_e = 0.25 \text{ ft}$$

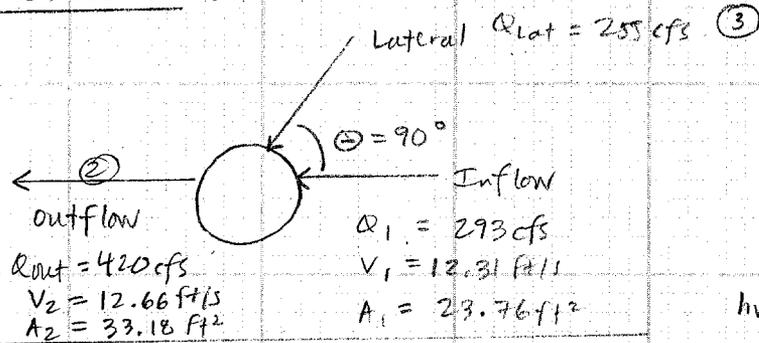


engineering and
environmental design

TITLE 10th Street Storm Drain
SUBJECT Headloss at Alice Ave (Jct #6)

MADE BY Flu DATE _____ CHECKED BY JA DATE _____

At Alice Avenue: (Jct #6)



$$h_{v_1} = \frac{V_1^2}{2g}$$

$$h_{v_2} = \frac{V_2^2}{2g}$$

$$h_j = \Delta y + h_{v_1} - h_{v_2}$$

$$\Delta y = \frac{Q_2 V_2 - Q_1 V_1 - Q_3 V_3 \cos \theta}{\frac{1}{2} (A_1 + A_2) g} + \frac{1}{2} (S_{f_1} + S_{f_2}) L$$

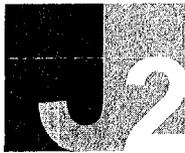
negligible

$$A_y = \frac{(420 \text{ cfs})(12.7 \text{ ft/s}) - (293 \text{ cfs})(12.3 \text{ ft/s}) - 0}{\frac{1}{2} (23.76 + 33.18 \text{ ft}^2)(32.2 \text{ ft/s}^2)}$$

$$h_j = 1.90 + \frac{(12.3)^2}{2(32.2)} - \frac{(12.7)^2}{2(32.2)}$$

$h_j = 2.15 \text{ ft}$

* Calculations were done for one pipe.



engineering and
environmental design

SHEET NO B OF 8

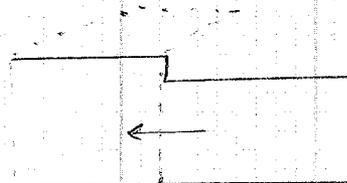
JOB NUMBER 05.0089

TITLE 10th Street SB.

SUBJECT Headloss at Transition to ACDC outlet

MADE BY FLU DATE _____ CHECKED BY JK DATE _____

Outlet Structure at ACDC



2-10x10-ft
Double Barrel Box
 $v = 13.2 \text{ ft/s}$
 $Q = 1288 \text{ cfs}$

Dual 96" pipes
 $v = 12.8 \text{ cfs}$

Expansion Loss:

$$H_e = K_e \left(\frac{v_1^2}{2g} \right)$$

$v_1 =$ velocity ups of transition

$$\frac{D_2}{D_1} = \frac{10'}{8'} = 1.25 \quad \left. \vphantom{\frac{D_2}{D_1}} \right\} K_e = 0.23$$

$$v_1 = 12.8 \text{ ft/s}$$

$$H_e = K_e \left(\frac{v_1^2}{2g} \right)$$

$$H_e = 0.23 \left(\frac{(12.8 \text{ ft/s})^2}{2(32.2 \text{ ft/s}^2)} \right)$$

$$H_e = 0.59 \text{ ft}$$

Worksheet for Outfall into ACDC

Project Description

Flow Element:	Rectangular Channel
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data

Roughness Coefficient:	0.013	
Channel Slope:	0.00400	ft/ft
Bottom Width:	20.00	ft
Discharge:	1279.10	ft ³ /s

Results

Normal Depth:	4.26	ft
Flow Area:	85.27	ft ²
Wetted Perimeter:	28.53	ft
Top Width:	20.00	ft
Critical Depth:	5.03	ft
Critical Slope:	0.00247	ft/ft
Velocity:	15.00	ft/s
Velocity Head:	3.50	ft
Specific Energy:	7.76	ft
Froude Number:	1.28	
Flow Type:	Supercritical	

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
Downstream Velocity:	Infinity	ft/s
Upstream Velocity:	Infinity	ft/s
Normal Depth:	4.26	ft
Critical Depth:	5.03	ft
Channel Slope:	0.00400	ft/ft
Critical Slope:	0.00247	ft/ft

Inlet Calculations for 10th Street

Orifice Flow (curb opening)

$Q_{orifice} = C_o A (2gd)^{0.5}$

Orifice Coefficient $C_o = 0.67$
 Height of Curb Opening (in) = 5
 Clogging Factor (percent open) = 0.8

Inlet Location (Station)	Curb Opening Length (ft)	Clogged Curb Opening Length (ft)	Area of Curb Opening (ft ²)	Assumed Flow Depth at Curb Opening (ft)	Curb Opening Qorifice (cfs)
6+83	9	7.2	3.00	0.50	8.7
8+10	9	7.2	3.00	0.50	8.7
7+92	9	7.2	3.00	0.50	8.7
10+38	13	10.4	4.33	0.50	12.6
11+31	13	10.4	4.33	0.50	12.6
12+48	13	10.4	4.33	0.50	12.6
13+73	9	7.2	3.00	0.50	8.7
14+95	13	10.4	4.33	0.50	12.6
16+26	9	7.2	3.00	0.50	8.7
17+20	13	10.4	4.33	0.50	12.6
18+94	9	7.2	3.00	0.50	8.7
20+43	13	10.4	4.33	0.50	12.6
21+76	9	7.2	3.00	0.50	8.7
23+25	9	7.2	3.00	0.50	8.7
24+77	13	10.4	4.33	0.50	12.6
25+39	9	7.2	3.00	0.50	8.7
26+66	13	10.4	4.33	0.50	12.6
27+93	9	7.2	3.00	0.50	8.7
29+16	13	10.4	4.33	0.50	12.6
30+46	9	7.2	3.00	0.50	8.7
31+77	13	10.4	4.33	0.50	12.6
33+01	9	7.2	3.00	0.50	8.7
34+27	13	10.4	4.33	0.50	12.6
35+55	13	10.4	4.33	0.50	12.6

Total Flow Intercepted = 256 cfs

Calculations for Inlet Structure at Alice Avenue (JCT #6)
 Station 36+08.52
 Drawing Numbers SD7 and S7

Grate Opening - Weir Flow

$$Q_{weir} = C_w P_{eff} d^{1.5}$$

Width of Grate (ft) = 33.42
 Length of Grate (ft) = 2.79
 Perimeter of Grate (ft) = 72.42
 Weir Coefficient = 3
 Clogging Factor (%) = 50
 Effective Perimeter (ft) = 39

Grate Opening - Orifice Flow

$$Q_{orifice} = C_o A_{open} (2gd)^{0.5}$$

Orifice Coefficient = 0.67
 Area of Grate (ft²) = 93.24
 Adjusted Area (ft²) = 37.30
 (Assume bars block 20% of open area,
 clogging blocks 50% of remaining open area)

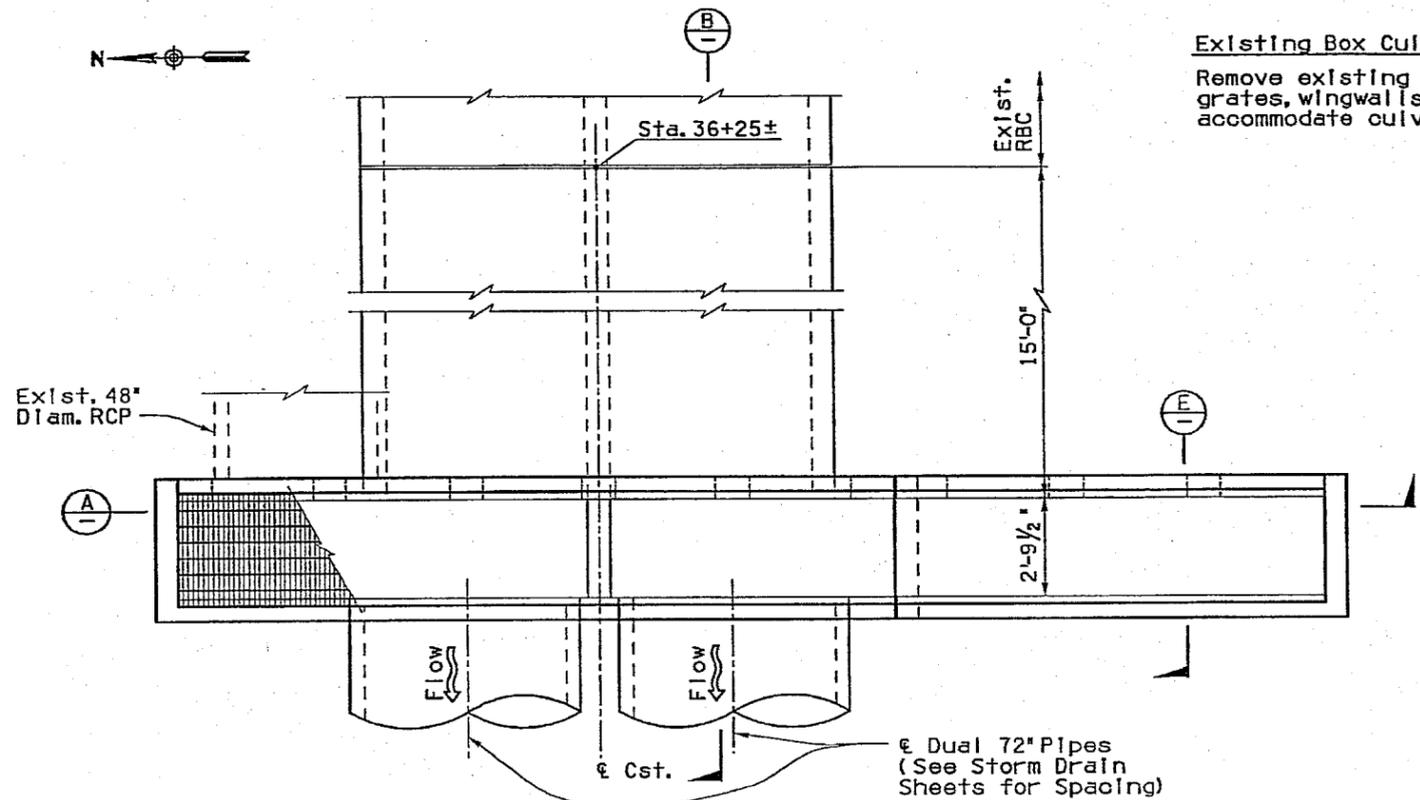
Curb Opening - Orifice Flow

$$Q_{orifice} = C_o A_{open} (2gd)^{0.5}$$

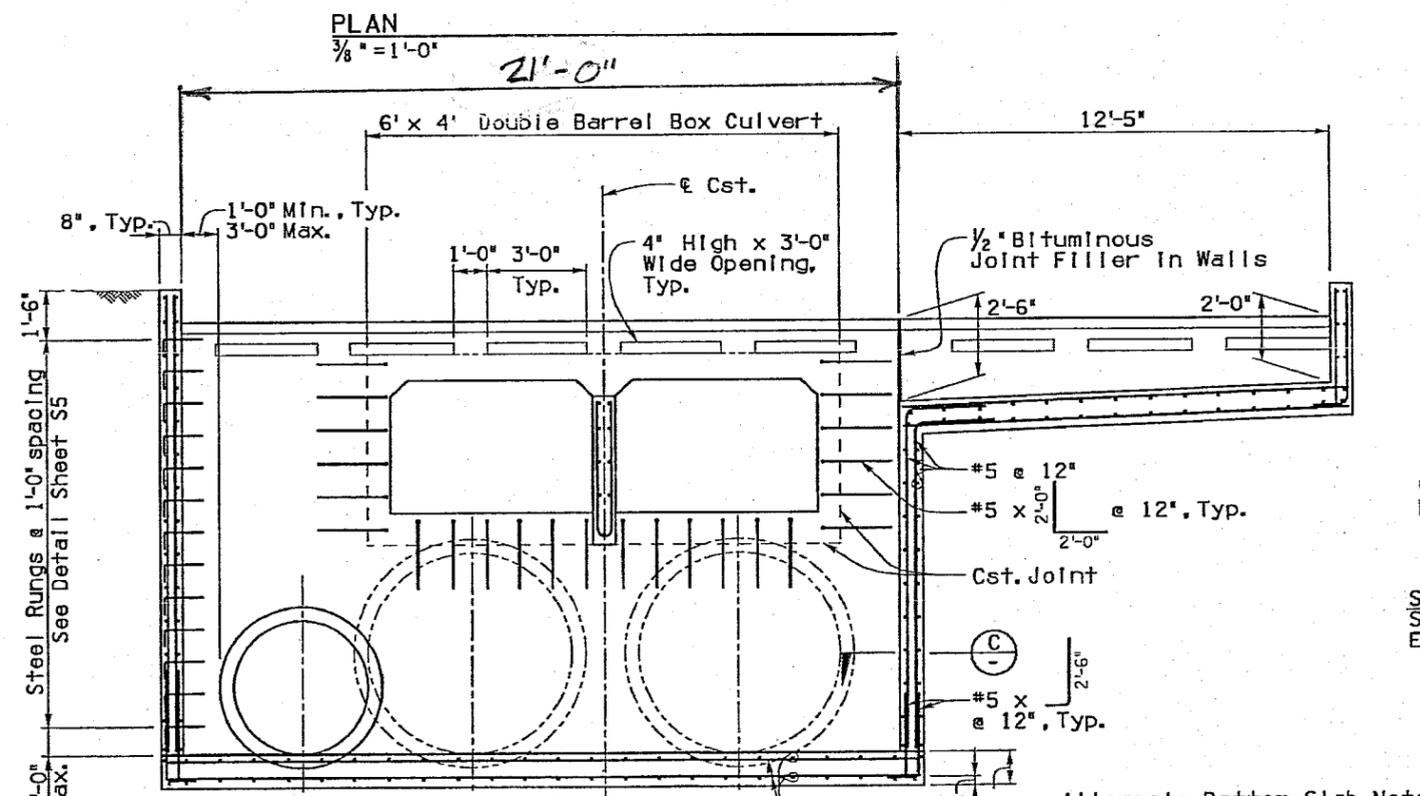
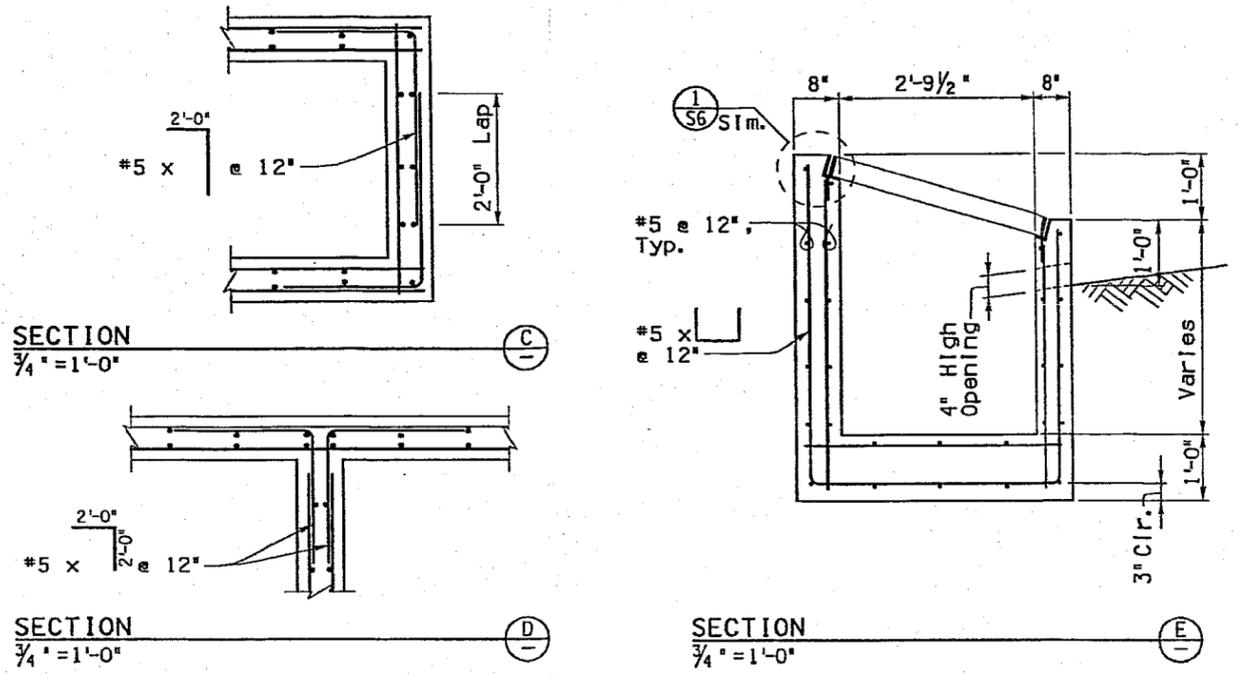
Orifice Coefficient = 0.67
 Area of Opening (ft²) = 8
 Adjusted Area (ft²) = 6.4
 (Assume clogging blocks 20% of open area)

Water Surface Elevation (ft)	Grate Opening					Curb Opening		Total Q into Inlet Structure (cfs)
	Depth over grate (ft)	Effective depth over grate (ft)	Weir Q (cfs)	Orifice Q (cfs)	Controlling Q through grate (cfs)	Depth at Curb Opening (ft)	Curb Opening Qorifice (cfs)	
1254.87	0.00	0.00	0	0	0	0.00	0.0	0.0
1255.37	0.00	0.00	0	0	0	0.50	24.3	24.3
1255.87	0.00	0.00	0	0	0	1.00	34.4	34.4
1256.37	0.50	0.00	0.0	0.0	0.0	1.50	42.1	42.1
1256.87	1.00	0.00	0.0	0	0.0	2.00	48.7	48.7
1257.37	1.50	0.17	8.2	62	8.2	2.50	54.4	63
1257.87	2.00	0.67	64.2	164	64.2	3.00	59.6	124
1258.37	2.50	1.17	148	217	148	3.50	64.4	212
1258.87	3.00	1.67	252	259	252	4.00	68.8	328
1259.37	3.50	2.17	374	295	295	4.50	73.0	368
1259.87	4.00	2.67	510	328	328	5.00	76.9	405
1260.37	4.50	3.17	660	357	357	5.50	80.7	438
1260.87	5.00	3.67	823	384	384	6.00	84.3	468

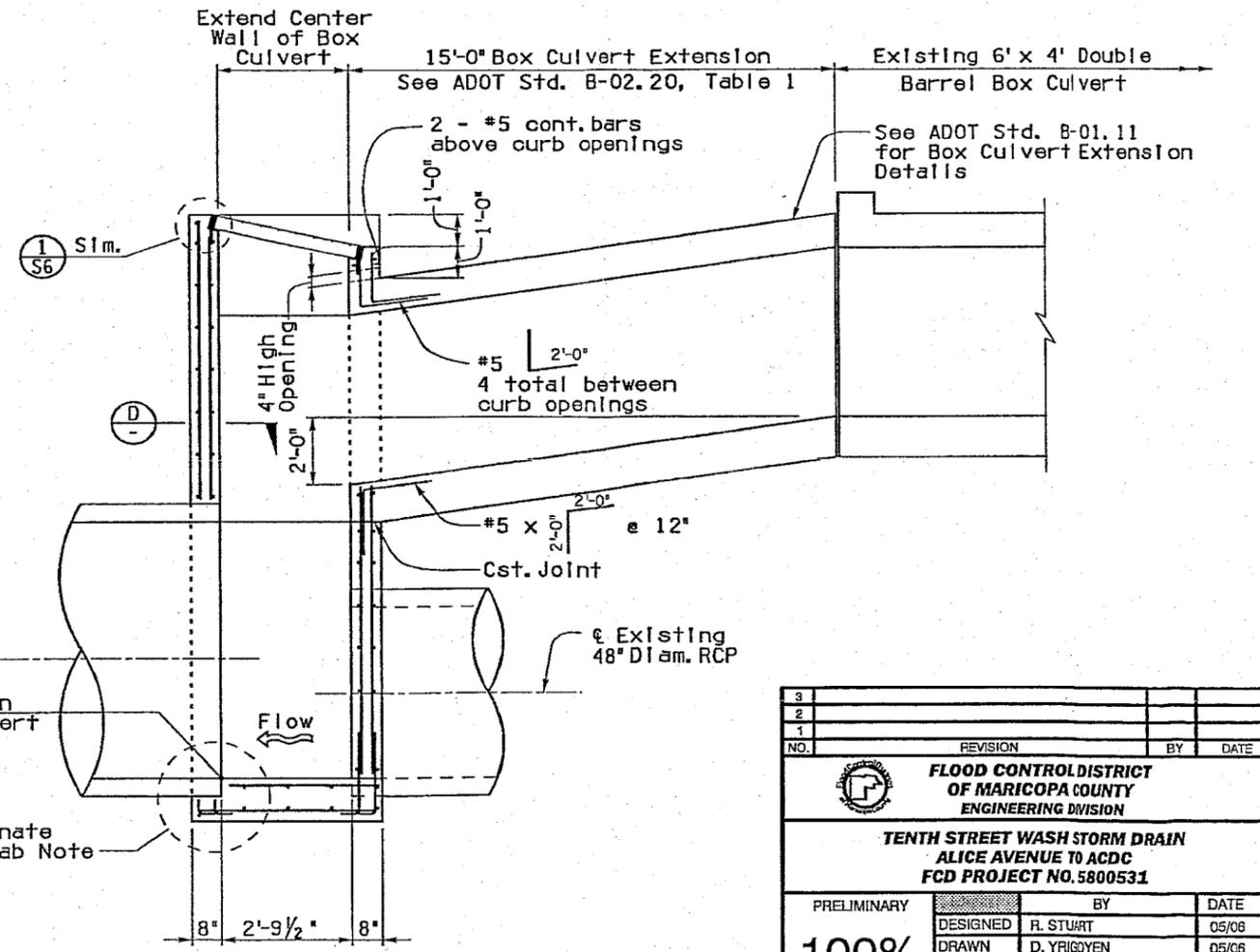
Centroid of grate is located at elevation 1257.2
 Effective depth over grate = (water surface elevation) - 1257.2
 At a water surface elevation of 1258.55, 255 cfs will pass into the grate
 Controlling Q = minimum of Weir Q and Orifice Q
 Refer to Drawing S7 for details regarding the INLET STRUCTURE



Existing Box Culvert Note:
 Remove existing metal railing, grates, wingwalls and apron to accommodate culvert extension.



Alternate Bottom Slab Note:
 In lieu of matching the bottom slab elevation to the pipe invert elevation as shown, the bottom slab may be constructed at a lower elevation in accordance with Detail 9, Sheet S4.



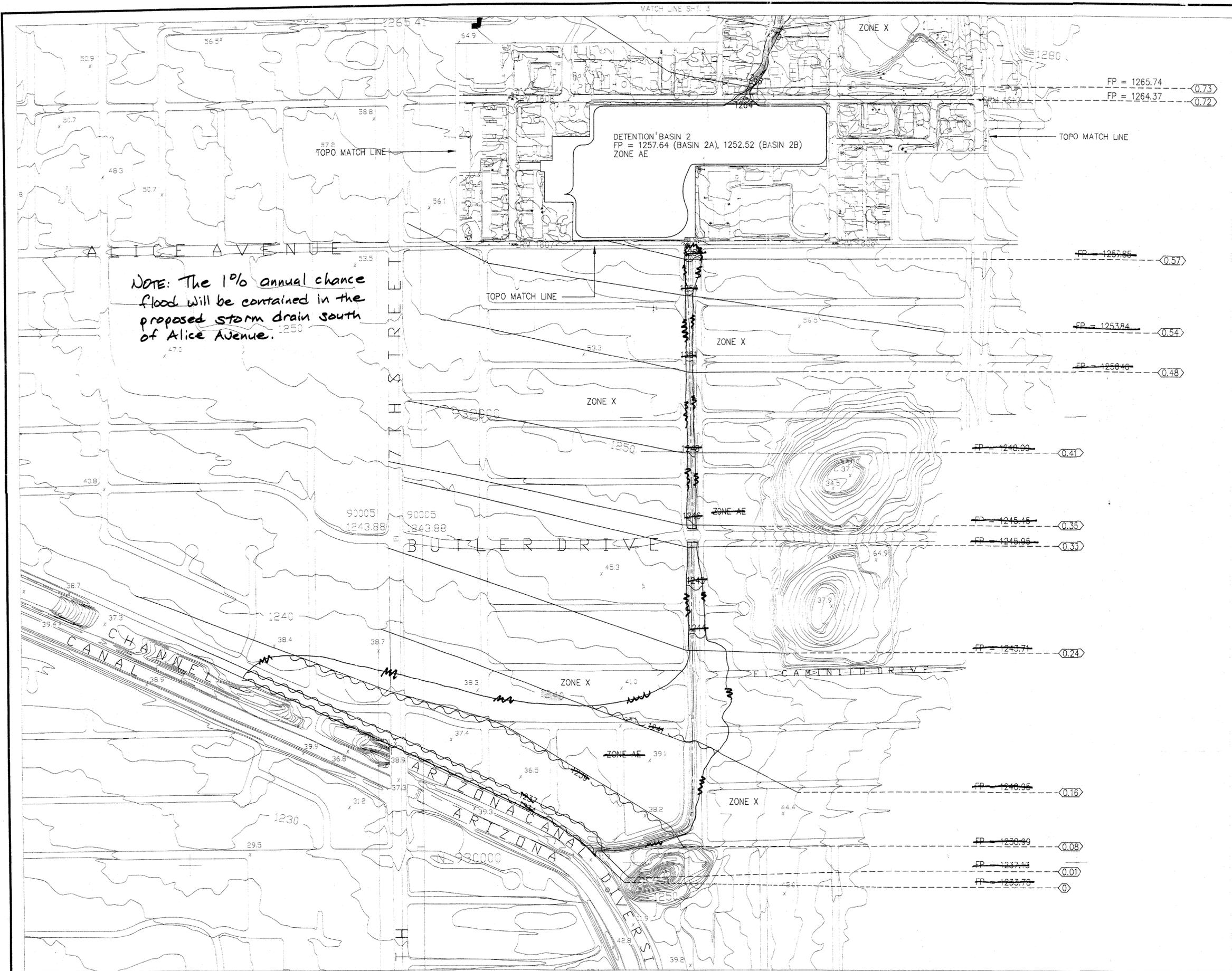
3			
2			
1			
NO.	REVISION	BY	DATE
 FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION			
TENTH STREET WASH STORM DRAIN ALICE AVENUE TO ACDC FCD PROJECT NO. 5800531			
PRELIMINARY		BY	DATE
DESIGNED	R. STUART		05/06
DRAWN	D. YRIGOYEN		05/06
CHECKED	R. SIMPSON		05/06
100%			
<small>NOT FOR CONSTRUCTION</small>			
DRAWING NO. S7		 Structural Grace, Inc <small>500 N. First Street Phoenix Arizona 85004 (602) 437-2551</small>	
INLET STRUCTURE AT ALICE		SHEET OF	

Appendix F: Erosion/Sediment Transport Analysis Supporting Documentation

No erosion or sediment / transport analysis was performed for this project.

Exhibit Maps

- Annotated Hydraulic Work Map
- Full size plan sheets (separate from this report)



FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
FLOOD DELINEATION STUDY OF
10TH STREET WASH

F.C.D. CONTRACT NO. 96-12

LEGEND

100-YR FLOODPLAIN BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
CROSS SECTION	FP=100 Yr WSE (0.54)
ELEVATION REFERENCE MARK	X ERM 1613
BASE FLOOD ELEVATIONS	~ 1221 ~
ZONE DESIGNATIONS	ZONE AE
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

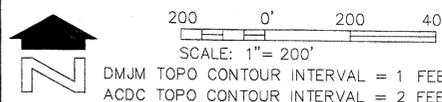
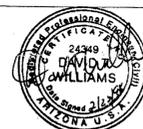
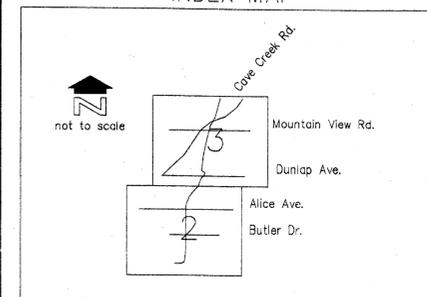
I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 1606	1260.29	Brass cap flush at 11th St. and Alice Ave.
ERM 1607	1257.27	Brass cap flush at 8th St. and Alice Ave.
ERM 1608	1261.77	Brass cap flush at 8th St. and Townley Ave.
ERM 1610	1272.79	Brass cap flush at 12th St. and Townley Ave.

NOTES

DMJM topo is upstream of Alice Ave., closest to the channel. ACDC topo is 1) downstream of Alice Ave., and 2) upstream of Alice Ave. to supplement DMJM topo in the overbanks.

Refer to topo match lines in the drawing.

INDEX MAP



WEST Consultants, Inc.

DESIGN	BY DS	DATE 5/97	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.	DW	5/97	
PLANS	DS	5/97	RECOMMENDED BY: DATE
PLANS CHK.	DW	5/97	APPROVED BY: DATE
SUBMITTED BY:			CHIEF ENGINEER AND GENERAL MANAGER
		DATE:	SHEET 2 OF 3

PHOTOGRAMMETRY BY KENNEY AERIAL MAPPING, INC. FOR DMJM AND ACDC TOPO (SEE NOTES). SURVEYING BY COLLINS-PINA CONSULTING ENGINEERS, INC. ON MARCH 10, 1994 (DMJM), AND BY KAMINSKI-HUBBARD ENGINEERING, INC. ON JANUARY 9, 1991 (ACDC). FLIGHT DATES: FEBRUARY 15, 1994 (DMJM), NOVEMBER 15, 1990 (ACDC). THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1" = 400' (ACDC) AND 1" = 200' (DMJM) HORIZONTAL SCALE AND 2' (ACDC) AND 1' (DMJM) CONTOUR INTERVAL. DATA PROVIDED BY KAMINSKI-HUBBARD ENGINEERING, INC. (ACDC) AND COLLINS-PINA CONSULTING ENGINEERS, INC. (DMJM).