CITY OF ALBUQUERQUE

Planning Department
Alan Varela, Director

Mayor Timothy M. Keller

October 24, 2022

Dana Peterson, P.E.
AECOM
6501 Americas Parkway NE, Suite 900
Albuquerque, NM 87110

RE: McMahon Blvd Widening-Kayenta to Rockcliff
Drainage Report
Engineer's Stamp Date: 08/31/22
Hydrology File: A10D012
CPN # 722690

Dear Mr. Peterson:

Based upon the information provided in your submittal received 09/01/2022, the Drainage Report is approved for Grading Permit and Work Order.

If you have any questions, please contact me at 924-3995 or rbrissette@cabq.gov.

Sincerely,

Renée C. Brissette

Renée C. Brissette, P.E. CFM
Senior Engineer, Hydrology
Planning Department

PO Box 1293
Albuquerque
NM 87103
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City of Albuquerque

Planning Department

Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET (REV 11/2018)

Project Title: McMahon Blvd Widening-Kayenta to Rockcliff Building Permit #:__________ Hydrology File #: __________

DRB#: __________ EPC#: __________ Work Order#: 7226.90

Legal Description: __________

City Address: McMahon Blvd Widening - Kayenta St. NW to Rockcliff Drive NW

Applicant: AECOM Contact: chris rosol

Address: 6501 Americas Parkway NE, Suite 900, Albuquerque, NM 87110

Phone#: 505-855-7473 Fax#: __________ E-mail: chris.rosol@aecom.com

Owner: City of Albuquerque - DMD Contact: Bridgette Garrett

Address: 400 Marquette NW, Old City Hall 3rd Floor, ABQ NM 87102

Phone#: 505-768-3679 Fax#: 505-768-2733 E-mail: bgarrett@cabq.gov

TYPE OF SUBMITTAL:_____ PLAT (___# OF LOTS) ____ RESIDENCE ____ DRB SITE x____ ADMIN SITE

IS THIS A RESUBMITTAL?: ____________ Yes x__________ No

DEPARTMENT: _____ TRAFFIC/ TRANSPORTATION x____ HYDROLOGY/ DRAINAGE

Check all that Apply:

TYPE OF SUBMITTAL:

____ ENGINEER/ARCHITECT CERTIFICATION
____ PAD CERTIFICATION
____ CONCEPTUAL G & D PLAN
____ GRADING PLAN
____ DRAINAGE MASTER PLAN
x____ DRAINAGE REPORT
____ FLOODPLAIN DEVELOPMENT PERMIT APPLIC
____ ELEVATION CERTIFICATE
____ CLOMR/LOMR
____ TRAFFIC CIRCULATION LAYOUT (TCL)
____ TRAFFIC IMPACT STUDY (TIS)
____ OTHER (SPECIFY) __________
____ PRE-DESIGN MEETING?

TYPE OF APPROVAL/ACCEPTANCE SOUGHT:

____ BUILDING PERMIT APPROVAL
____ CERTIFICATE OF OCCUPANCY
____ PRELIMINARY PLAT APPROVAL
____ SITE PLAN FOR SUB'D APPROVAL
____ SITE PLAN FOR BLDG. PERMIT APPROVAL
____ FINAL PLAT APPROVAL
____ SIA/ RELEASE OF FINANCIAL GUARANTEE
____ FOUNDATION PERMIT APPROVAL
____ GRADING PERMIT APPROVAL
____ SO-19 APPROVAL
____ PAVING PERMIT APPROVAL
____ GRADING/ PAD CERTIFICATION
x____ WORK ORDER APPROVAL
____ CLOMR/LOMR
____ FLOODPLAIN DEVELOPMENT PERMIT
____ OTHER (SPECIFY) __________

DATE SUBMITTED: 30 Aug 2022 By: Chris Rosol

COA STAFF: ELECTRONIC SUBMITTAL RECEIVED:__________

FEE PAID:__________

Drainage Report for:

McMahon Boulevard Widening

Kayenta Street to Rockcliff Drive

Prepared for: City of Albuquerque

COA Project Number: 7226.90
AECOM Project Number: 60645365

August 2022

City of Albuquerque
Planning Department
Development Review Services
HYDROLOGY SECTION
APPROVED

DATE: 10/24/22
BY: Renée C. Brissette
HydroTrans # A11D011

THE APPROVAL OF THESE PLANS/REPORT SHALL NOT BE CONSTRUED TO PERMIT VIOLATIONS OF ANY CITY ORDINANCE OR STATE LAW, AND SHALL NOT PREVENT THE CITY OF ALBUQUERQUE FROM REQUIRING CORRECTION, OR ERROR OR DIMENSIONS IN PLANS, SPECIFICATIONS, OR CONSTRUCTIONS. SUCH APPROVED PLANS SHALL NOT BE CHANGED, MODIFIED OR ALTERED WITHOUT AUTHORIZATION.

AECOM Imagine it. Delivered.

This report, entitled McMahon Boulevard Widening Drainage Report, was prepared by me or directly under my supervision.

____

Dana M Peterson, PE

New Mexico PE Number 23231

Table of Contents

Attachments

1 Executive Summary

This Drainage Report analyzed the contributing drainage to McMahon Blvd within the proposed project limits in accordance with City of Albuquerque Drainage Standards. Previous drainage studies and their associated City Work Order plans were researched in the preparation of this report and are cited throughout. A Portion of this project is in the FEMA designated Floodway and SFHA Zone AE. Due to the placement of fill in a Floodway, a Conditional Letter of Map Revision (CLOMR) is recommended prior to commencing work. A Letter of Map Revision (LOMR) is also recommended at project completion.

There is one existing outfall from McMahon Blvd into the Calabacillas Arroyo: a 48” storm drain located approximately 600 ft east of the Calabacillas Bridge, constructed as part of CPN 773481. In coordination with AMAFCA, it is the intent of this project to continue using this outfall as the only outfall for McMahon Blvd into the Calabacillas. Surface flows from McMahon Blvd and its contributing subbasins all flow to a low point in McMahon Blvd, approximately 800 ft east of the Calabacillas bridge. Here they are collected by several inlets and conveyed to the Calabacillas via the 48” storm drain. Drainage from the existing westbound lanes is collected in the existing inlets on the north side of McMahon. Drainage in the proposed eastbound lanes will be similarly collected by inlets along the south side of McMahon, constructed with this project.

Hydrologic analysis for the proposed development was conducted for the contributing drainage basins in accordance with the 2020 City of Albuquerque Development Process Manual. Proposed ROW development, both this project and future proposed projects, was assigned land treatments based on its proposed development. Areas outside the City limits were allowed to discharge based on current (undeveloped) rates. Most of the residential subdivisions surrounding the project area do not discharge to McMahon Blvd.

Hydraulic analysis was also conducted in accordance with the 2020 City of Albuquerque Development Process Manual (DPM). Street capacity analysis did show McMahon Blvd to be slightly over-capacity just west of the McMahon and Kayenta intersection assuming proposed development of the upstream ROW. Any proposed development (non-ROW) west of this intersection will need to match the existing discharge patterns. Inlet analysis showed adequate capacity for the existing and proposed inlets. Storm drain analysis showed adequate capacity on the existing and proposed storm drain.

2 Introduction and Background

The purpose of this drainage report is to document the existing and proposed storm water flows associated with the expansion of McMahon Boulevard between Rockcliff Drive and Kayenta Street. The current section is a 2-lane partial section, which will be expanded to become a 4-lane full section with the addition of the two dedicated eastbound lanes as well as a bike lane and sidewalk. The City of Albuquerque Project Number (CPN) is: 7226.90. The project location is shown below in Figure 2-1:

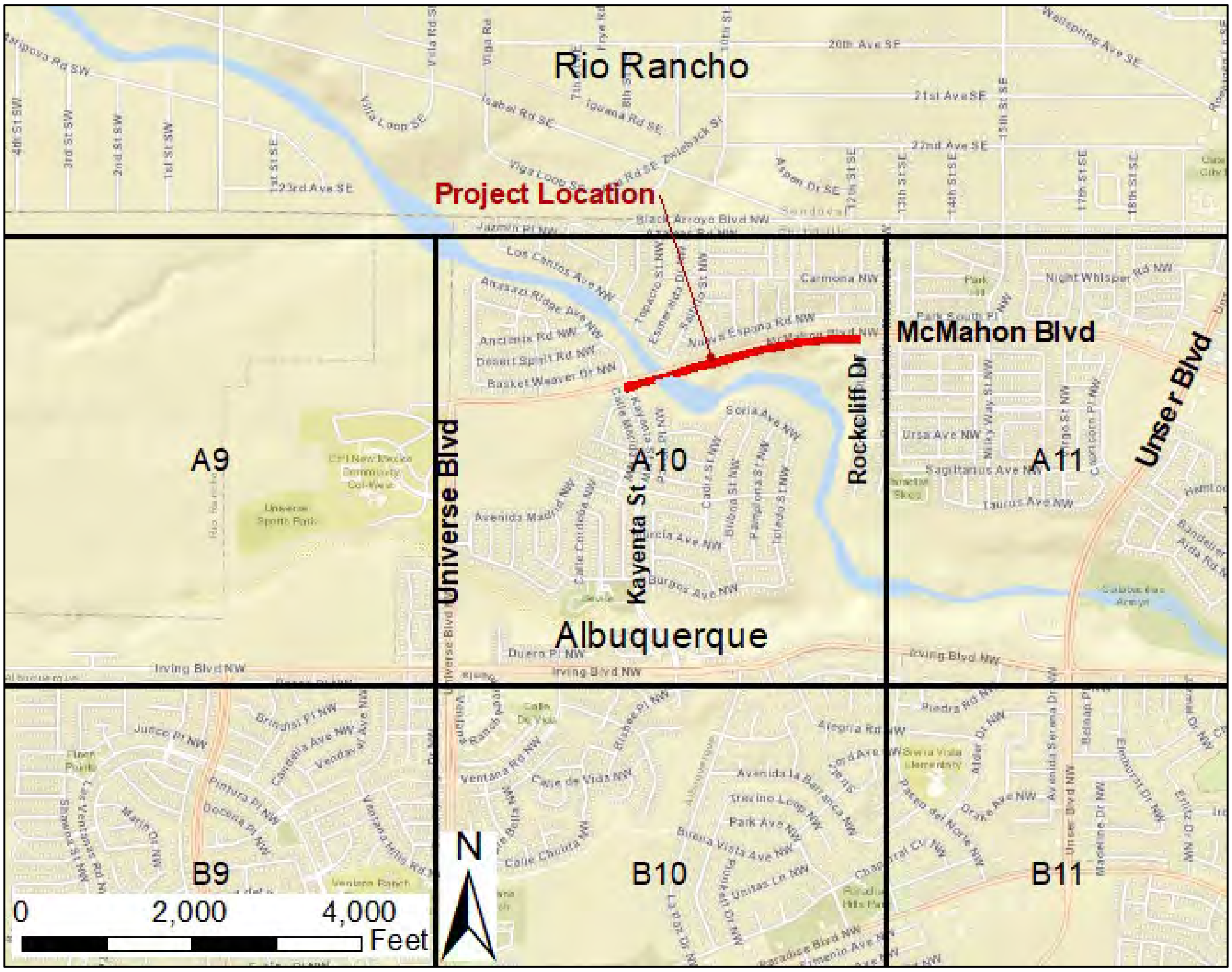


Figure 2-1: Project Location

2.1 Floodplain

The McMahon Blvd project area is bisected by the Calabacillas Arroyo, an AMAFCA-managed regional drainage facility. The Calabacillas Arroyo is a mapped Special Flood Hazard Area (SFHA) per FEMA Flood Insurance Rate Maps (FIRMs) 35001C0103H and 35001C0104H, both effective 8/16/2012 (Figure 2-2):

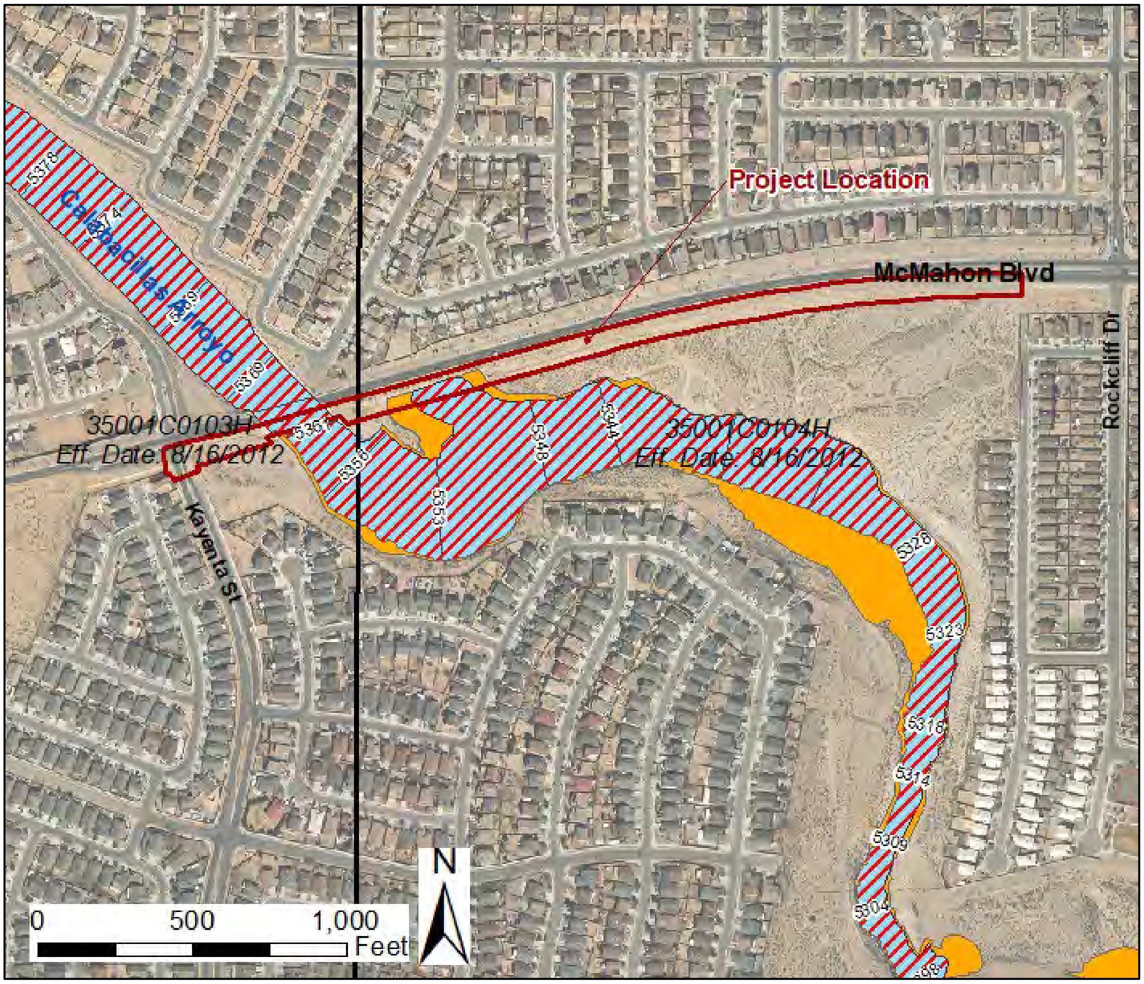


Figure 2-2: SFHA's in Project Vicinity

A Portion of this project is in the FEMA designated Floodway and SFHA Zone AE. Due to the placement of fill in a Floodway, a Conditional Letter of Map Revision (CLOMR) is recommended prior to commencing work. A Letter of Map Revision (LOMR) is also recommended at project completion.

2.2 Previous Studies

The existing and proposed drainage conditions along McMahon Blvd are documented in several reports for private development and previous road improvements in the area:

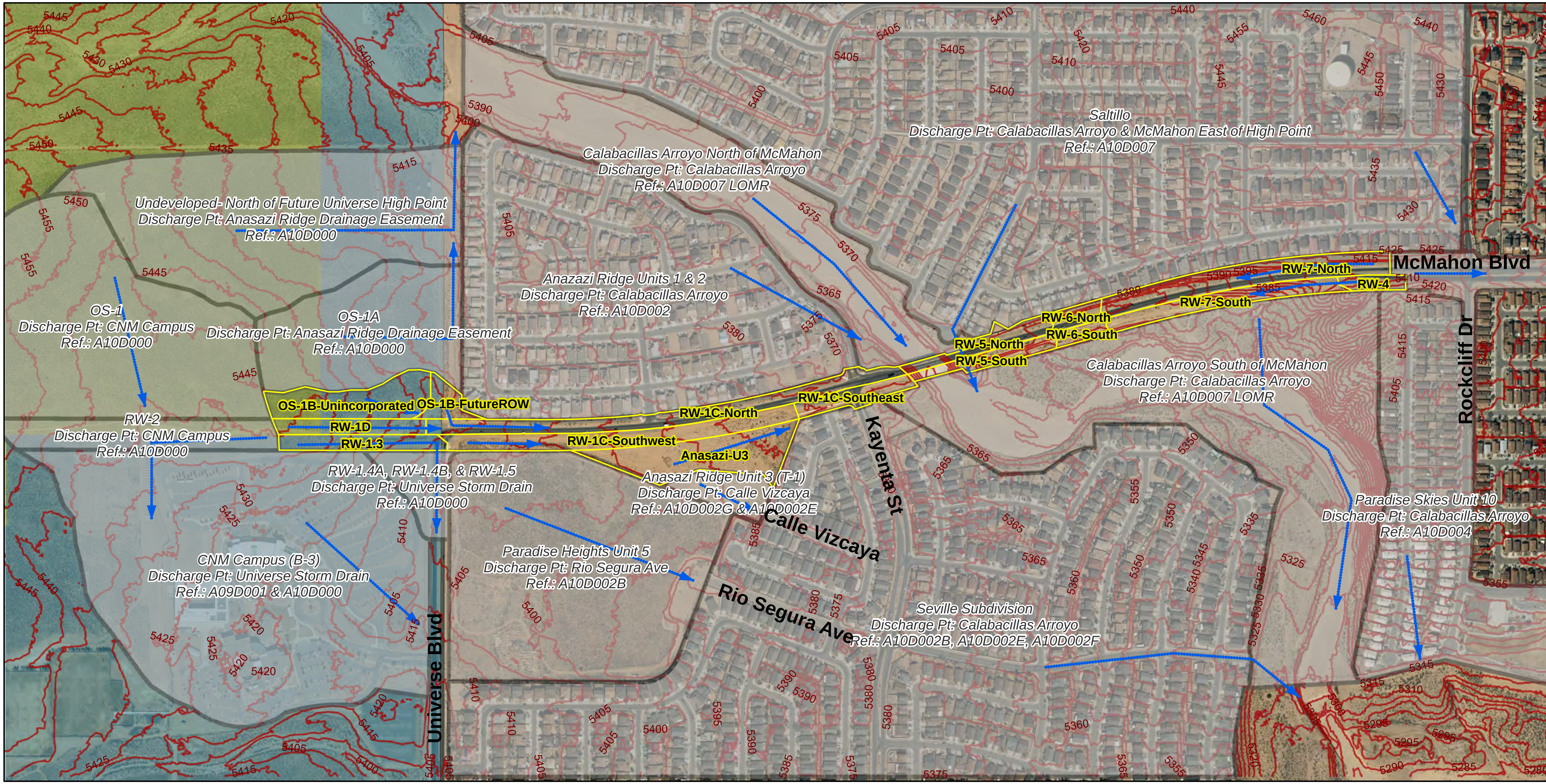
- Bohannan Huston, Inc. *Drainage Study for Paradise Skies Unit 10 Subdivision*. ABQ Hydrology File No.: A10D004. April 2003. The report and supporting grading plan served as the basis of development for Paradise Skies Unit 10, located on the south side of McMahon Blvd and west of Rockcliff Dr.
- Mark Goodwin & Associates, Inc. *Drainage Report for Anasazi Ridge Subdivision*. ABQ Hydrology File No.: A10D002. November 2004. This report and associated grading plan were the basis of development for Anasazi Ridge Units 1 and 2, located on the north side of McMahon Blvd, west of the Calabacillas Arroyo.

- Mark Goodwin & Associates, Inc. *Arroyo Vista Subdivision Drainage Management Plan*. ABQ Hydrology File No.: A10D007. July 2005. This report and supporting grading plans were the basis of development for Arroyo Vista Subdivision, later renamed as Saltillo Subdivision Unit 1 and 2.
- Mark Goodwin & Associates, Inc. *Drainage Report for Seville Unit 7A*. ABQ Hydrology File No.: A10D002F. July 2006. This report and supporting grading plan were the basis of development for Seville Subdivision Unit 7A, located southwest of the McMahon and Kayenta intersection.
- Mark Goodwin & Associates, Inc. *LOMR for the Upper Bound of the Detailed Study Reach of the Calabacillas Arroyo*. ABQ Hydrology File No.: A10D007-LOMR. January 2010. This LOMR revised the Calabacillas Arroyo floodplain and floodway based on the development of Saltillo Subdivision, Anasazi Ridge Subdivision and the McMahon Blvd bridge crossing.
- Mark Goodwin & Associates, Inc. *Anasazi Ridge Unit 3 Subdivision Drainage Management Plan*. ABQ Hydrology File No.: A10D002G. January 2015. This report and associated grading plan were the basis of development for Anasazi Ridge Unit 3 Subdivision, located on the south side of McMahon Blvd, west of Kayenta Street. At the time of this report, work on Anasazi Ridge Unit 3 has not yet commenced.
- URS, Inc. *McMahon Boulevard Extension – Final Drainage Report, Revision 2.* ABQ Hydrology File No.: A10D000. April 2010. This report characterizes the drainage patterns west of the Calabacillas bridge. Both existing and proposed developed conditions are included.
- Wilson and Company, Inc. *Drainage Report for Seville Subdivision Unit 3*. ABQ Hydrology File No.: A10D002B. April 2002. This report and supporting grading plan were the basis of development for Seville Subdivision Unit 3, located on the south side of McMahon Blvd, west of the Calabacillas Arroyo.
- Wilson and Company, Inc. *Drainage Report for Seville Subdivision Unit 7*. ABQ Hydrology File No.: A10D002E. September 2003. This report and supporting grading plan were the basis of development for Seville Subdivision Unit 7, located southwest of the McMahon and Kayenta intersection.
- Wilson and Company, Inc. *Central New Mexico Community College Westside Campus Drainage Master Plan*. ABQ Hydrology File NO.: A09D001. August 2010. This report master planned the drainage for the CNM Westside campus, located west of Universe Blvd in unincorporated Bernalillo County.

These drainage studies and the associated City Work Order plans were researched in the preparation of this report and are cited throughout.

3 Existing Conditions

By reviewing the previously developed drainage reports, existing and proposed development, and site topography, a combined drainage basin map of the flows contributing to the McMahon Blvd project area was developed. The drainage basins were drawn to match those presented in previous reports and were modified to reflect current existing conditions and proposed development See Figure 3-1:



0 500 1,000 Feet

1 inch = 500 feet

N

Project: McMahon Blvd Widening
Location: Bernalillo County, NM
Prepared for: City of Albuquerque
CABQ CPN: 722690
AECOM Project No.: 60645365

Legend

- Flow Paths
- Contributing Drainage Basins
- Non-Contributing Drainage
- 5 Ft Contours

Jurisdiction:

- Albuquerque
- Rio Rancho
- Unincorporated

AECOM

McMahon Blvd Widening
Drainage Basins

Figure 3-1

3.1 Contributing Drainage

Most of the residential subdivisions surrounding the project area do not discharge to McMahon Blvd. These non-contributing drainage areas were investigated to ensure they will have no adverse impact to the McMahon Blvd project. The following basins do contribute to McMahon Blvd:

- Anasazi-U3. This undeveloped subbasin currently discharges to McMahon Blvd. The results of the drainage analysis showed McMahon Blvd to be at capacity near the intersection of McMahon and Kayenta, so developed discharge from this subbasin will need to be restricted existing discharge.
- OS-1B-FutureROW. This subbasin is currently undeveloped, but will eventually become Universe Blvd, north of McMahon. The proposed development of this ROW will free discharge into the westbound lanes of McMahon Blvd.
- OS-1B-Unincorporated. This undeveloped subbasin lays outside the City of Albuquerque in Unincorporated Bernalillo County and in the City of Rio Rancho. The existing discharge is accommodated in the design of McMahon Blvd, but any development will need to be restricted to the existing discharge.
- RW-1.3. This subbasin is partially developed to provide access to the CNM Westside Campus. It currently discharges to Universe Blvd, south of the McMahon and Universe intersection. Future development of McMahon Blvd west of the Universe intersection will be required to maintain this discharge pattern, per the URS report (URS, 2010) and the Wilson report for CNM Campus (Wilson, 2010).
- RW-1C-North. This fully developed subbasin free discharges to McMahon Blvd and is expected to continue to do so.
- RW-1C-Southwest. This subbasin is currently undeveloped, but will eventually become the eastbound lanes of McMahon Blvd, between Kayenta Blvd and Universe Blvd. The proposed development of this ROW will free discharge to the eastbound lanes of McMahon Blvd.
- RW-1C-Southeast. This subbasin is partially developed, but will be fully developed as part of this project to become the eastbound lanes of McMahon Blvd, in the immediate vicinity of Kayenta Street. The development of this ROW will free discharge to the eastbound lanes of McMahon Blvd.
- RW-1D. This subbasin is currently undeveloped, but will eventually become the westbound lanes of McMahon Blvd, west of Universe Blvd. The proposed development of this ROW will free discharge to the westbound lanes of McMahon Blvd.
- RW-4 This subbasin is currently undeveloped, but will become the eastbound lanes of McMahon Blvd, west of Rockcliff, as part of this project. The development of this ROW will free discharge to the eastbound lanes of McMahon Blvd.
- RW-5-North. This fully developed subbasin free discharges to McMahon Blvd and is expected to continue to do so.
- RW-5-South. This subbasin is currently undeveloped, but will become the eastbound lanes of McMahon Blvd, east of Kayenta Street, as part of this project. The development of this ROW will free discharge to the eastbound lanes of McMahon Blvd.
- RW-6-North. This fully developed subbasin free discharges to McMahon Blvd and is expected to continue to do so.

- RW-6-South. This subbasin is currently undeveloped, but will become the eastbound lanes of McMahon Blvd, east of subbasin RW-5-South, as part of this project. The development of this ROW will free discharge to the eastbound lanes of McMahon Blvd.
- RW-7-North. This fully developed subbasin free discharges to McMahon Blvd and is expected to continue to do so.
- RW-7-South. This subbasin is currently undeveloped, but will become the eastbound lanes of McMahon Blvd, west of subbasin RW-4, as part of this project. The development of this ROW will free discharge to the eastbound lanes of McMahon Blvd.

The drainage basins delineated in URS (2010) report served as the base for the delineations and naming structure of this report's basins. The additional basins were added and modified to reflect the expanded scope, current, and proposed conditions.

3.2 State of Surrounding Development

As demonstrated by the drainage basin map (Figure 3-1), the areas surrounding this project are largely built-out. Street capacity analysis (Section 5.1) did show McMahon Blvd to be at slightly over-capacity just west of the McMahon and Kayenta intersection assuming proposed development of the upstream ROW. Any development (non-ROW) west of this intersection will need to match the existing discharge patterns. Any development west of Universe Blvd is outside of the City of Albuquerque and will be expected to match the existing discharge patterns if discharging into the City of Albuquerque.

East of the McMahon and Kayenta Intersection, the developable properties are built-out and only the eastbound ROW remains to be developed (this project). Hydraulic analysis showed adequate capacity in the street, inlets, and storm drain for the westbound and eastbound lanes in this area. The area of land east of the bridge and pinned between McMahon Blvd and the Calabacillas Arroyo (non-contributing drainage basin "Calabacillas Arroyo South of McMahon"), is largely owned by AMAFCA. If this were to ever be developed, it would be expected to discharge downhill into the Calabacillas unless capacity could be demonstrated in McMahon Blvd.

The street sections shown below (Figure 3-2, Figure 3-3, Figure 3-4, and Figure 3-5) illustrate the existing state of McMahon Blvd versus the proposed condition, which is to be built by this project:

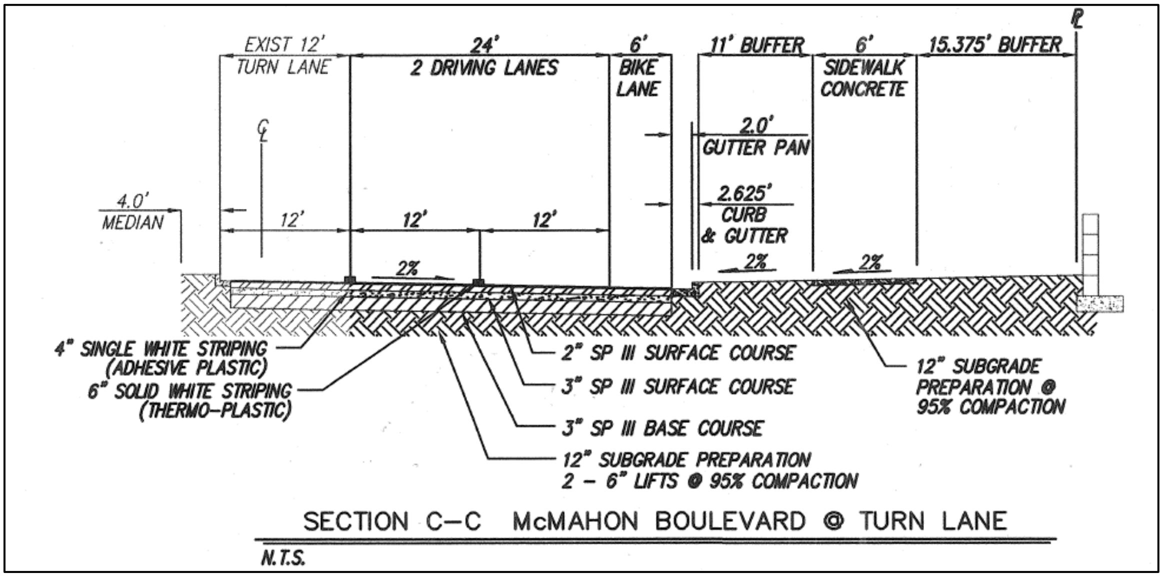


Figure 3-2: Existing Eastbound McMahon Blvd at Sta. 1046+25 Analysis Point "EB-A", excerpt from CPN 722680

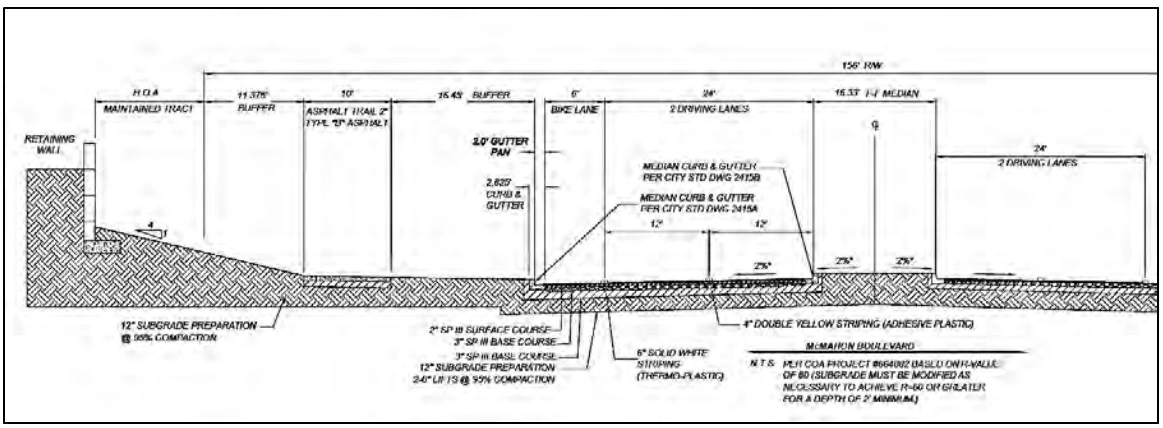


Figure 3-3: Existing Westbound McMahon Blvd at Sta. 1046+25, Analysis Point "WB-A", adapted from CPN 759581

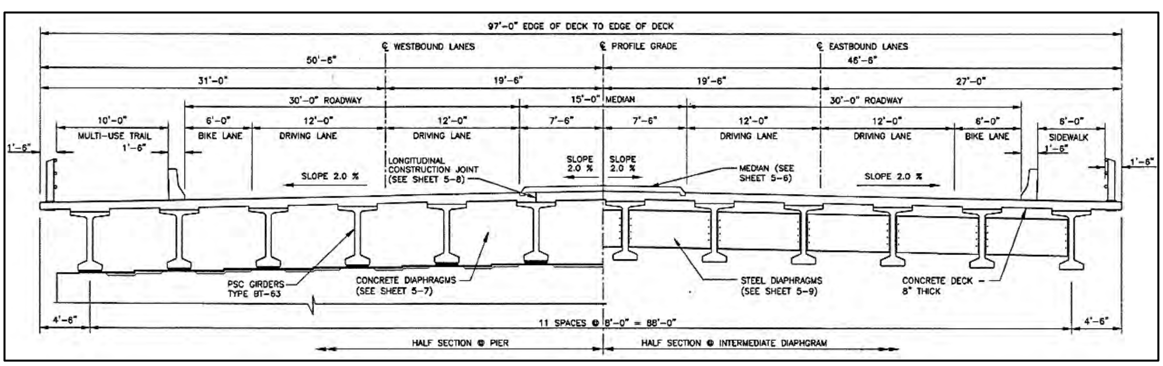


Figure 3-4: Existing Eastbound and Westbound McMahon Blvd at Sta. 1052+00, Analysis Point "EB-B" & "WB-B", excerpt from CPN 681602

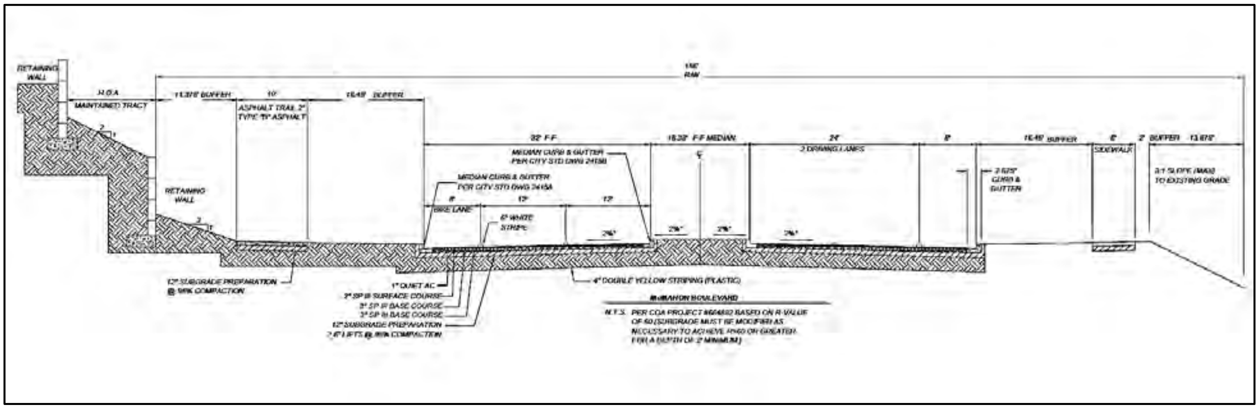


Figure 3-5: Existing Westbound and Proposed Eastbound McMahon Blvd at Sta. 1058+60 through 1066+20, Analysis Point "EB-C, D, E" & "WB-C, D, E", adapted from CPN 773481

Stations referenced above refer to the stationing provided in the work order plans; the referenced analysis points refer to the locations of the street capacity analysis in Section 5.1. For plan view locations, please see Figure 5-1.

3.3 Calabacillas Arroyo & AMAFCA

There is one existing outfall from McMahon Blvd into the Calabacillas Arroyo: a 48" storm drain located approximately 600 ft east of the Calabacillas Bridge, constructed as part of Saltillo Unit 1 (CPN 773481, Mark Goodwin & Associates, 2006). In coordination with AMAFCA, it is the intent of this project to continue using this outfall as the only outfall for McMahon Blvd into the Calabacillas. There also exists a 108" storm drain outfall at the eastern bridge abutment, constructed with the Saltillo Subdivision; this storm drain serves the Saltillo Subdivision and is not expected to be disturbed as part of this project.

3.4 Existing Storm Drain System

Surface flows from McMahon Blvd and its contributing subbasins all flow to a low point in McMahon Blvd, approximately 800 ft east of the Calabacillas bridge. Here they are collected by several inlets and conveyed to the Calabacillas via the 48" storm drain discussed above. Drainage from the existing westbound lanes is collected in the existing inlets on the north side of McMahon. Drainage in the proposed eastbound lanes will be similarly collected by inlets along the south side of McMahon, constructed with this project. The existing storm drain is shown in Figure 3-6:

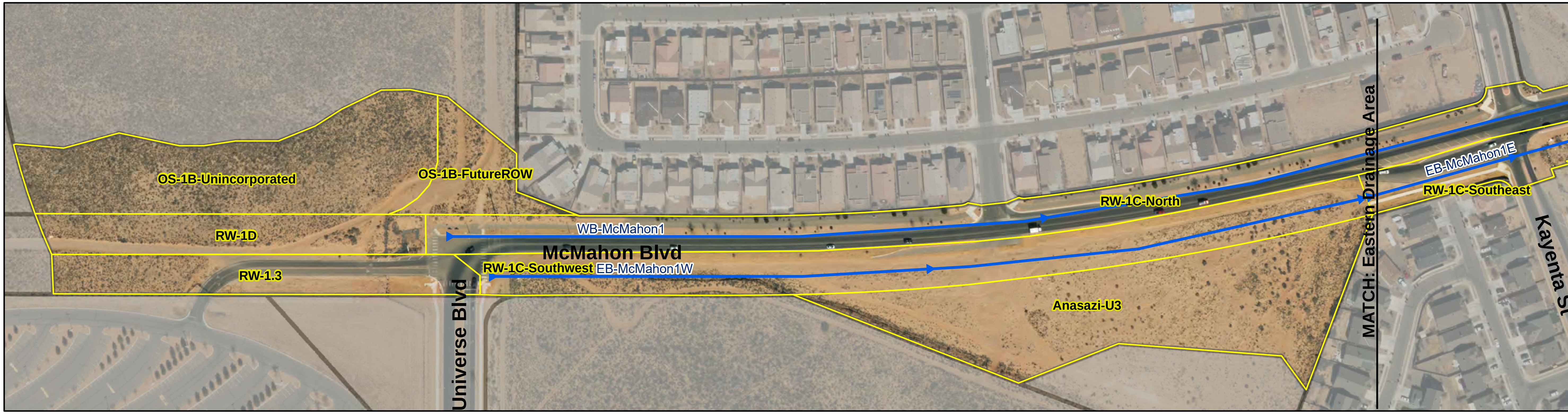
Figure 3-6: Existing Storm Drain Infrastructure

The proposed storm drain and inlets will connect with the existing storm drain and utilize the same 48" outfall into the Calabacillas. Street capacity, inlet capacity, and storm drain capacity were all confirmed for both the existing system and the proposed improvements. Original layout of the proposed storm drain for the eastbound lanes was designed with CPN 773481 (Mark Goodwin & Associates, 2006). The drainage analysis conducted with the current project confirmed the original layout and design based on current, as-constructed conditions and proposed development.

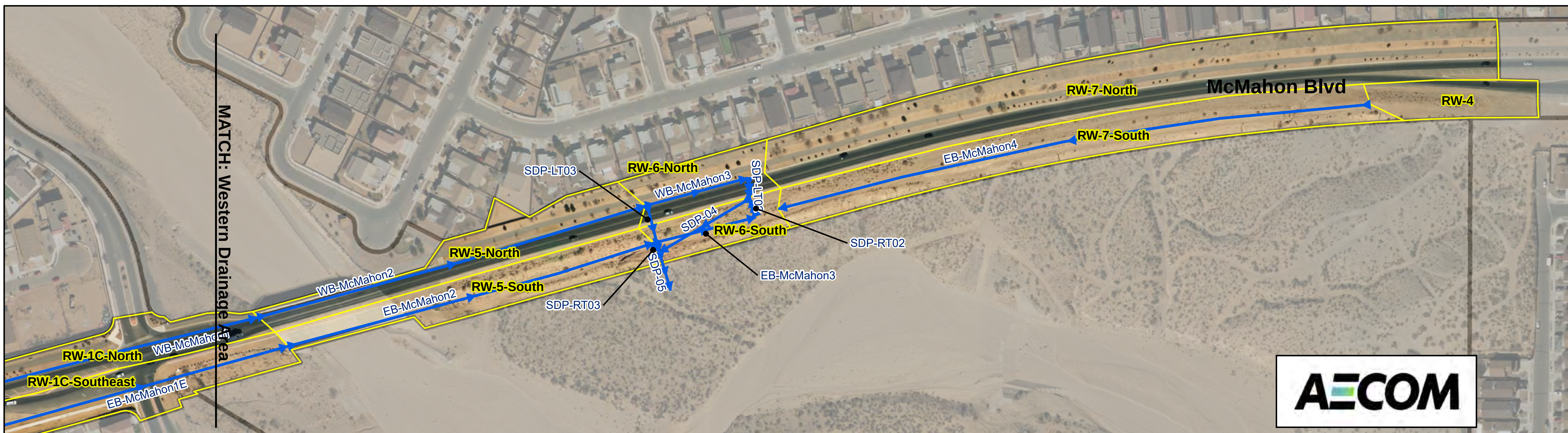
4 Hydrology

Hydrologic analysis for the proposed development was conducted for the contributing drainage basins identified in Figure 3-1 in accordance with the 2020 City of Albuquerque Development Process Manual (DPM). These drainage basins are shown in detail as Figure 4-1:

Western Drainage Area:



Eastern Drainage Area:



Project: McMahon Blvd Widening
Location: Bernalillo County, NM
Prepared for: City of Albuquerque
CABQ CPN: 722690
AECOM Project No.: 60645365

0 200 400 Feet
1 inch = 200 feet

N

Legend

Reaches
Contributing Drainage Basins
Non-Contributing Drainage

McMahon Blvd Widening
Contributing Drainage Basins
Figure 4-1

4.1 Precipitation

Precipitation was determined from NOAA Atlas 14 at the centroid of the watershed (Attachment 1-1). Both the 100-yr storm and the 10-yr storm were evaluated. The 100-yr storm was used as the design basis for all the hydraulic analysis. The 10-yr storm was used as the design basis for the arterial road street capacity, per the DPM Ch 6-9(A)4; McMahon Blvd is a Regional Principal Arterial.

The modeled storm was a 24-hr NRCS Frequency Storm with the peak at hour 12 and a 5-minute intensity duration. The 100-yr, 24-hr precipitation was: 2.61”. The 10-yr, 24-hr precipitation was: 1.76”.

4.2 Land Treatment and Initial Constraints

The contributing drainage basins were assigned the following land treatments based on current and proposed land cover. Proposed ROW development, both this project and future proposed projects, was assigned land treatments based on its proposed development. Areas outside the City limits were allowed discharge based on current (undeveloped) rates.

The weighted initial abstractions and curve numbers were calculated per the DPM, Tables 6.2.11 and 6.2.9. The Time of Concentration (Tc) was less than 0.2-hrs for all basins, so Tc = 0.2-hrs (12-minutes) was used, per the DPM, Equation 6.10. Lag Time was determined, per the DPM Equation, 6.17. Land treatments and initial constraints were as follows (Table 4-1):

Table 4-1: Land Treatment and Initial Constraints

Basin Name	Area	Land Cover				Weighted Initial Abstraction	Weighted CN	Time of Concentration	Lag Time
		A	B	C	D				
	Ac	%	%	%	%	in	unitless	min	min
Anasazi-U3	**3.99**	95%	0%	5%	0%	**0.64**	**77**	12	**7.2**
OS-1B-FutureROW	**0.78**	0%	0%	40%	60%	**0.20**	**93**	12	**7.2**
OS-1B-Unincorporated	**3.05**	95%	0%	5%	0%	**0.64**	**77**	12	**7.2**
RW-1.3	**1.48**	0%	0%	40%	60%	**0.20**	**93**	12	**7.2**
RW-1C-North	**4.01**	0%	0%	40%	60%	**0.20**	**93**	12	**7.2**
RW-1C-Southeast	**1.13**	0%	0%	40%	60%	**0.20**	**93**	12	**7.2**
RW-1C-Southwest	**3.40**	0%	0%	40%	60%	**0.20**	**93**	12	**7.2**
RW-1D	**1.36**	0%	0%	40%	60%	**0.20**	**93**	12	**7.2**
RW-4	**0.55**	0%	0%	40%	60%	**0.20**	**93**	12	**7.2**
RW-5-North	**1.25**	0%	0%	40%	60%	**0.20**	**93**	12	**7.2**
RW-5-South	**1.11**	0%	0%	40%	60%	**0.20**	**93**	12	**7.2**
RW-6-North	**0.62**	0%	0%	40%	60%	**0.20**	**93**	12	**7.2**
RW-6-South	**0.48**	0%	0%	40%	60%	**0.20**	**93**	12	**7.2**
RW-7-North	**3.75**	0%	0%	50%	50%	**0.23**	**92**	12	**7.2**
RW-7-South	**2.08**	0%	0%	40%	60%	**0.20**	**93**	12	**7.2**

Basin “Anasazi-U3” will need to be restricted to current discharge if developed; street capacity analysis did show McMahon Blvd to be at capacity just west of the McMahon and Kayenta intersection assuming proposed development of the upstream ROW. Any non-ROW development west of this intersection will need to match the existing discharge patterns. Any development west of Universe Blvd such as "OS-1B-Unicorporated" and neighboring non-contributing basins, is outside of the City of Albuquerque and will be expected to match the existing discharge patterns if discharging into the City of Albuquerque.

4.3 Reach Routing

The above basins were routed to their discharge points using the reaches shown in Figure 4-1 and summarized below in Table 4-2:

Table 4-2: Reaches

	Length	Average Slope	Manning's n	Channel Width or Pipe Dia.	K	Velocity	Travel Time
Reach Name	Ft	%	unitless	Ft	unitless	fps	minutes
EB-McMahon1E	600	1.00%	0.016	32	3	3.0	3.3
EB-McMahon1W	1738	1.58%	0.016	32	3	3.8	7.7
EB-McMahon2	747	1.94%	0.016	32	3	4.2	3.0
EB-McMahon3	207	0.97%	0.016	32	3	3.0	1.2
EB-McMahon4	1184	3.46%	0.016	32	3	5.6	3.5
SDP-04	200	2.05%	0.013	2.5	3	4.3	0.8
SDP-05	80	0.50%	0.013	4	3	2.1	0.6
SDP-LT02	38	7.58%	0.013	2	3	8.3	0.1
SDP-LT03	90	12.00%	0.013	1.5	3	10.4	0.1
SDP-RT02	38	7.58%	0.013	2	3	8.3	0.1
SDP-RT03	38	12.00%	0.013	1.5	3	10.4	0.1
WB-McMahon1	2357	1.46%	0.016	32	3	3.6	10.8
WB-McMahon2	793	1.83%	0.016	32	3	4.1	3.3
WB-McMahon3	208	0.96%	0.016	32	3	2.9	1.2

Surface reach lengths and slopes were determined in ArcGIS using 2010 Bernalillo County Lidar for the elevations; surface reaches are prefixed with "EB" (eastbound) or "WB" (westbound). Surface reaches used a simplified rectangular cross section for the street widths.

Storm drain pipe (SDP) reach lengths, slopes, and diameters were taken from the Saltillo Unit 1 Work Order and As-builts, which included the proposed storm drain. Manning's n values of 0.016 (asphalt) and 0.013 (concrete and storm drain) were used. Travel time was computed using the simple Lag method and the DPM, Equations 6.10 and 6.11.

4.4 Modeling

A hydrologic model was created in HEC-HMS 4.7 using the inputs described above. The basin model map (Figure 4-2) and McMahon low point detail (Figure 4-3) are shown below. Additional supporting excerpts are included as (Attachment 1-2) and the model is in included in the electronic files (Attachment 3-1).

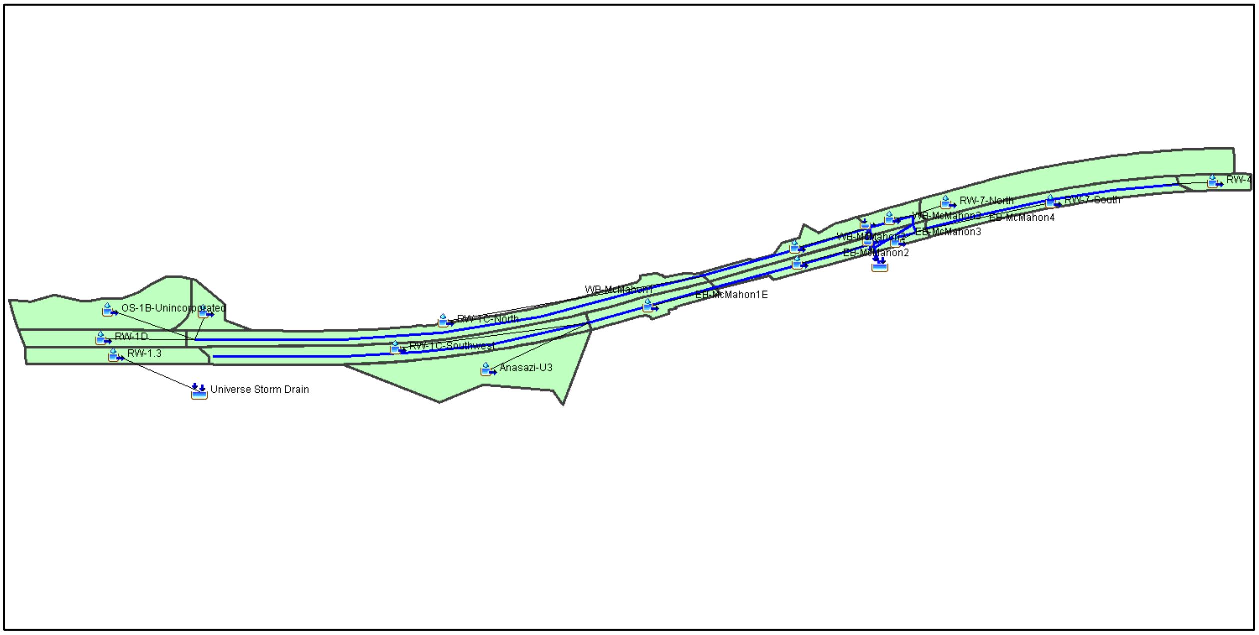


Figure 4-2: Basin Model Map

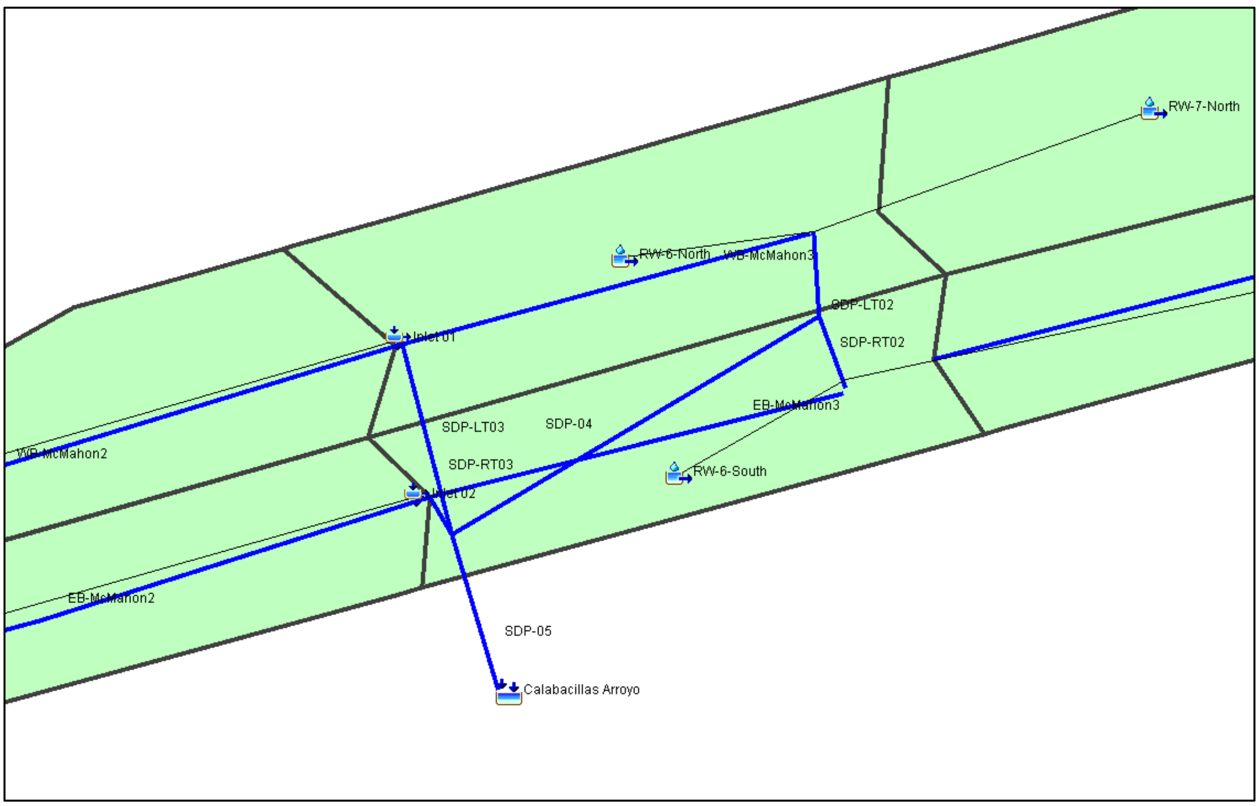


Figure 4-3: McMahon Low Point Detail

Inlet 01 and Inlet 02 are inlets on grade; flows were split at these elements using diversion elements and inlet rating tables developed as part of the Inlet Analysis (Section 5.2). Flows that bypassed Inlet 01 and

Inlet 02 continued east to the McMahon low point located at SDP-LT02 and SDP-RT02; sump inlets Inlet 03 and Inlet 05 capture all residual flows at the low point.

Summary results are shown below (Table 4-3) and additional results are included in (Attachment 1-2).

Table 4-3: HEC-HMS Summary Results

Element	Drainage Area (Sq. Mi)	10-yr Peak discharge (cfs)	10-yr Volume (Ac-Ft)	100-yr Peak discharge (cfs)	100-yr Volume (Ac-Ft)
Anasazi-U3	0.0062	**1.8**	0.1	**6.0**	0.3
Calabacillas Arroyo	0.0433	**35.7**	2.0	**69.4**	3.6
EB-McMahon1E	0.0115	**8.5**	0.4	**18.6**	0.8
EB-McMahon1W	0.0000	**0.0**	0.0	**0.0**	0.0
EB-McMahon2	0.0133	**10.5**	0.5	**22.3**	1.0
EB-McMahon3	0.0150	**4.5**	0.1	**13.2**	0.4
EB-McMahon4	0.0009	**1.2**	0.1	**2.2**	0.1
Inlet 01	0.0164	**4.2**	0.2	**11.0**	0.5
Inlet 02	0.0150	**4.5**	0.1	**13.2**	0.4
OS-1B-FutureROW	0.0012	**1.5**	0.1	**2.9**	0.1
OS-1B-Unincorporated	0.0048	**1.4**	0.1	**4.6**	0.2
RW-1C-North	0.0063	**8.1**	0.4	**15.1**	0.6
RW-1C-Southeast	0.0018	**2.3**	0.1	**4.3**	0.2
RW-1C-Southwest	0.0053	**6.8**	0.3	**12.7**	0.5
RW-1D	0.0021	**2.7**	0.1	**5.0**	0.2
RW-1.3	0.0023	**3.0**	0.1	**5.5**	0.2
RW-4	0.0009	**1.2**	0.1	**2.2**	0.1
RW-5-North	0.0020	**2.6**	0.1	**4.8**	0.2
RW-5-South	0.0017	**2.2**	0.1	**4.1**	0.2
RW-6-North	0.0010	**1.3**	0.1	**2.4**	0.1
RW-6-South	0.0008	**1.0**	0.0	**1.9**	0.1
RW-7-North	0.0059	**7.1**	0.3	**13.5**	0.5
RW-7-South	0.0033	**4.3**	0.2	**7.9**	0.3
SDP-LT02	0.0233	**11.9**	0.5	**25.3**	1.1
SDP-LT03	0.0000*	**7.4**	0.5	**11.1**	0.9
SDP-RT02	0.0200	**9.6**	0.4	**22.2**	0.9
SDP-RT03	0.0000*	**7.6**	0.5	**12.1**	0.8
SDP-04	0.0433	**21.1**	1.0	**46.6**	2.0
SDP-05	0.0433	**35.7**	2.0	**69.4**	3.6
Universe Storm Drain	0.0023	**3.0**	0.1	**5.5**	0.2
WB-McMahon1	0.0081	**5.5**	0.3	**12.5**	0.5
WB-McMahon2	0.0144	**9.7**	0.6	**20.1**	1.1
WB-McMahon3	0.0164	**4.2**	0.2	**11.0**	0.5

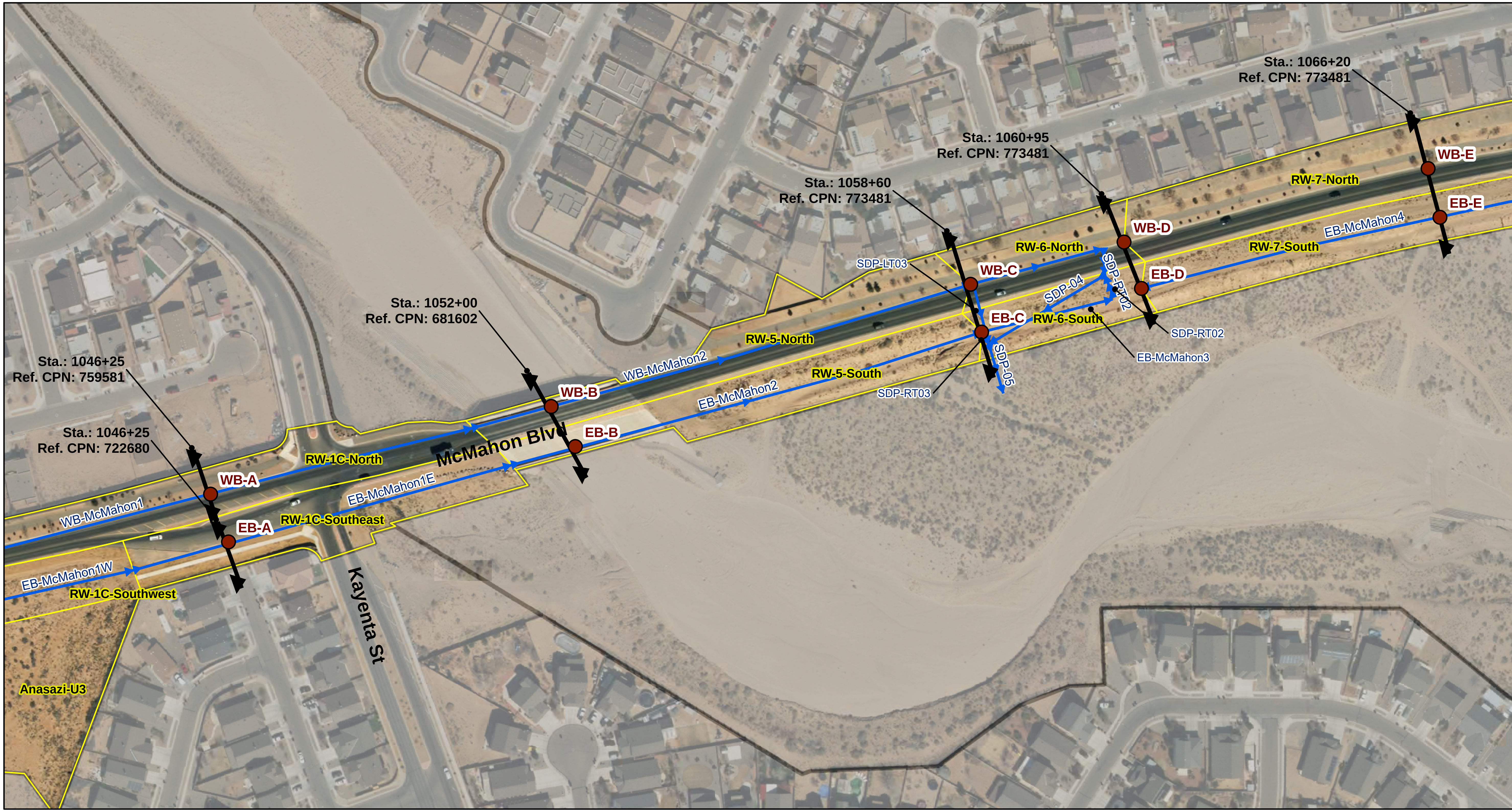
**these elements have no associated drainage area because the upstream elements are diversions*

5 Hydraulics

Hydraulic analysis for the proposed development was conducted in accordance with the 2020 City of Albuquerque Development Process Manual (DPM).

5.1 Street Capacity

Street capacity analysis was conducted for the existing westbound lanes and the proposed eastbound lanes by identifying the key areas where the flow depth or the energy grade might exceed DPM requirements. The below analysis points were selected (Figure 5-1):



Project: McMahon Blvd Widening
Location: Bernalillo County, NM
Prepared for: City of Albuquerque
CABQ CPN: 722690
AECOM Project No.: 60645365

AECOM

McMahon Blvd Widening
Analysis Points
Figure 5-1

At each analysis point, street sections were determined from as-built construction plans (Table 5-1):

Table 5-1: Street Sections

EB-A, section per CPN 722680		
Station	Elevation	Description
0.000	1.465	top of median curb
0.167	0.965	face of median curb
12.167	0.725	edge of left turn lane
24.167	0.485	edge of left drive lane (1 dry lane)
42.167	0.125	edge of asphalt / edge of gutter pan
44.167	0.000	flowline
44.333	0.667	top of curb
55.333	0.887	edge of sidewalk
61.333	1.007	back of sidewalk
76.708	1.314	property line

WB-A, section per CPN 759581		
Station	Elevation	Description
0.000	4.039	property line
11.375	1.196	back of asphalt trail
21.375	0.996	edge of asphalt trail
37.825	0.667	top of curb
37.992	0.000	flowline
39.992	0.125	edge of asphalt / edge of gutter pan
57.992	0.485	edge of left drive lane (1 dry lane)
69.992	0.725	face of median curb
70.158	1.225	top of median curb

EB-B, section per CPN 681602		
Station	Elevation	Description
0.000	0.933	top of median concrete
0.333	0.600	face of median concrete
12.333	0.360	edge of left drive lane (1 dry lane)
30.333	0.000	flowline
31.083	2.667	top of Jersey barrier

WB-B, section per CPN 681602		
Station	Elevation	Description
0.000	2.667	top of Jersey barrier
0.750	0.000	flowline
18.750	0.360	edge of left drive lane (1 dry lane)
30.750	0.600	face of median concrete
31.083	0.933	top of median concrete

EB-C, EB-D, & EB-E, section per CPN 773481		
Station	Elevation	Description
0.000	1.225	top of median curb
0.167	0.725	face of median curb
12.167	0.485	edge of left drive lane (1 dry lane)
30.167	0.125	edge of asphalt / edge of gutter pan
32.167	0.000	flowline
32.333	0.667	top of curb
48.783	0.996	edge of sidewalk
54.783	1.116	back of sidewalk
70.158	1.423	property line

WB-C, WB-D, & WB-E, section per CPN 773481		
Station	Elevation	Description
0.000	4.984	property line
11.375	1.196	back of asphalt trail
21.375	0.996	edge of asphalt trail
37.825	0.667	top of curb
37.992	0.000	flowline
39.992	0.125	edge of asphalt / edge of gutter pan
57.992	0.485	edge of left drive lane (1 dry lane)
69.992	0.725	face of median curb
70.158	1.225	top of median curb

Excerpts showing these cross sections are provided as Figure 3-2, Figure 3-3, Figure 3-4, and Figure 3-5; their locations are shown in Figure 5-1. The proposed eastbound lanes are generally planned to mirror the westbound lanes – standard curb and gutter, two driving lanes, but with sidewalk instead of an asphalt trail.

At each analysis point, the slope was determined from as-built construction plans as well. For the proposed eastbound lanes, the slope was assumed to match that of the adjacent westbound lanes. Contributing drainage to each analysis point was determined from the hydrologic analysis. The initial constraints for the street capacity analysis are shown in Table 5-2:

Table 5-2: Street Capacity Initial Constraints

Name	Slope	Contributing Drainage	Q10	Q100
	ft/ft		cfs	cfs
EB-A	0.0050	RW-1C-Southwest, Anasazi-U3, 25% of RW-1C Southeast	9.2	19.8
EB-B	0.0122	EB-McMahon2	10.5	22.3
EB-C	0.0171	EB-McMahon2 plus RW-5-South	12.7	26.4
EB-D (Sump)	0.0000	EB-McMahon3 plus EB-McMahon4, minus inlet 02 loss	9.6	22.2
EB-E	0.0500	EB-McMahon4 plus RW-7-South	5.5	10.1
WB-A	0.0050	OS-1B-Unincorporated, OS-1B-FutureROW, RW-1D, 80% of RW-1C-North	12.0	24.6
WB-B	0.0122	WB-McMahon2	9.7	20.1
WB-C	0.0171	WB-McMahon2 plus RW-5-North	12.3	24.9
WB-D (Sump)	0.0000	WB-C plus RW-6-North, RW-7-North, minus inlet 01 loss	11.9	25.3
WB-E	0.0500	RW-7-North	7.1	13.5

The street sections and initial constraints were loaded into Bentley FlowMaster (v. 10.00.00.02) to determine the flow depth and velocity at each analysis point for the 10-yr and 100-yr storm using the Manning's n equation for irregular channel sections. The detailed reports are included in Attachment 2-1 and the model workbook is provided in Attachment 3-2. Summarized results are provided below (Table 5-3 and Table 5-4):

Table 5-3: Summarized Street Capacity Results, 10-yr Storm

Name	Q10	Q10 Flow Depth	Q10 Allowable Flow Depth	Q10 Top Width	F-F width	remaining drivable width	Q10 Velocity	Depth x Velocity
	cfs	Ft	Ft	Ft	Ft	Ft	fps	< 6.5
EB-A	9.2	0.493	0.485	20.5	32	11.5	2.15	1.06
EB-B	10.5	0.342	0.360	16.4	30	13.6	3.57	1.22
EB-C	12.7	0.450	0.485	17.7	32	14.3	3.69	1.66
EB-D (Sump)	9.6	0.342	0.485	11.1	32	20.9	0.00	0.00
EB-E	5.5	0.297	0.485	10.7	32	21.4	4.53	1.35
WB-A	12.0	0.537	0.485	22.8	32	9.3	2.29	1.23
WB-B	9.7	0.332	0.360	16.2	30	13.9	3.50	1.16
WB-C	12.3	0.445	0.485	17.7	32	14.4	3.66	1.63
WB-D (Sump)	11.9	0.375	0.485	13.2	32	18.8	0.00	0.00
WB-E	7.1	0.320	0.485	11.8	32	20.2	4.82	1.54

Table 5-4: Summarized Street Capacity Results, 100-yr Storm

Name	Q100	Q100 Flow Depth	Q100 Allowable Flow Depth	Q100 Velocity	Q100 EGL	Q100 Allowable EGL
	cfs	Ft	Ft	fps	Ft	Ft
EB-A	19.8	0.633	0.667	2.59	0.737	1.314
EB-B	22.3	0.453	0.993	4.32	0.743	2.667
EB-C	26.4	0.568	0.667	4.43	0.873	1.423
EB-D (Sump)	22.2	0.517	0.667	0.00	0.000	1.423
EB-E	10.1	0.355	0.667	5.24	0.781	1.423
WB-A	24.6	0.683	0.667	2.70	0.796	4.039
WB-B	20.1	0.436	0.993	4.21	0.711	2.667
WB-C	24.9	0.558	0.667	4.36	0.853	4.984
WB-D (Sump)	25.3	0.558	0.667	0.00	0.000	4.984
WB-E	13.5	0.388	0.667	5.62	0.878	4.984

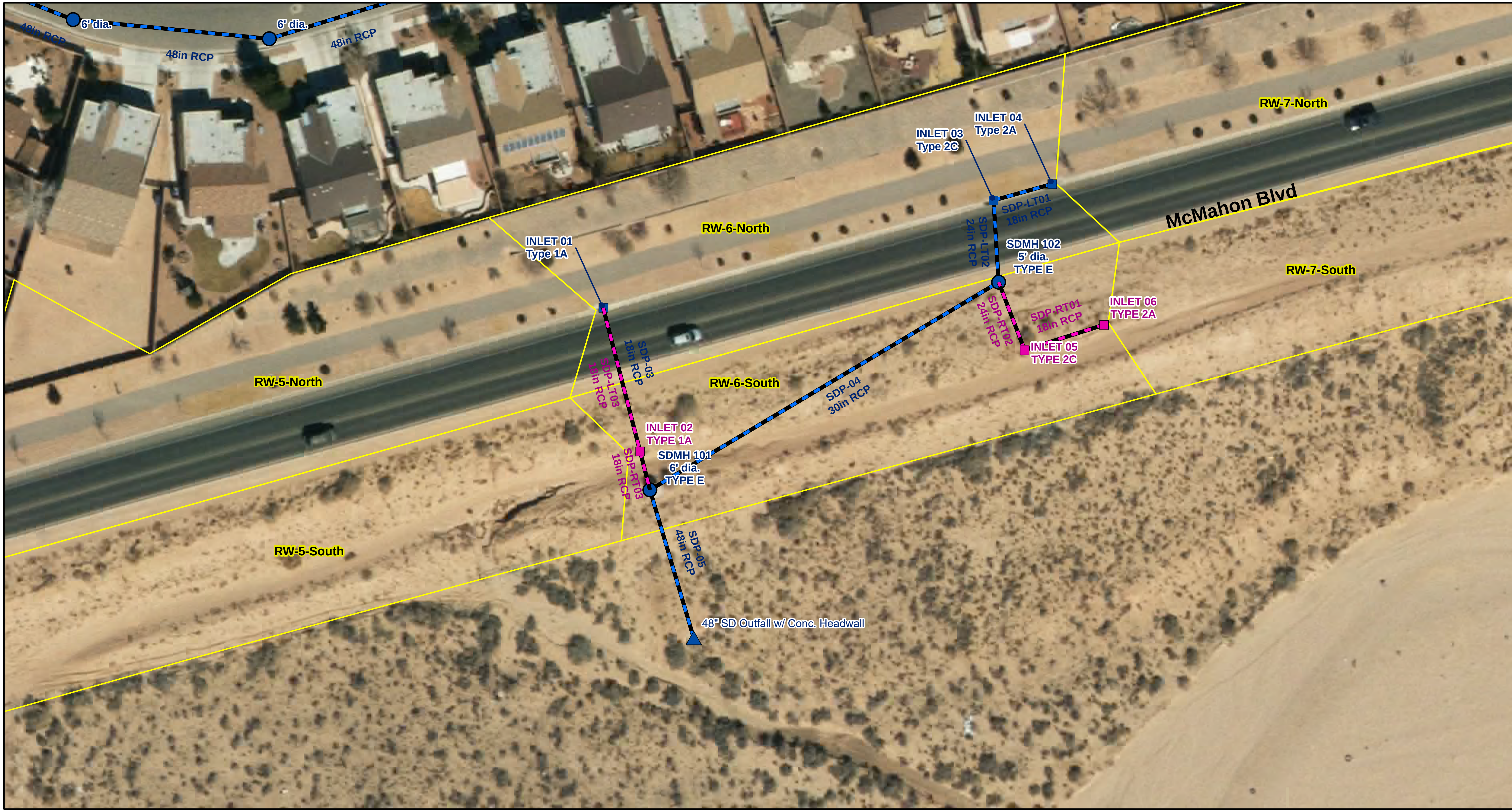
McMahon Blvd exceeds capacity at analysis point “EB-A” and “WB-A” as shown above in red (Table 5-3 and Table 5-4). Because both the eastbound and westbound lanes are already constructed at these locations, a variance from DPM standards is requested for:

- EB-A: Flow depth exceeded by 0.008’ (0.10”) during the 10-yr event; however, 11.5’ of remaining drivable width remains
- WB-A: Flow depth exceeded by 0.052’ (0.6”) during the 10-yr event; however, 9.3’ of drivable width, plus the entire left turn bay (12’) remains
- WB-A: Flow depth exceeded by 0.016’ (0.2”) during the 100-yr event; flow depth is still contained within the ROW

Analysis points WB-D and EB-D are at the sumps; flow depths at these analysis points were determined from the headwater depth at the sump inlets as determined in the Inlet Analysis (Section 5.2).

5.2 Inlet Analysis

3 existing and 3 proposed inlets are located in the project area, connecting to existing and proposed storm drain as shown in Figure 5-2:



0 50 100 Feet

1 inch = 50 feet

N

Project: McMahon Blvd Widening
Location: Bernalillo County, NM
Prepared for: City of Albuquerque
CABQ CPN: 722690
AECOM Project No.: 60645365

Legend

- Proposed Inlet
- Proposed Storm Drain
- Existing Outfall
- Existing Inlet
- Existing MH
- Existing Storm Drain
- Contributing Drainage Basins

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McMahon Blvd Widening

Proposed Inlets and Storm Drain

Figure 5-2

Inlet capacity for the existing and proposed inlets was determined using Bentley FlowMaster (v. 10.00.00.02) and information obtained from the Saltillo Unit 1 construction plans.

Inlet 01 and Inlet 02 are inlets on grade. Their capture efficiency was modeled in HEC-HMS as diversion elements using rating tables developed first in FlowMaster. A range of flows were loaded into FlowMaster based on preliminary results from HEC-HMS in order to determine a total flow vs. interception rating table. These rating tables were then loaded into the HEC-HMS model and to determine the interception and bypass flows. The rating tables are shown as Table 5-5 and the reports provided in (Attachment 2-1).

Table 5-5: Rating Tables

Inlet 01				Inlet 02		
Q100 range:	0-25.9 cfs	preliminary range from HEC-HMS		Q100 range:	0-24.2 cfs	preliminary range from HEC-HMS
Q Total	Efficiency	Q Intercepted		Q Total	Efficiency	Q Intercepted
cfs	%	cfs		cfs	%	cfs
0		0.00		0		0.00
5	83.06	4.15		5	83.06	4.15
10	67.18	6.72		10	67.18	6.72
15	58.27	8.74		15	58.27	8.74
20	52.39	10.48		20	52.39	10.48
25	48.13	12.03		25	48.13	12.03
30	44.85	13.46		30	44.85	13.46
35	42.23	14.78		35	42.23	14.78
40	40.06	16.02		40	40.06	16.02
45	38.23	17.20		45	38.23	17.20

Inlet 03 and Inlet 04 were modeled as one large inlet in a sump with a 50% clogging factor on the grate. Inlet 05 and Inlet 06 were modeled the same way. The headwater depths at the sump were also used for determining street capacity in Section 5.1. The inlet summary is shown below (Table 5-6) and the detailed reports are provided in (Attachment 2-1).

Table 5-6: Inlet Summary

	Name	Type	Q100 Total	**Q100 Intercepted**	Q100 Bypass
			cfs	**cfs**	cfs
Existing WB Inlets	Inlet 01	Single-A on grade	22.1	**11.1**	11
	Inlet 03	Double-C in sump	25.3	**12.65**	12.65
	Inlet 04	Double-A in sump	12.65	**12.65**	0
Proposed EB Inlets	Inlet 02	Single-A on grade	25.3	**12.1**	13.2
	Inlet 05	Double-C in sump	22.2	**11.1**	11.1
	Inlet 06	Double-A in sump	11.1	**11.1**	0

5.3 Storm Drain Analysis

Once the Inlet interceptions were known the storm drain was modeled as a steady state system using Bentley StormCAD v8i SELECTseries 5 (v. 08.11.05.113). The storm drain model plan view is shown below (Figure 5-3) and the storm drain profiles are provided in (Attachment 2-2).

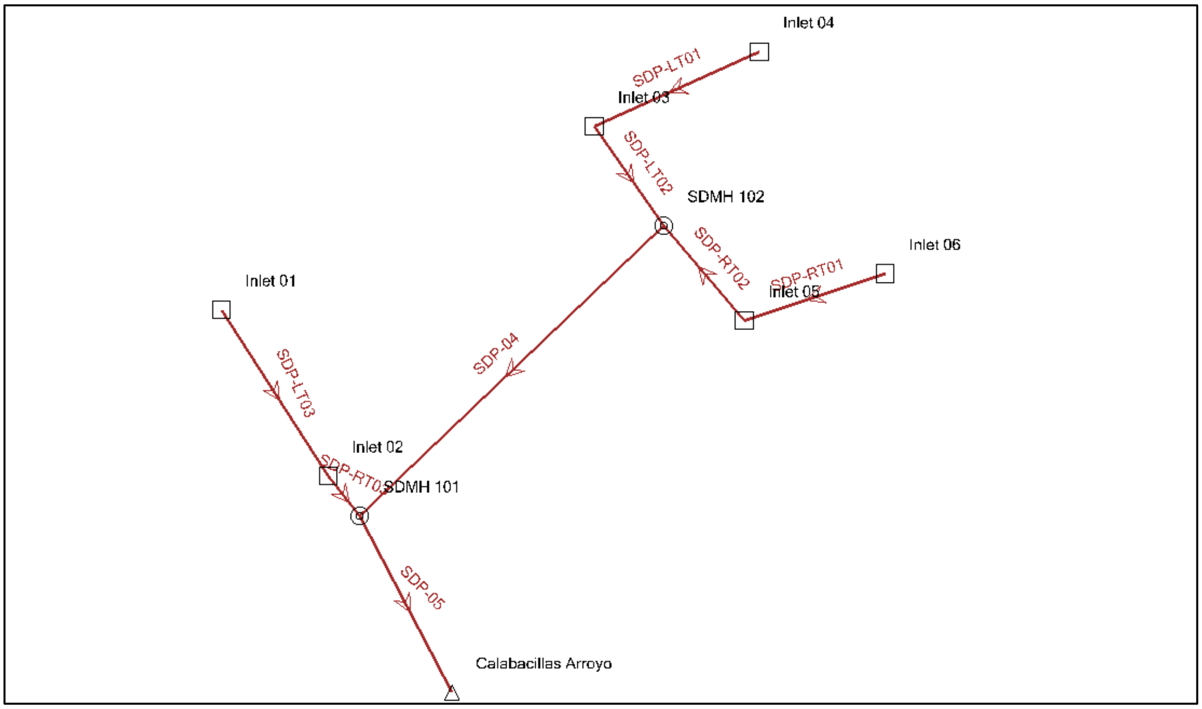

Figure 5-3: Storm Drain Model Plan View

HEC-22 Energy Equations (Third Edition) were selected for the headloss method and the 100-yr water surface elevation (WSE) in the Calabacillas Arroyo was used as the tailwater elevation. The 100-yr water surface was determined to be 5349.47 ft by linear interpolation between the two Base Flood Elevations published in the effective FIRM (Table 5-7):

Table 5-7: Calabacillas Outfall WSE

Name	100yr BFE	distance from DS-X Section	WS Slope
	Ft	Ft	ft/ft
US X-Section	5353.00	357.5	0.0140
DS X-Section	5348.00	0.0	
48" SD Outfall	**5349.47**	105.00	

Rim, invert and flowline data provided in the Saltillo Unit 1 as-built construction plans were used; this included the proposed elevation data for the new storm drain and inlets. Elevation data and detailed results of the storm drain analysis are provided in Attachment 2-2. The StormCAD Model is provided in Attachment 3-3. The storm drain has adequate capacity to accept the proposed flows.

6 Data Sources

BernCo. "LiDAR-derived, Topographic Contours – Bernalillo County." Bohannan-Huston, Inc. 2010.

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URS, Inc. *McMahon Boulevard Extension – Final Drainage Report, Revision 2.* ABQ Hydrology File No.: A10D000. April 2010.

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Wilson and Company, Inc. *Drainage Report for Seville Subdivision Unit 7*. ABQ Hydrology File No.: A10D002E. September 2003.

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Attachment 1: Supporting Hydrology

1-1 NOAA Atlas 14 Precipitation Report

NOAA Atlas 14, Volume 1, Version 5
Location name: Albuquerque, New Mexico, USA*
Latitude: 35.2126°, Longitude: -106.7207°
Elevation: 5361.78 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.163 (0.140-0.191)	0.212 (0.181-0.248)	0.285 (0.243-0.334)	0.342 (0.291-0.400)	0.421 (0.356-0.492)	0.483 (0.407-0.564)	0.549 (0.459-0.639)	0.619 (0.513-0.720)	0.714 (0.586-0.831)	0.789 (0.644-0.919)
10-min	0.249 (0.213-0.291)	0.322 (0.275-0.377)	0.434 (0.369-0.508)	0.521 (0.443-0.609)	0.641 (0.542-0.749)	0.736 (0.620-0.858)	0.836 (0.699-0.973)	0.942 (0.782-1.10)	1.09 (0.892-1.27)	1.20 (0.980-1.40)
15-min	0.308 (0.265-0.360)	0.400 (0.341-0.467)	0.537 (0.458-0.630)	0.646 (0.550-0.755)	0.795 (0.672-0.928)	0.912 (0.769-1.06)	1.04 (0.866-1.21)	1.17 (0.969-1.36)	1.35 (1.11-1.57)	1.49 (1.22-1.73)
30-min	0.415 (0.356-0.485)	0.538 (0.459-0.629)	0.724 (0.617-0.849)	0.870 (0.740-1.02)	1.07 (0.905-1.25)	1.23 (1.03-1.43)	1.40 (1.17-1.63)	1.57 (1.31-1.83)	1.81 (1.49-2.11)	2.01 (1.64-2.34)
60-min	0.514 (0.441-0.601)	0.666 (0.568-0.779)	0.896 (0.764-1.05)	1.08 (0.916-1.26)	1.33 (1.12-1.55)	1.52 (1.28-1.77)	1.73 (1.44-2.01)	1.95 (1.62-2.27)	2.24 (1.84-2.62)	2.48 (2.02-2.89)
2-hr	0.604 (0.515-0.717)	0.773 (0.657-0.919)	1.02 (0.869-1.22)	1.23 (1.04-1.45)	1.51 (1.27-1.78)	1.74 (1.45-2.04)	1.98 (1.64-2.32)	2.24 (1.84-2.62)	2.60 (2.11-3.04)	2.89 (2.32-3.39)
3-hr	0.664 (0.572-0.785)	0.845 (0.727-0.997)	1.11 (0.953-1.30)	1.32 (1.13-1.55)	1.61 (1.37-1.89)	1.85 (1.56-2.16)	2.10 (1.76-2.45)	2.37 (1.97-2.76)	2.74 (2.25-3.19)	3.04 (2.48-3.55)
6-hr	0.765 (0.663-0.892)	0.966 (0.842-1.13)	1.25 (1.09-1.45)	1.47 (1.27-1.71)	1.77 (1.53-2.06)	2.01 (1.73-2.33)	2.26 (1.93-2.62)	2.52 (2.14-2.92)	2.89 (2.42-3.34)	3.19 (2.64-3.69)
12-hr	0.854 (0.751-0.978)	1.08 (0.948-1.23)	1.37 (1.20-1.56)	1.60 (1.40-1.82)	1.91 (1.66-2.17)	2.15 (1.86-2.44)	2.40 (2.06-2.72)	2.66 (2.27-3.02)	3.00 (2.55-3.42)	3.29 (2.76-3.75)
24-hr	0.966 (0.854-1.10)	1.21 (1.07-1.38)	1.52 (1.34-1.73)	1.76 (1.56-2.00)	2.09 (1.84-2.38)	2.35 (2.05-2.66)	2.61 (2.28-2.96)	2.88 (2.50-3.26)	3.24 (2.80-3.67)	3.53 (3.02-3.99)
2-day	1.03 (0.916-1.16)	1.29 (1.15-1.46)	1.62 (1.44-1.83)	1.88 (1.67-2.12)	2.23 (1.97-2.51)	2.50 (2.20-2.81)	2.78 (2.43-3.12)	3.06 (2.67-3.44)	3.44 (2.98-3.87)	3.73 (3.22-4.21)
3-day	1.18 (1.07-1.31)	1.47 (1.33-1.63)	1.83 (1.65-2.02)	2.10 (1.90-2.33)	2.48 (2.23-2.74)	2.77 (2.48-3.06)	3.06 (2.73-3.38)	3.36 (2.98-3.71)	3.75 (3.32-4.16)	4.05 (3.57-4.50)
4-day	1.33 (1.22-1.45)	1.65 (1.51-1.81)	2.03 (1.86-2.22)	2.33 (2.13-2.54)	2.73 (2.49-2.98)	3.04 (2.76-3.31)	3.34 (3.03-3.65)	3.65 (3.30-3.99)	4.06 (3.66-4.44)	4.37 (3.92-4.79)
7-day	1.53 (1.40-1.66)	1.90 (1.74-2.06)	2.31 (2.12-2.52)	2.64 (2.42-2.87)	3.07 (2.81-3.33)	3.39 (3.10-3.68)	3.71 (3.38-4.03)	4.02 (3.66-4.36)	4.42 (4.01-4.81)	4.72 (4.27-5.14)
10-day	1.69 (1.55-1.84)	2.10 (1.93-2.28)	2.57 (2.36-2.79)	2.94 (2.70-3.19)	3.43 (3.15-3.72)	3.80 (3.48-4.11)	4.17 (3.81-4.51)	4.54 (4.13-4.92)	5.02 (4.55-5.44)	5.37 (4.86-5.83)
20-day	2.13 (1.95-2.32)	2.64 (2.43-2.88)	3.21 (2.95-3.49)	3.64 (3.34-3.95)	4.19 (3.84-4.55)	4.59 (4.20-4.97)	4.98 (4.55-5.39)	5.35 (4.87-5.78)	5.81 (5.28-6.29)	6.13 (5.56-6.65)
30-day	2.56 (2.35-2.77)	3.18 (2.92-3.44)	3.83 (3.52-4.14)	4.31 (3.96-4.65)	4.92 (4.51-5.30)	5.35 (4.90-5.76)	5.76 (5.27-6.20)	6.15 (5.61-6.62)	6.61 (6.03-7.12)	6.94 (6.31-7.48)
45-day	3.12 (2.88-3.37)	3.86 (3.57-4.18)	4.61 (4.25-4.97)	5.15 (4.74-5.54)	5.80 (5.34-6.24)	6.24 (5.75-6.72)	6.65 (6.12-7.15)	7.01 (6.45-7.54)	7.43 (6.83-7.98)	7.69 (7.08-8.26)
60-day	3.59 (3.32-3.89)	4.45 (4.11-4.81)	5.31 (4.91-5.73)	5.92 (5.47-6.39)	6.66 (6.16-7.19)	7.17 (6.63-7.73)	7.63 (7.06-8.24)	8.05 (7.44-8.69)	8.53 (7.89-9.22)	8.84 (8.18-9.55)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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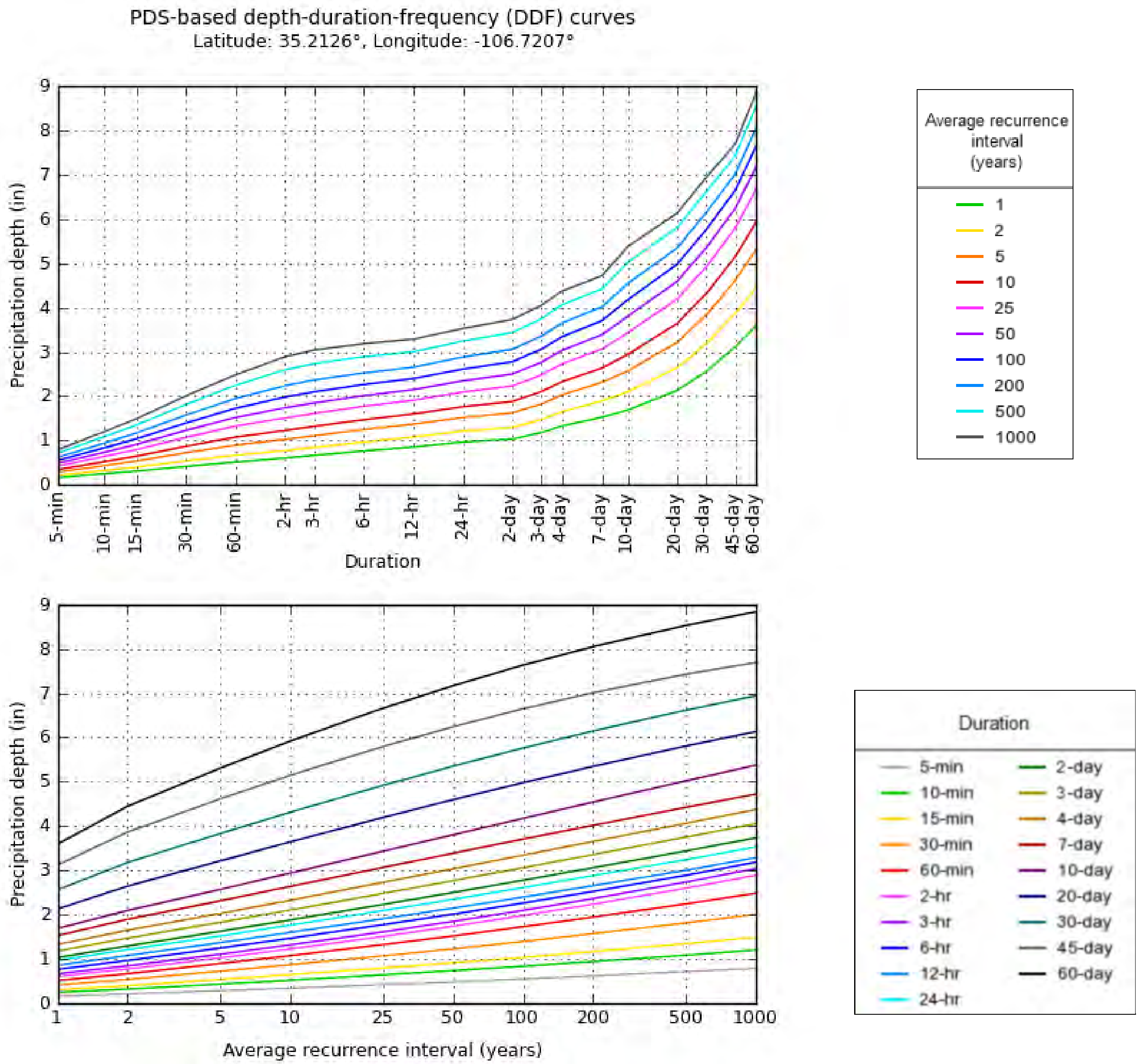
PF graphical



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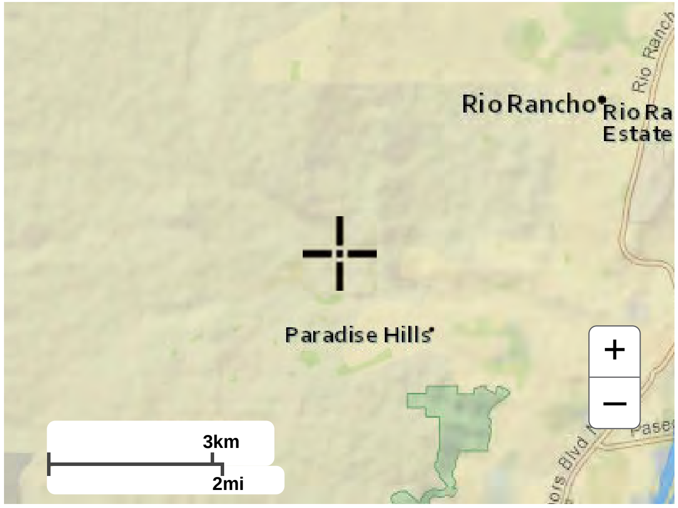
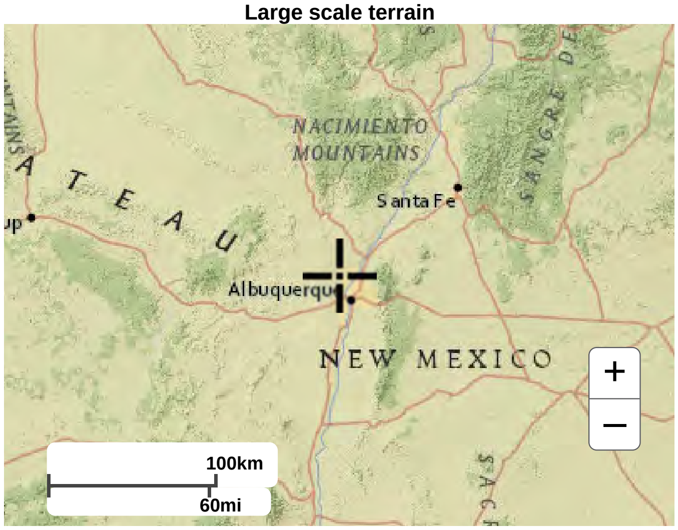
Maps & aerials

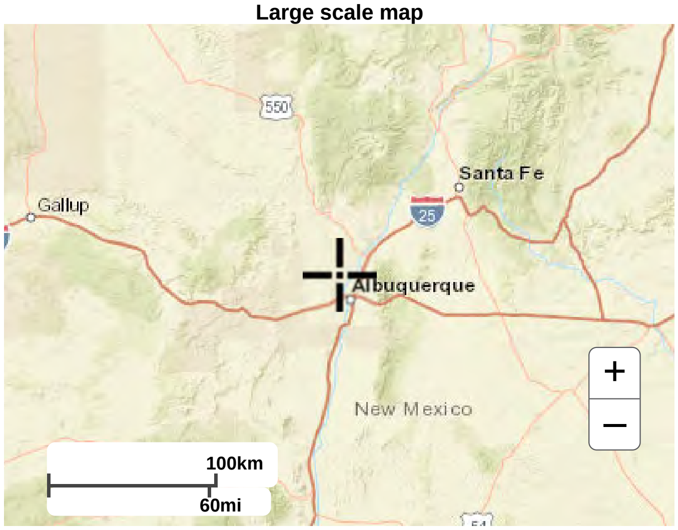
Small scale terrain



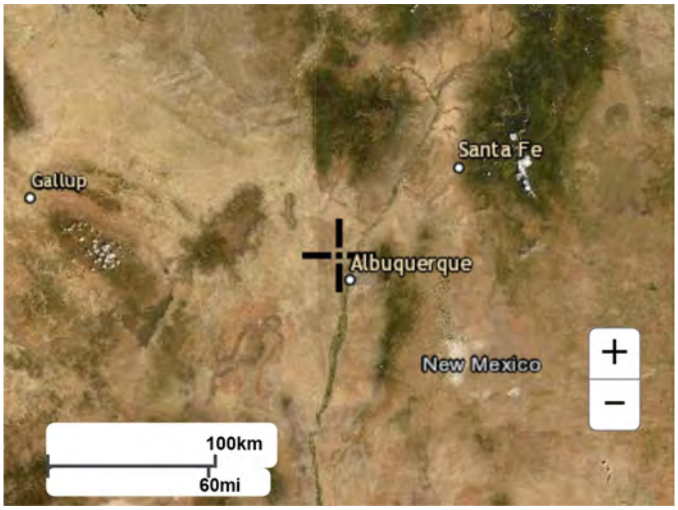
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

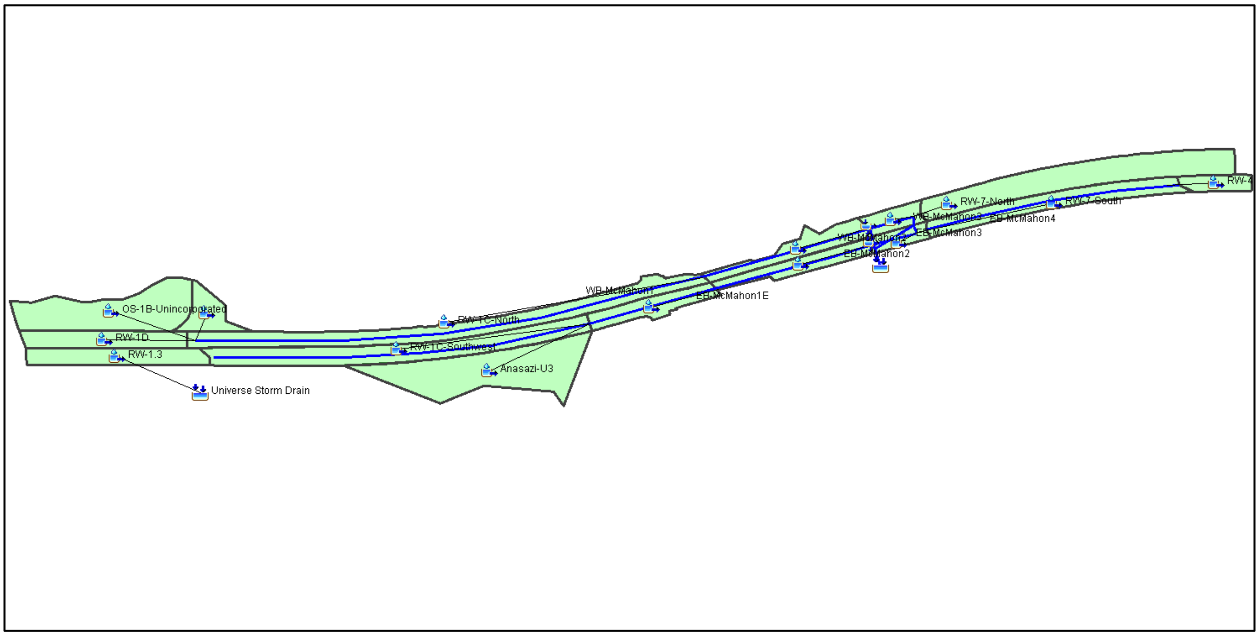
Disclaimer

1-2 HEC-HMS Inputs and Outputs

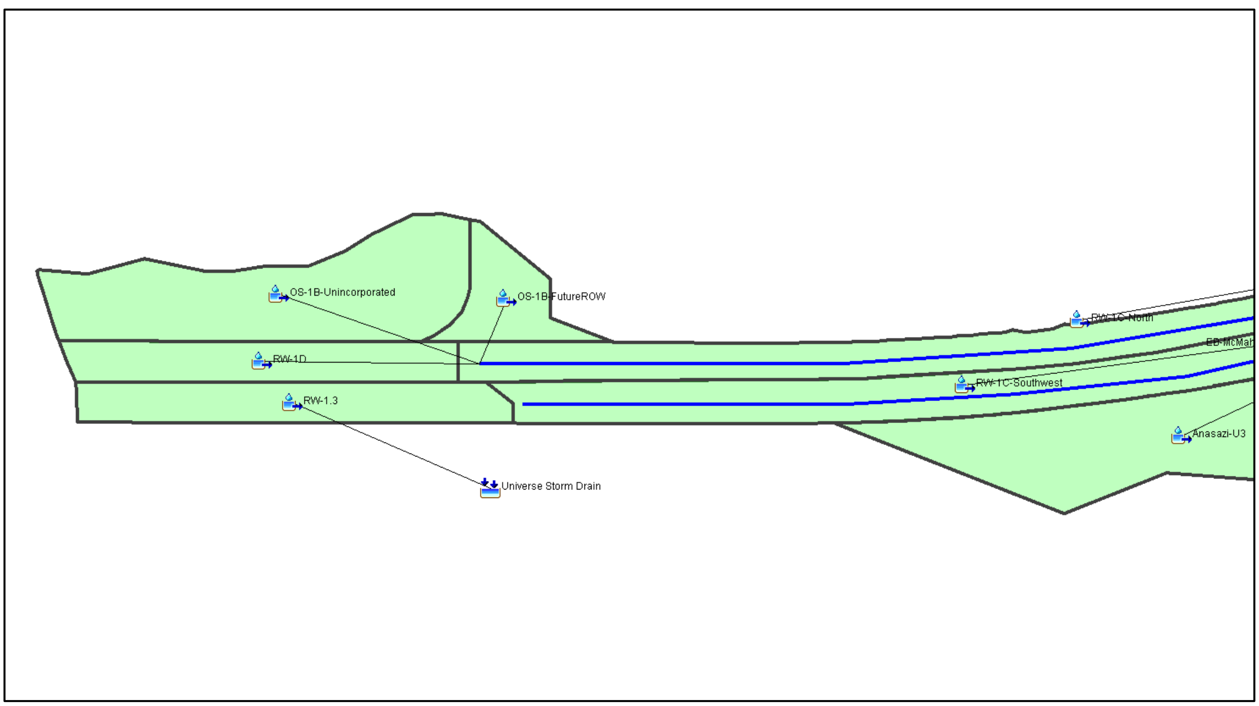
HEC-HMS Inputs and Outputs

Basin Model

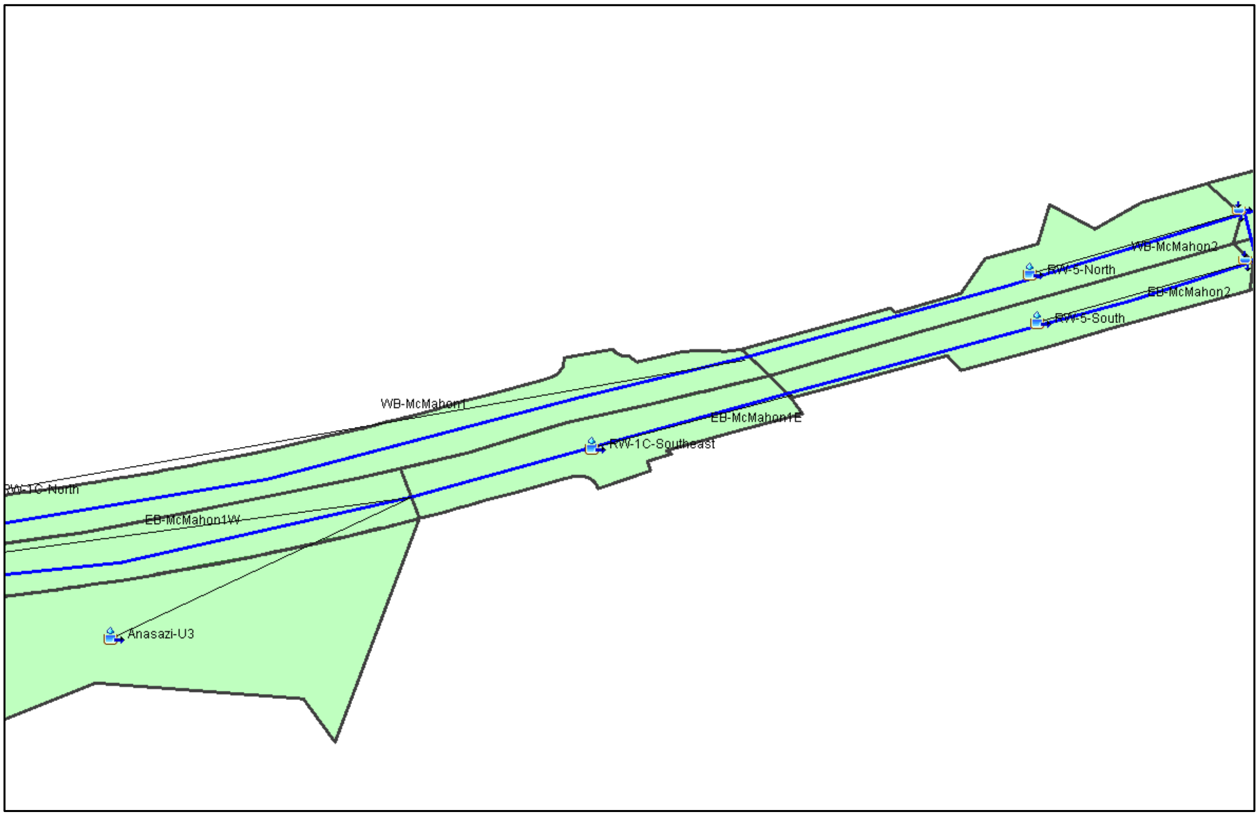
Overview:



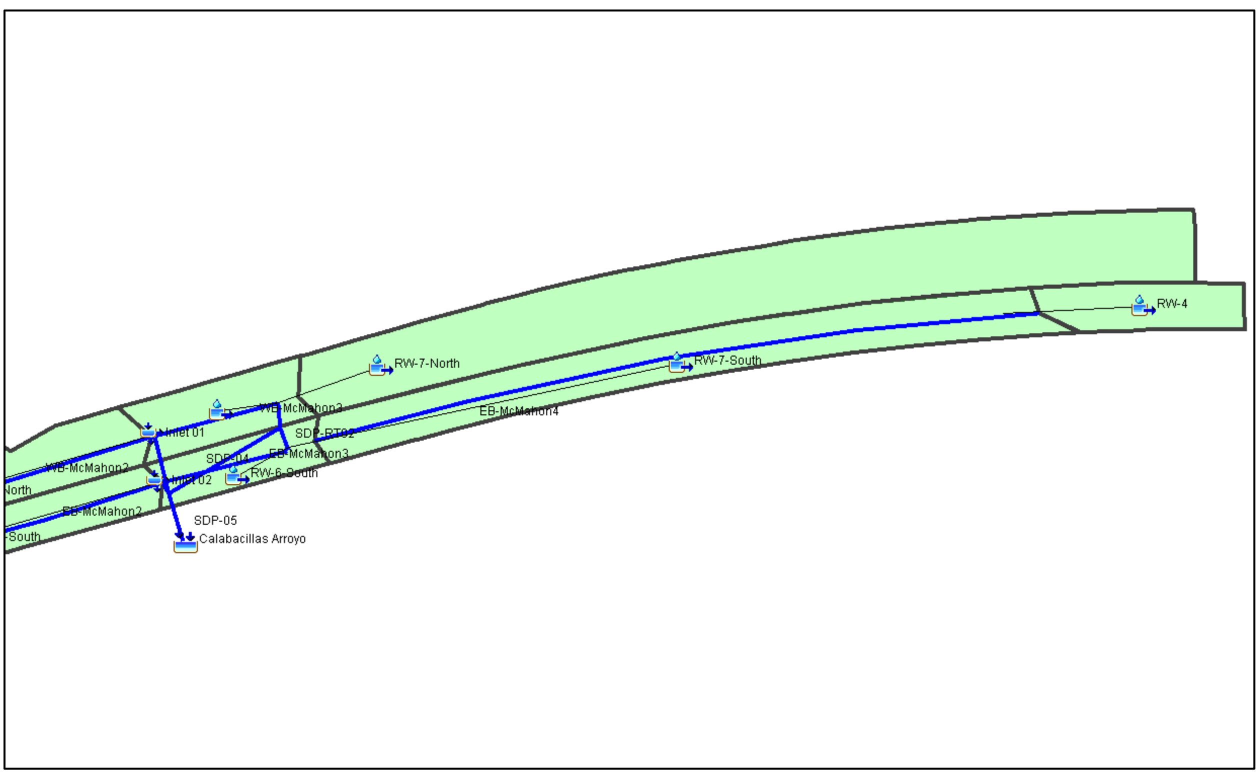
West Area:



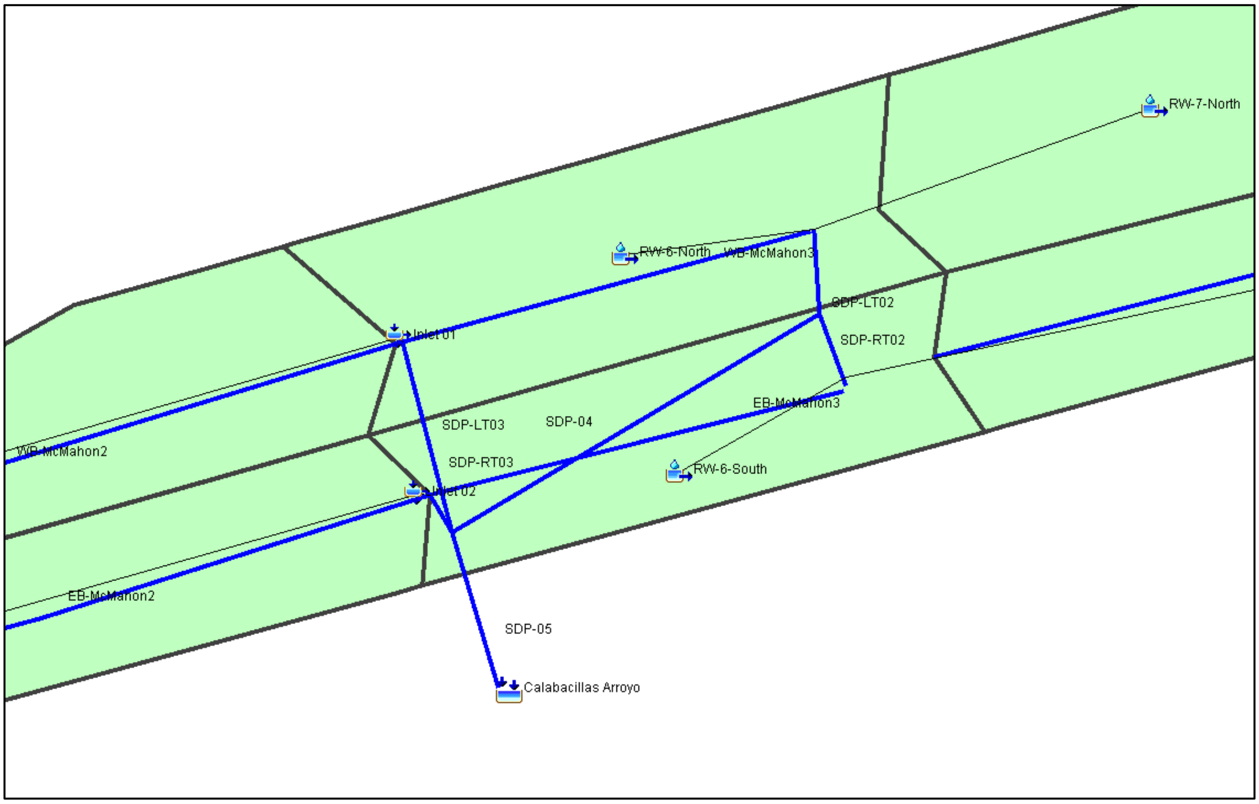
Center Area:



East Area:

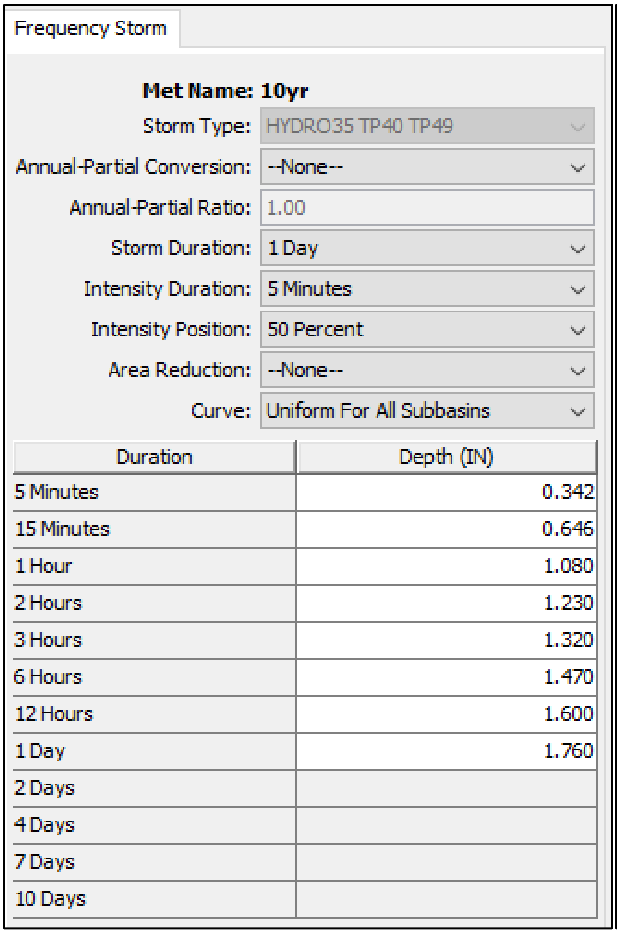


McMahon Low Point Detail:



Precipitation

10-yr Storm:



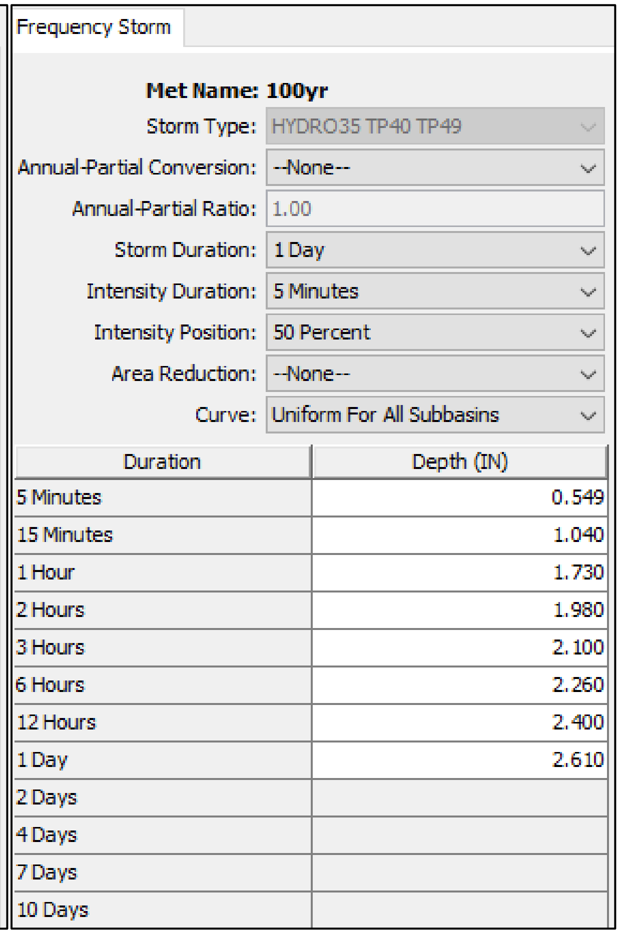
Frequency Storm

Met Name: 10yr

Storm Type: HYDRO35 TP40 TP49
Annual-Partial Conversion: --None--
Annual-Partial Ratio: 1.00
Storm Duration: 1 Day
Intensity Duration: 5 Minutes
Intensity Position: 50 Percent
Area Reduction: --None--
Curve: Uniform For All Subbasins

Duration	Depth (IN)
5 Minutes	0.342
15 Minutes	0.646
1 Hour	1.080
2 Hours	1.230
3 Hours	1.320
6 Hours	1.470
12 Hours	1.600
1 Day	1.760
2 Days	
4 Days	
7 Days	
10 Days	

100-yr Storm:



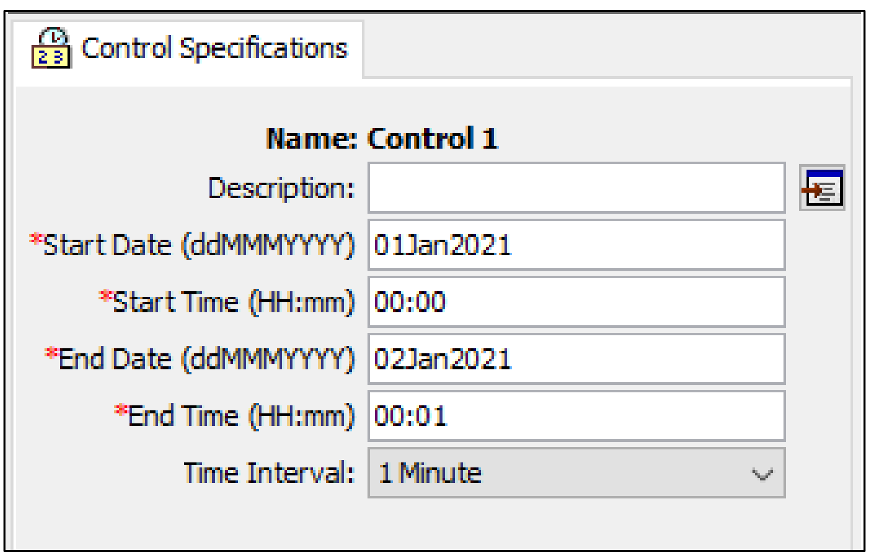
Frequency Storm

Met Name: 100yr

Storm Type: HYDRO35 TP40 TP49
Annual-Partial Conversion: --None--
Annual-Partial Ratio: 1.00
Storm Duration: 1 Day
Intensity Duration: 5 Minutes
Intensity Position: 50 Percent
Area Reduction: --None--
Curve: Uniform For All Subbasins

Duration	Depth (IN)
5 Minutes	0.549
15 Minutes	1.040
1 Hour	1.730
2 Hours	1.980
3 Hours	2.100
6 Hours	2.260
12 Hours	2.400
1 Day	2.610
2 Days	
4 Days	
7 Days	
10 Days	

Control



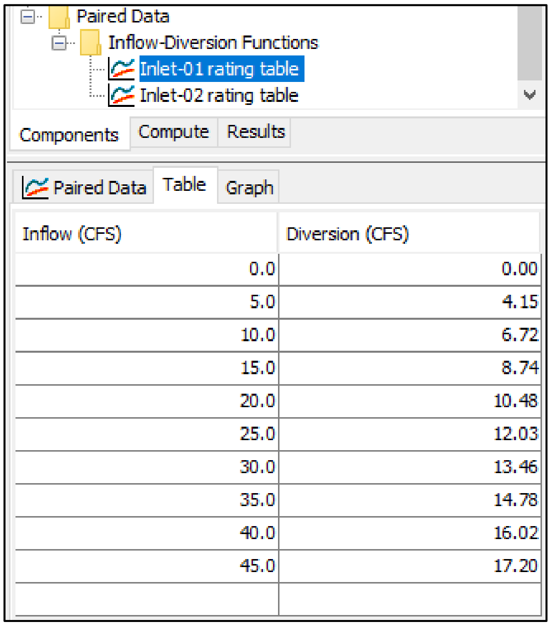
Control Specifications

Name: Control 1

Description:
*Start Date (ddMMMYYYY) 01Jan2021
*Start Time (HH:mm) 00:00
*End Date (ddMMMYYYY) 02Jan2021
*End Time (HH:mm) 00:01
Time Interval: 1 Minute

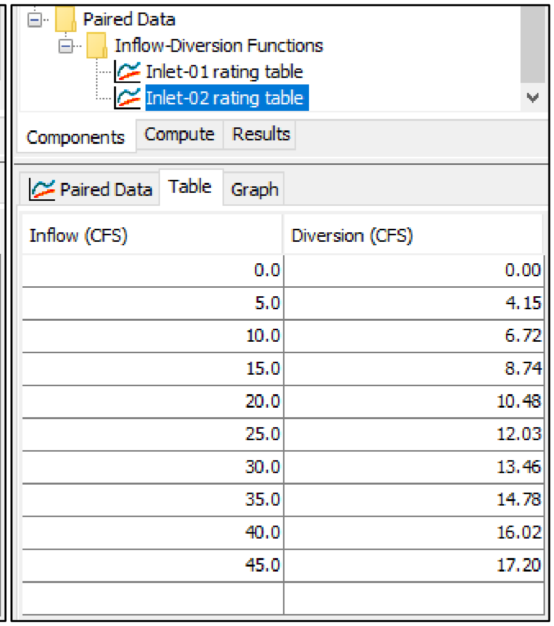
Inflow-Diversion Functions

Inlet-01 Rating Table



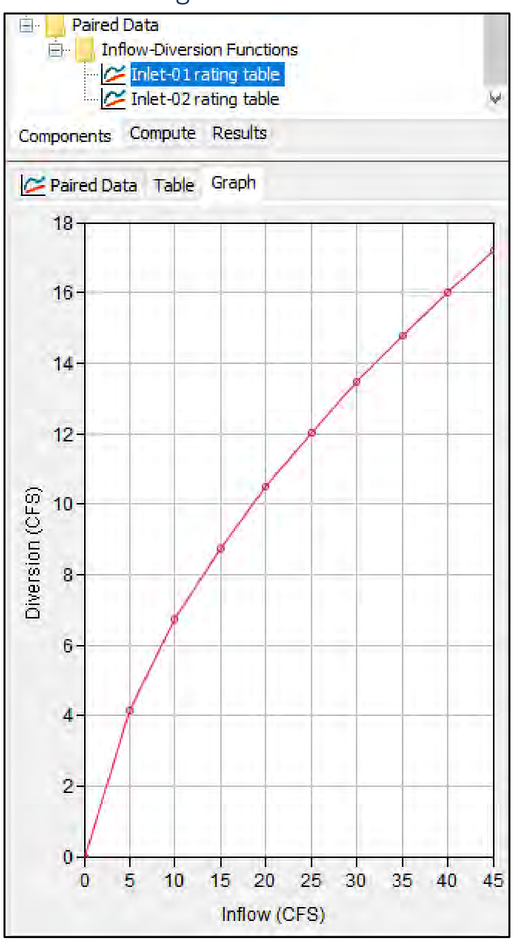
Inflow (CFS)	Diversion (CFS)
0.0	0.00
5.0	4.15
10.0	6.72
15.0	8.74
20.0	10.48
25.0	12.03
30.0	13.46
35.0	14.78
40.0	16.02
45.0	17.20

Inlet-02 Rating Table

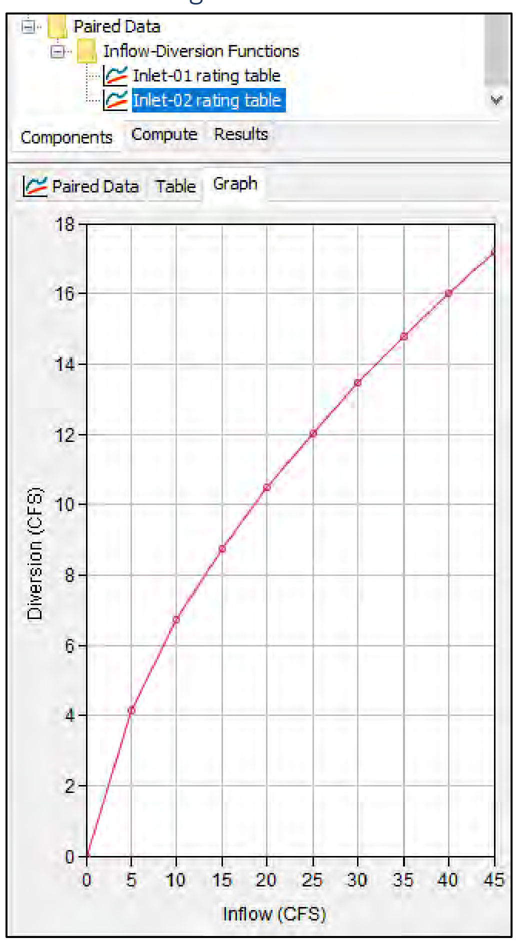


Inflow (CFS)	Diversion (CFS)
0.0	0.00
5.0	4.15
10.0	6.72
15.0	8.74
20.0	10.48
25.0	12.03
30.0	13.46
35.0	14.78
40.0	16.02
45.0	17.20

Inlet-01 Rating Curve



Inlet-02 Rating Curve



Summary Output Tables

10-yr Storm

Global Summary Results for Run "10yr"

Project: McMahon_Expansion   Simulation Run: 10yr

Start of Run: 01Jan2021, 00:00   Basin Model: McMahon Basins
End of Run: 02Jan2021, 00:01   Meteorologic Model: 10yr
Compute Time: 04Feb2021, 10:13:12   Control Specifications: Control 1

Show Elements: All Elements   Volume Units: IN ACRE-FT   Sorting: Alphabetic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (ACRE-FT)
Anasazi-U3	0.0062	1.8	01Jan2021, 12:11	0.1
Calabacillas Arroyo	0.0433	35.7	01Jan2021, 12:12	2.0
EB-McMahon1E	0.0115	8.5	01Jan2021, 12:12	0.4
EB-McMahon1W	0.0000	0.0	01Jan2021, 00:00	0.0
EB-McMahon2	0.0133	10.5	01Jan2021, 12:15	0.5
EB-McMahon3	0.0150	4.5	01Jan2021, 12:15	0.1
EB-McMahon4	0.0009	1.2	01Jan2021, 12:12	0.1
Inlet 01	0.0164	4.2	01Jan2021, 12:12	0.2
Inlet 02	0.0150	4.5	01Jan2021, 12:14	0.1
OS-1B-FutureROW	0.0012	1.5	01Jan2021, 12:09	0.1
OS-1B-Unincorporated	0.0048	1.4	01Jan2021, 12:11	0.1
RW-1C-North	0.0063	8.1	01Jan2021, 12:09	0.4
RW-1C-Southeast	0.0018	2.3	01Jan2021, 12:09	0.1
RW-1C-Southwest	0.0053	6.8	01Jan2021, 12:09	0.3
RW-1D	0.0021	2.7	01Jan2021, 12:09	0.1
RW-1.3	0.0023	3.0	01Jan2021, 12:09	0.1
RW-4	0.0009	1.2	01Jan2021, 12:09	0.1
RW-5-North	0.0020	2.6	01Jan2021, 12:09	0.1
RW-5-South	0.0017	2.2	01Jan2021, 12:09	0.1
RW-6-North	0.0010	1.3	01Jan2021, 12:09	0.1
RW-6-South	0.0008	1.0	01Jan2021, 12:09	0.0
RW-7-North	0.0059	7.1	01Jan2021, 12:09	0.3
RW-7-South	0.0033	4.3	01Jan2021, 12:09	0.2
SDP-LT02	0.0233	11.9	01Jan2021, 12:11	0.5
SDP-LT03	0.0000	7.4	01Jan2021, 12:12	0.5
SDP-RT02	0.0200	9.6	01Jan2021, 12:13	0.4
SDP-RT03	0.0000	7.6	01Jan2021, 12:14	0.5
SDP-04	0.0433	21.1	01Jan2021, 12:11	1.0
SDP-05	0.0433	35.7	01Jan2021, 12:12	2.0
Universe Storm Drain	0.0023	3.0	01Jan2021, 12:09	0.1
WB-McMahon1	0.0081	5.5	01Jan2021, 12:19	0.3
WB-McMahon2	0.0144	9.7	01Jan2021, 12:20	0.6
WB-McMahon3	0.0164	4.2	01Jan2021, 12:13	0.2

100-yr Storm:

Global Summary Results for Run "100yr"

Project: McMahon_Expansion Simulation Run: 100yr

Start of Run: 01Jan2021, 00:00 Basin Model: McMahon Basins
End of Run: 02Jan2021, 00:01 Meteorologic Model: 100yr
Compute Time:04Feb2021, 10:14:09 Control Specifications:Control 1

Show Elements: All Elements Volume Units: IN ACRE-FT Sorting: Alphabetic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (ACRE-FT)
Anasazi-U3	0.0062	6.0	01Jan2021, 12:10	0.3
Calabacillas Arroyo	0.0433	69.4	01Jan2021, 12:12	3.6
EB-McMahon1E	0.0115	18.6	01Jan2021, 12:12	0.8
EB-McMahon1W	0.0	0.0	01Jan2021, 00:00	0.0
EB-McMahon2	0.0133	22.3	01Jan2021, 12:15	1.0
EB-McMahon3	0.0150	13.2	01Jan2021, 12:15	0.4
EB-McMahon4	0.0009	2.2	01Jan2021, 12:12	0.1
Inlet 01	0.0164	11.0	01Jan2021, 12:12	0.5
Inlet 02	0.0150	13.2	01Jan2021, 12:14	0.4
OS-1B-FutureROW	0.0012	2.9	01Jan2021, 12:09	0.1
OS-1B-Unincorporated	0.0048	4.6	01Jan2021, 12:10	0.2
RW-1C-North	0.0063	15.1	01Jan2021, 12:09	0.6
RW-1C-Southeast	0.0018	4.3	01Jan2021, 12:09	0.2
RW-1C-Southwest	0.0053	12.7	01Jan2021, 12:09	0.5
RW-1D	0.0021	5.0	01Jan2021, 12:09	0.2
RW-1.3	0.0023	5.5	01Jan2021, 12:09	0.2
RW-4	0.0009	2.2	01Jan2021, 12:09	0.1
RW-5-North	0.0020	4.8	01Jan2021, 12:09	0.2
RW-5-South	0.0017	4.1	01Jan2021, 12:09	0.2
RW-6-North	0.0010	2.4	01Jan2021, 12:09	0.1
RW-6-South	0.0008	1.9	01Jan2021, 12:09	0.1
RW-7-North	0.0059	13.5	01Jan2021, 12:09	0.5
RW-7-South	0.0033	7.9	01Jan2021, 12:09	0.3
SDP-LT02	0.0233	25.3	01Jan2021, 12:11	1.1
SDP-LT03	0.0	11.1	01Jan2021, 12:12	0.9
SDP-RT02	0.0200	22.2	01Jan2021, 12:13	0.9
SDP-RT03	0.0	12.1	01Jan2021, 12:14	0.8
SDP-04	0.0433	46.6	01Jan2021, 12:12	2.0
SDP-05	0.0433	69.4	01Jan2021, 12:12	3.6
Universe Storm Drain	0.0023	5.5	01Jan2021, 12:09	0.2
WB-McMahon1	0.0081	12.5	01Jan2021, 12:19	0.5
WB-McMahon2	0.0144	20.1	01Jan2021, 12:20	1.1
WB-McMahon3	0.0164	11.0	01Jan2021, 12:13	0.5

Attachment 2: Supporting Hydraulics

2-1 FlowMaster Reports

Worksheet for EB-A, 10yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0050
Discharge	9.20

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	1.465
0+00.167	0.965
0+24.167	0.485
0+42.167	0.125
0+44.167	0.000
0+44.333	0.667
0+55.333	0.887
0+61.333	1.007
0+76.708	1.314

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 1.465)	(0+76.708, 1.314)	0.017

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	5.9
Elevation Range	0.000 to 1.465 ft
Flow Area	4.3
Wetted Perimeter	20.938
Hydraulic Radius	2.5
Top Width	20.54
Normal Depth	5.9
Critical Depth	5.6
Critical Slope	0.0075
Velocity	2.15
Velocity Head	0.072
Specific Energy	0.5650
Froude Number	0.829
Flow Type	Subcritical

GVF Input Data

Worksheet for EB-A, 10yr

GVF Input Data

Downstream Depth	0.0
Length	0.000
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	0.00
Upstream Velocity	0.00
Normal Depth	5.9
Critical Depth	5.6
Channel Slope	0.0050
Critical Slope	0.0075

Worksheet for WB-A, 10yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0050
Discharge	12.00

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	4.039
0+11.375	1.196
0+21.375	0.996
0+37.825	0.667
0+37.992	0.000
0+39.992	0.125
0+57.992	0.485
0+69.992	0.725
0+70.158	1.225

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 4.039)	(0+70.158, 1.225)	0.017

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	6.4
Elevation Range	0.000 to 4.039 ft
Flow Area	5.2
Wetted Perimeter	23.178
Hydraulic Radius	2.7
Top Width	22.75
Normal Depth	6.4
Critical Depth	6.1
Critical Slope	0.0072
Velocity	2.29
Velocity Head	0.082
Specific Energy	0.6189
Froude Number	0.842
Flow Type	Subcritical

GVF Input Data

Worksheet for WB-A, 10yr

GVF Input Data

Downstream Depth	0.0
Length	0.000
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.4
Critical Depth	6.1
Channel Slope	0.0050
Critical Slope	0.0072

Worksheet for EB-B, 10yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.0122
Discharge	10.50

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	0.933
0+00.333	0.600
0+12.333	0.360
0+30.333	0.000
0+31.083	2.667

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 0.933)	(0+31.083, 2.667)	0.014

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	4.1
Elevation Range	0.000 to 2.667 ft
Flow Area	2.9
Wetted Perimeter	17.450
Hydraulic Radius	2.0
Top Width	17.19
Normal Depth	4.1
Critical Depth	4.9
Critical Slope	0.0050
Velocity	3.57
Velocity Head	0.199
Specific Energy	0.5404
Froude Number	1.524
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.000
Number Of Steps	0

Worksheet for EB-B, 10yr

GVF Output Data	
Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.1
Critical Depth	4.9
Channel Slope	0.0122
Critical Slope	0.0050

Worksheet for WB-B, 10yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.0122
Discharge	9.70

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	2.667
0+00.750	0.000
0+18.750	0.360
0+30.750	0.600
0+31.083	0.933

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 2.667)	(0+31.083, 0.933)	0.014

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	4.0
Elevation Range	0.000 to 2.667 ft
Flow Area	2.8
Wetted Perimeter	16.950
Hydraulic Radius	2.0
Top Width	16.70
Normal Depth	4.0
Critical Depth	4.7
Critical Slope	0.0050
Velocity	3.50
Velocity Head	0.190
Specific Energy	0.5224
Froude Number	1.514
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.000
Number Of Steps	0

Worksheet for WB-B, 10yr

GVF Output Data	
Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.0
Critical Depth	4.7
Channel Slope	0.0122
Critical Slope	0.0050

Worksheet for EB-C, 10yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0171
Discharge	12.70

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	1.225
0+00.167	0.725
0+12.167	0.485
0+30.167	0.125
0+32.167	0.000
0+32.333	0.667
0+48.783	0.996
0+54.783	1.116
0+70.158	1.423

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 1.225)	(0+70.158, 1.423)	0.017

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	5.4
Elevation Range	0.000 to 1.423 ft
Flow Area	3.4
Wetted Perimeter	18.712
Hydraulic Radius	2.2
Top Width	18.35
Normal Depth	5.4
Critical Depth	6.2
Critical Slope	0.0072
Velocity	3.69
Velocity Head	0.212
Specific Energy	0.6619
Froude Number	1.505
Flow Type	Supercritical

GVF Input Data

Worksheet for EB-C, 10yr

GVF Input Data	
Downstream Depth	0.0
Length	0.000
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	5.4
Critical Depth	6.2
Channel Slope	0.0171
Critical Slope	0.0072

Worksheet for WB-C, 10yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0171
Discharge	12.30

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	4.984
0+11.375	1.196
0+21.375	0.996
0+37.825	0.667
0+37.992	0.000
0+39.992	0.125
0+57.992	0.485
0+69.992	0.725
0+70.158	1.225

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 4.984)	(0+70.158, 1.225)	0.017

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	5.3
Elevation Range	0.000 to 4.984 ft
Flow Area	3.4
Wetted Perimeter	18.484
Hydraulic Radius	2.2
Top Width	18.13
Normal Depth	5.3
Critical Depth	6.1
Critical Slope	0.0072
Velocity	3.66
Velocity Head	0.209
Specific Energy	0.6541
Froude Number	1.502
Flow Type	Supercritical

GVF Input Data

Worksheet for WB-C, 10yr

GVF Input Data	
Downstream Depth	0.0
Length	0.000
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	5.3
Critical Depth	6.1
Channel Slope	0.0171
Critical Slope	0.0072

Worksheet for EB-D, 10yr, Inlets 05 and 06 in sump

Project Description

Solve For	Spread

Input Data

Discharge	9.60
Gutter Width	2.50
Gutter Cross Slope	0.0625
Road Cross Slope	0.0200
Local Depression	2.8
Local Depression Width	25.0
Grate Width	2.10
Grate Length	13.400
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0
Curb Opening Length	18.290
Opening Height	0.650
Curb Throat Type	Horizontal
Throat Incline Angle	90.00

Options

Calculation Option	Use Both

Results

Spread	11.734
Depth	4.1
Gutter Depression	1.3
Total Depression	4.1
Open Grate Area	11.3
Active Grate Weir Length	15.500

Worksheet for WB-D, 10yr, Inlets 03 and 04 in sump

Project Description

Solve For	Spread

Input Data

Discharge	11.90
Gutter Width	2.50
Gutter Cross Slope	0.0625
Road Cross Slope	0.0200
Local Depression	2.8
Local Depression Width	25.0
Grate Width	2.10
Grate Length	13.400
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0
Curb Opening Length	18.290
Opening Height	0.650
Curb Throat Type	Horizontal
Throat Incline Angle	90.00

Options

Calculation Option	Use Both

Results

Spread	13.552
Depth	4.5
Gutter Depression	1.3
Total Depression	4.1
Open Grate Area	11.3
Active Grate Weir Length	15.500

Worksheet for EB-E, 10yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0500
Discharge	5.50

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	1.225
0+00.167	0.725
0+12.167	0.485
0+30.167	0.125
0+32.167	0.000
0+32.333	0.667
0+48.783	0.996
0+54.783	1.116
0+70.158	1.423

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 1.225)	(0+70.158, 1.423)	0.017

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	3.6
Elevation Range	0.000 to 1.423 ft
Flow Area	1.2
Wetted Perimeter	10.887
Hydraulic Radius	1.3
Top Width	10.65
Normal Depth	3.6
Critical Depth	4.7
Critical Slope	0.0080
Velocity	4.53
Velocity Head	0.319
Specific Energy	0.6152
Froude Number	2.364
Flow Type	Supercritical

GVF Input Data

Worksheet for EB-E, 10yr

GVF Input Data

Downstream Depth	0.0
Length	0.000
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	3.6
Critical Depth	4.7
Channel Slope	0.0500
Critical Slope	0.0080

Worksheet for WB-E, 10yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.0500
Discharge	7.10

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	4.984
0+11.375	1.196
0+21.375	0.996
0+37.825	0.667
0+37.992	0.000
0+39.992	0.125
0+57.992	0.485
0+69.992	0.725
0+70.158	1.225

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 4.984)	(0+70.158, 1.225)	0.017

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	3.8
Elevation Range	0.000 to 4.984 ft
Flow Area	1.5
Wetted Perimeter	12.069
Hydraulic Radius	1.5
Top Width	11.81
Normal Depth	3.8
Critical Depth	5.1
Critical Slope	0.0077
Velocity	4.82
Velocity Head	0.360
Specific Energy	0.6800
Froude Number	2.403
Flow Type	Supercritical

GVF Input Data

Worksheet for WB-E, 10yr

GVF Input Data

Downstream Depth	0.0
Length	0.000
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	3.8
Critical Depth	5.1
Channel Slope	0.0500
Critical Slope	0.0077

Worksheet for EB-A, 100yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0050
Discharge	19.80

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	1.465
0+00.167	0.965
0+24.167	0.485
0+42.167	0.125
0+44.167	0.000
0+44.333	0.667
0+55.333	0.887
0+61.333	1.007
0+76.708	1.314

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 1.465)	(0+76.708, 1.314)	0.017

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	7.6
Elevation Range	0.000 to 1.465 ft
Flow Area	7.6
Wetted Perimeter	28.042
Hydraulic Radius	3.3
Top Width	27.54
Normal Depth	7.6
Critical Depth	7.2
Critical Slope	0.0067
Velocity	2.59
Velocity Head	0.105
Specific Energy	0.7372
Froude Number	0.869
Flow Type	Subcritical

GVF Input Data

Worksheet for EB-A, 100yr

GVF Input Data

Downstream Depth	0.0
Length	0.000
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	0.00
Upstream Velocity	0.00
Normal Depth	7.6
Critical Depth	7.2
Channel Slope	0.0050
Critical Slope	0.0067

Worksheet for WB-A, 100yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0050
Discharge	24.60

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	4.039
0+11.375	1.196
0+21.375	0.996
0+37.825	0.667
0+37.992	0.000
0+39.992	0.125
0+57.992	0.485
0+69.992	0.725
0+70.158	1.225

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 4.039)	(0+70.158, 1.225)	0.017

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	8.2
Elevation Range	0.000 to 4.039 ft
Flow Area	9.1
Wetted Perimeter	31.436
Hydraulic Radius	3.5
Top Width	30.91
Normal Depth	8.2
Critical Depth	7.8
Critical Slope	0.0065
Velocity	2.70
Velocity Head	0.114
Specific Energy	0.7969
Froude Number	0.878
Flow Type	Subcritical

GVF Input Data

Worksheet for WB-A, 100yr

GVF Input Data	
Downstream Depth	0.0
Length	0.000
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	8.2
Critical Depth	7.8
Channel Slope	0.0050
Critical Slope	0.0065

Worksheet for EB-B, 100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.0122
Discharge	22.30

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	0.933
0+00.333	0.600
0+12.333	0.360
0+30.333	0.000
0+31.083	2.667

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 0.933)	(0+31.083, 2.667)	0.014

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	5.4
Elevation Range	0.000 to 2.667 ft
Flow Area	5.2
Wetted Perimeter	23.144
Hydraulic Radius	2.7
Top Width	22.80
Normal Depth	5.4
Critical Depth	6.6
Critical Slope	0.0045
Velocity	4.32
Velocity Head	0.289
Specific Energy	0.7428
Froude Number	1.598
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.000
Number Of Steps	0

Worksheet for EB-B, 100yr

GVF Output Data	
Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	5.4
Critical Depth	6.6
Channel Slope	0.0122
Critical Slope	0.0045

Worksheet for WB-B, 100yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0122
Discharge	20.10

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	2.667
0+00.750	0.000
0+18.750	0.360
0+30.750	0.600
0+31.083	0.933

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 2.667)	(0+31.083, 0.933)	0.014

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	5.2
Elevation Range	0.000 to 2.667 ft
Flow Area	4.8
Wetted Perimeter	22.255
Hydraulic Radius	2.6
Top Width	21.92
Normal Depth	5.2
Critical Depth	6.3
Critical Slope	0.0046
Velocity	4.21
Velocity Head	0.275
Specific Energy	0.7109
Froude Number	1.588
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0
Length	0.000
Number Of Steps	0

Worksheet for WB-B, 100yr

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	5.2
Critical Depth	6.3
Channel Slope	0.0122
Critical Slope	0.0046

Worksheet for EB-C, 100yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0171
Discharge	26.40

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	1.225
0+00.167	0.725
0+12.167	0.485
0+30.167	0.125
0+32.167	0.000
0+32.333	0.667
0+48.783	0.996
0+54.783	1.116
0+70.158	1.423

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 1.225)	(0+70.158, 1.423)	0.017

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	6.8
Elevation Range	0.000 to 1.423 ft
Flow Area	6.0
Wetted Perimeter	24.758
Hydraulic Radius	2.9
Top Width	24.31
Normal Depth	6.8
Critical Depth	8.0
Critical Slope	0.0065
Velocity	4.43
Velocity Head	0.304
Specific Energy	0.8728
Froude Number	1.575
Flow Type	Supercritical

GVF Input Data

Worksheet for EB-C, 100yr

GVF Input Data

Downstream Depth	0.0
Length	0.000
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.8
Critical Depth	8.0
Channel Slope	0.0171
Critical Slope	0.0065

Worksheet for WB-C, 100yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0171
Discharge	24.90

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	4.984
0+11.375	1.196
0+21.375	0.996
0+37.825	0.667
0+37.992	0.000
0+39.992	0.125
0+57.992	0.485
0+69.992	0.725
0+70.158	1.225

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 4.984)	(0+70.158, 1.225)	0.017

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	6.7
Elevation Range	0.000 to 4.984 ft
Flow Area	5.7
Wetted Perimeter	24.222
Hydraulic Radius	2.8
Top Width	23.78
Normal Depth	6.7
Critical Depth	7.8
Critical Slope	0.0065
Velocity	4.36
Velocity Head	0.295
Specific Energy	0.8531
Froude Number	1.568
Flow Type	Supercritical

GVF Input Data

Worksheet for WB-C, 100yr

GVF Input Data

Downstream Depth	0.0
Length	0.000
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.7
Critical Depth	7.8
Channel Slope	0.0171
Critical Slope	0.0065

Worksheet for EB-D, 100yr, Inlets 05 and 06 in sump

Project Description

Solve For	Spread

Input Data

Discharge	22.20
Gutter Width	2.50
Gutter Cross Slope	0.0625
Road Cross Slope	0.0200
Local Depression	2.8
Local Depression Width	25.0
Grate Width	2.10
Grate Length	13.400
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0
Curb Opening Length	18.290
Opening Height	0.650
Curb Throat Type	Horizontal
Throat Incline Angle	90.00

Options

Calculation Option	Use Both

Results

Spread	20.612
Depth	6.2
Gutter Depression	1.3
Total Depression	4.1
Open Grate Area	11.3
Active Grate Weir Length	15.500

Worksheet for WB-D, 100yr, Inlets 03 and 04 in sump

Project Description

Solve For	Spread

Input Data

Discharge	25.30
Gutter Width	2.50
Gutter Cross Slope	0.0625
Road Cross Slope	0.0200
Local Depression	2.8
Local Depression Width	25.0
Grate Width	2.10
Grate Length	13.400
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0
Curb Opening Length	18.290
Opening Height	0.650
Curb Throat Type	Horizontal
Throat Incline Angle	90.00

Options

Calculation Option	Use Both

Results

Spread	22.508
Depth	6.7
Gutter Depression	1.3
Total Depression	4.1
Open Grate Area	11.3
Active Grate Weir Length	15.500

Worksheet for EB-E, 100yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0500
Discharge	10.10

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	1.225
0+00.167	0.725
0+12.167	0.485
0+30.167	0.125
0+32.167	0.000
0+32.333	0.667
0+48.783	0.996
0+54.783	1.116
0+70.158	1.423

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 1.225)	(0+70.158, 1.423)	0.017

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	4.3
Elevation Range	0.000 to 1.423 ft
Flow Area	1.9
Wetted Perimeter	13.885
Hydraulic Radius	1.7
Top Width	13.60
Normal Depth	4.3
Critical Depth	5.7
Critical Slope	0.0074
Velocity	5.24
Velocity Head	0.427
Specific Energy	0.7824
Froude Number	2.456
Flow Type	Supercritical

GVF Input Data

Worksheet for EB-E, 100yr

GVF Input Data

Downstream Depth	0.0
Length	0.000
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.3
Critical Depth	5.7
Channel Slope	0.0500
Critical Slope	0.0074

Worksheet for WB-E, 100yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0500
Discharge	13.50

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	4.984
0+11.375	1.196
0+21.375	0.996
0+37.825	0.667
0+37.992	0.000
0+39.992	0.125
0+57.992	0.485
0+69.992	0.725
0+70.158	1.225

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.000, 4.984)	(0+70.158, 1.225)	0.017

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	4.7
Elevation Range	0.000 to 4.984 ft
Flow Area	2.4
Wetted Perimeter	15.566
Hydraulic Radius	1.9
Top Width	15.26
Normal Depth	4.7
Critical Depth	6.3
Critical Slope	0.0071
Velocity	5.62
Velocity Head	0.491
Specific Energy	0.8791
Froude Number	2.497
Flow Type	Supercritical

GVF Input Data

Worksheet for WB-E, 100yr

GVF Input Data	
Downstream Depth	0.0
Length	0.000
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.7
Critical Depth	6.3
Channel Slope	0.0500
Critical Slope	0.0071

Worksheet for Inlets 01 and 02 Rating Table

Project Description

Solve For	Efficiency

Input Data

Discharge	10.00
Slope	0.0171
Gutter Width	2.50
Gutter Cross Slope	0.0625
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Local Depression	2.8
Local Depression Width	25.0
Grate Width	2.10
Grate Length	3.300
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	0.0
Curb Opening Length	7.500

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	67.18
Intercepted Flow	6.72
Bypass Flow	3.28
Spread	14.729
Depth	4.8
Flow Area	2.3
Gutter Depression	1.3
Total Depression	4.1
Velocity	4.34
Splash Over Velocity	6.53
Frontal Flow Factor	1.000
Side Flow Factor	0.129
Grate Flow Ratio	0.407
Equivalent Cross Slope	0.0834
Active Grate Length	3.300
Length Factor	0.170
Total Interception Length	24.714

Rating Table for Inlets 01 and 02 Rating Table

Project Description

Solve For	Efficiency

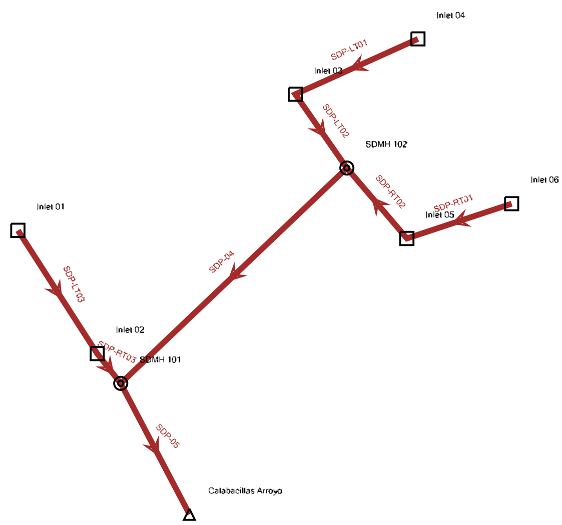
Input Data

Discharge	10.00
Slope	0.0171
Gutter Width	2.50
Gutter Cross Slope	0.0625
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Local Depression	2.8
Local Depression Width	25.0
Grate Width	2.10
Grate Length	3.300
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	0.0
Curb Opening Length	7.500

Discharge (cfs)	Efficiency (%)	Intercepted Flow (cfs)
0.00		
5.00	83.06	4.15
10.00	67.18	6.72
15.00	58.27	8.74
20.00	52.39	10.48
25.00	48.13	12.03
30.00	44.85	13.46
35.00	42.23	14.78
40.00	40.06	16.02
45.00	38.23	17.20

2-2 StormCAD Reports

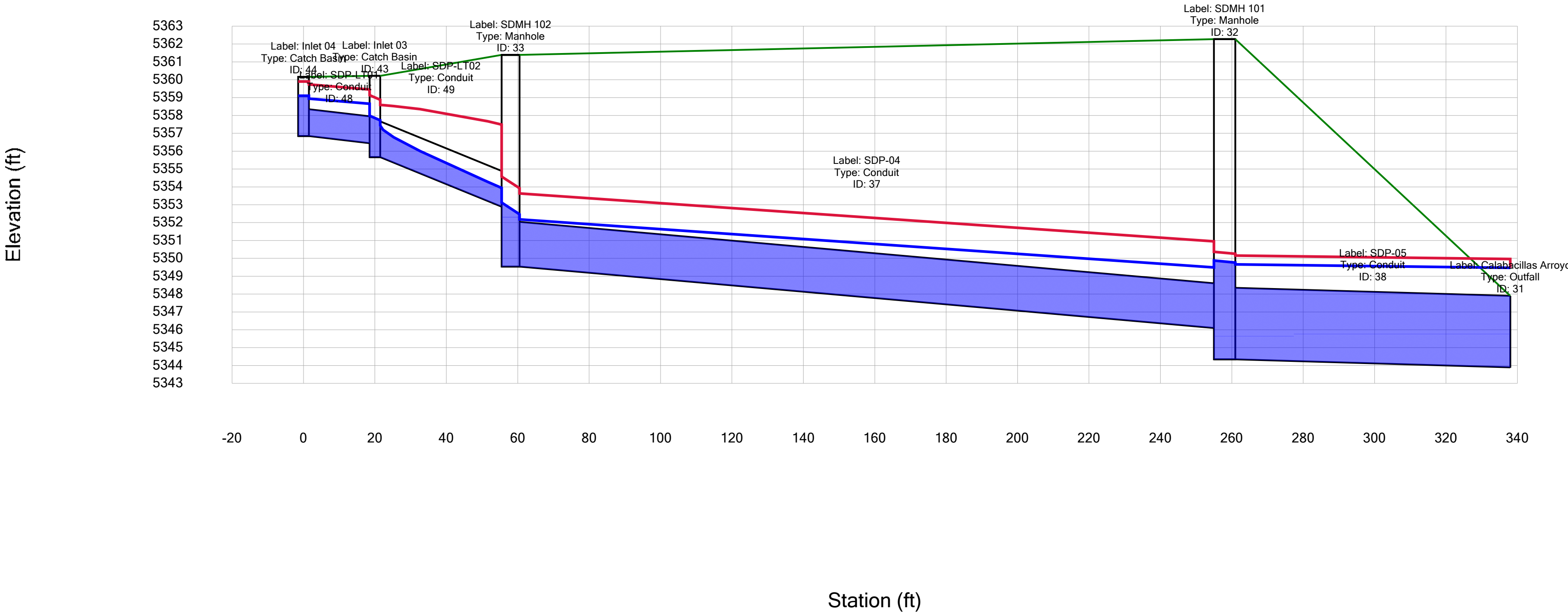
Scenario: 100yr



Profile Report

Profile: Inlet 04 to Calabacillas Arroyo

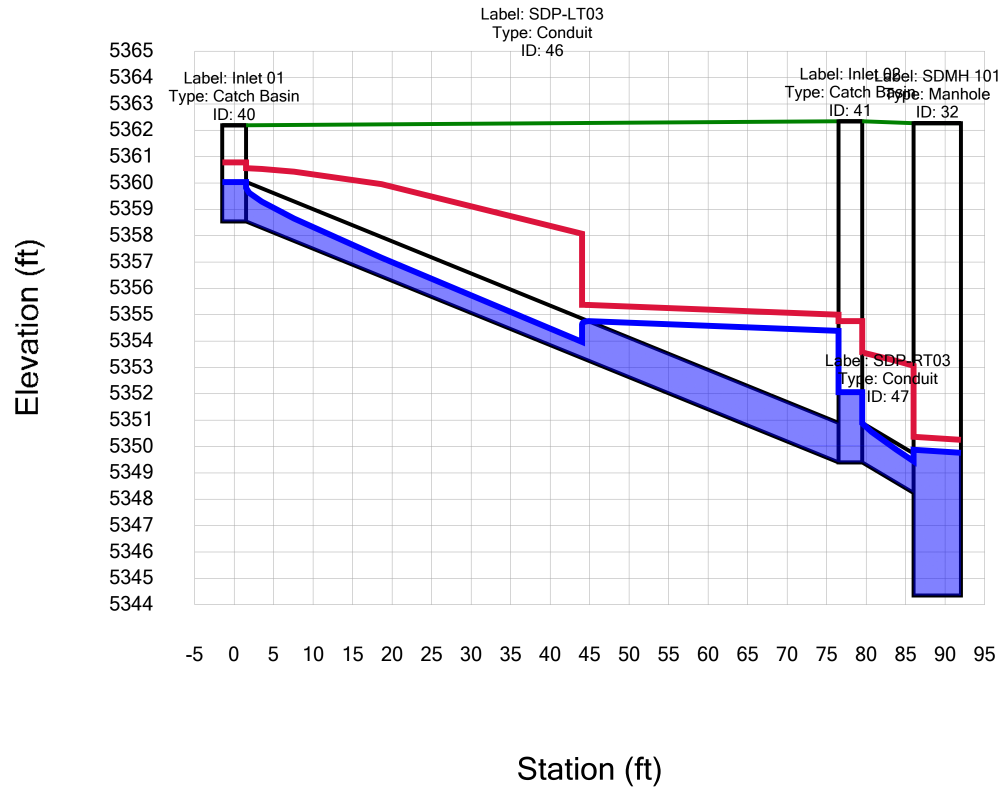
Inlet 04 to Calabacillas Arroyo - 100yr



Profile Report

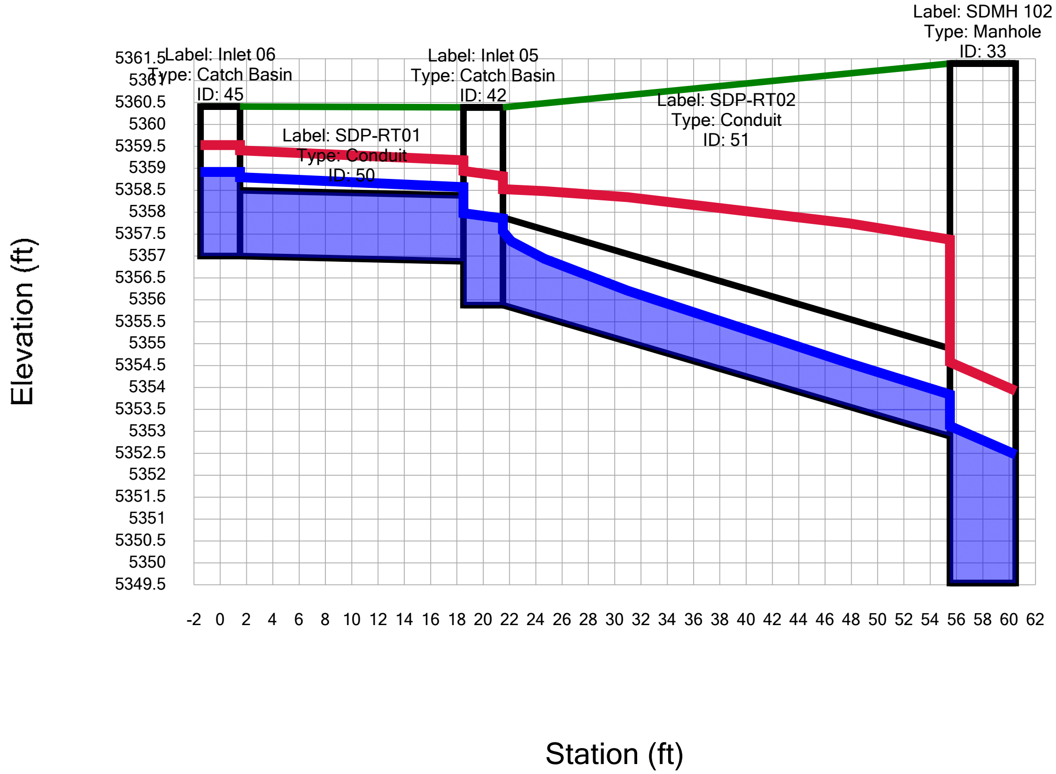
Profile: Inlet 01 to SDMH 101

Inlet 01 to SDMH 101 - 100yr



Profile Report
Profile: Inlet 06 to SDMH 102

Inlet 06 to SDMH 102 - 100yr



Analysis Results
Scenario: 100yr

Title	
Engineer	
Company	
Date	12/29/2020
Notes	

Scenario Summary

ID	52
Label	100yr
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	Base Physical
Boundary Condition	Base Boundary Condition
Initial Settings	Base Initial Settings
Hydrology	Base Hydrology
Output	Base Output
Infiltration and Inflow	Base Infiltration and Inflow
Rainfall Runoff	Base Rainfall Runoff
Water Quality	Base Water Quality
Sanitary Loading	Base Sanitary Loading
Headloss	Base Headloss
Operational	Base Operational
Design	Base Design
System Flows	Base System Flows
SCADA	Base SCADA
Solver Calculation Options	Base Calculation Options

Network Inventory

Conduits	8	Manholes	2
-Circle	8	Taps	0
-Box	0	Transitions	0
-Ellipse	0	Cross Sections	0
-Virtual	0	Outfalls	1
-Irregular Channel	0	Catchments	0
-Trapezoidal Channel	0	Low Impact Development Controls	0
-Triangular Channel	0	Ponds	0
-Rectangular Channel	0	Pond Outlet Structures	0
-Pipe-Arch	0	Headwalls	0

Analysis Results
Scenario: 100yr

Network Inventory

Laterals	0	Pumps	0
Channels	0	Wet Wells	0
Gutters	0	Pressure Junctions	0
Pressure Pipes	0	SCADA Elements	0
Catch Basins	6	Pump Stations	0
-Maximum Capacity	0	Variable Speed Pump Batteries	0
-Full Capture	6	Air Valves	0
-Catalog Inlet	0		

Outfall elements for network with outlet: <None>

Label	System Additional Flow (cfs)	System Known Flow (cfs)	System Rational Flow (cfs)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
Calabacillas Arroyo	34.85	35.85	0.00	11.972	0.669	0.000

Conduit elements for network with outlet: Calabacillas Arroyo

Label	Section Type	Conduit Description	Length (Unified) (ft)	Number of Barrels	Slope (Calculated) (ft/ft)	Flow (cfs)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
SDP-04	Circle	Circle - 30.0 in	200.0	1	0.017	47.50	9.68	5,349.54	5,346.10	5,352.18	5,349.50
SDP-05	Circle	Circle - 48.0 in	80.0	1	0.006	70.70	5.63	5,344.35	5,343.90	5,349.66	5,349.47
SDP-LT03	Circle	Circle - 18.0 in	78.0	1	0.117	11.10	17.92	5,358.54	5,349.40	5,359.81	5,354.39
SDP-RT03	Circle	Circle - 18.0 in	11.0	1	0.105	23.20	20.75	5,349.40	5,348.24	5,350.88	5,349.44
SDP-LT01	Circle	Circle - 18.0 in	20.0	1	0.020	12.65	7.16	5,356.85	5,356.45	5,358.94	
SDP-LT02	Circle	Circle - 24.0 in	38.0	1	0.073	25.30	18.55	5,355.67	5,352.89	5,357.44	
SDP-RT01	Circle	Circle - 18.0 in	20.0	1	0.006	11.10	6.28	5,357.00	5,356.88	5,358.80	
SDP-RT02	Circle	Circle - 24.0 in	38.0	1	0.079	22.20	18.41	5,355.88	5,352.89	5,357.56	

Conduit elements for network with outlet: Calabacillas Arroyo

Hydraulic Grade Line (Out) (ft)
5,358.65
5,353.94
5,358.57
5,353.84

Catch Basin elements for network with outlet: Calabacillas Arroyo

Label	Inlet Type	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
Inlet 01	Full Capture	0.00	0.00	100.0	5,360.04	5,360.04	0.22	HEC-22 Energy (Third Edition)
Inlet 02	Full Capture	0.00	0.00	100.0	5,352.07	5,352.07	1.18	HEC-22 Energy (Third Edition)
Inlet 05	Full Capture	0.00	0.00	100.0	5,357.98	5,357.86	0.41	HEC-22 Energy (Third Edition)
Inlet 03	Full Capture	0.00	0.00	100.0	5,357.98	5,357.73	0.54	HEC-22 Energy (Third Edition)
Inlet 04	Full Capture	0.00	0.00	100.0	5,359.10	5,359.10	0.16	HEC-22 Energy (Third Edition)
Inlet 06	Full Capture	0.00	0.00	100.0	5,358.92	5,358.92	0.12	HEC-22 Energy (Third Edition)

Manhole elements for network with outlet: Calabacillas Arroyo

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (cfs)	System Known Flow (cfs)	System Rational Flow (cfs)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)

Analysis Results

Scenario: 100yr

Manhole elements for network with outlet: Calabacillas Arroyo

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (cfs)	System Known Flow (cfs)	System Rational Flow (cfs)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
SDMH 101	5,349.88	5,349.76	0.21	HEC-22 Energy (Third Edition)	34.85	35.85	0.00	8.000	0.432	0.000
SDMH 102	5,353.12	5,352.47	0.94	HEC-22 Energy (Third Edition)	23.75	23.75	0.00	8.000	0.087	0.000

Conduit FlexTable: Combined Pipe/Node Report

Label	Start Node	Stop Node	Length (Unified) (ft)	Flow (cfs)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)
SDP-04	SDMH 102	SDMH 101	200.0	47.50	9.68	5,349.54	5,346.10	0.017	5,361.39	5,362.27
SDP-05	SDMH 101	Calabacillas Arroyo	80.0	70.70	5.63	5,344.35	5,343.90	0.006	5,362.27	5,347.90
SDP-LT03	Inlet 01	Inlet 02	78.0	11.10	17.92	5,358.54	5,349.40	0.117	5,362.19	5,362.34
SDP-RT03	Inlet 02	SDMH 101	11.0	23.20	20.75	5,349.40	5,348.24	0.105	5,362.34	5,362.27
SDP-LT01	Inlet 04	Inlet 03	20.0	12.65	7.16	5,356.85	5,356.45	0.020	5,360.16	5,360.22
SDP-LT02	Inlet 03	SDMH 102	38.0	25.30	18.55	5,355.67	5,352.89	0.073	5,360.22	5,361.39
SDP-RT01	Inlet 06	Inlet 05	20.0	11.10	6.28	5,357.00	5,356.88	0.006	5,360.41	5,360.39
SDP-RT02	Inlet 05	SDMH 102	38.0	22.20	18.41	5,355.88	5,352.89	0.079	5,360.39	5,361.39

Label	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
SDP-04	5,353.63	5,350.95	5,352.18	5,349.50
SDP-05	5,350.16	5,349.96	5,349.66	5,349.47
SDP-LT03	5,360.56	5,355.00	5,359.81	5,354.39
SDP-RT03	5,353.57	5,351.44	5,350.88	5,349.44
SDP-LT01	5,359.74	5,359.45	5,358.94	5,358.65
SDP-LT02	5,358.59	5,355.81	5,357.44	5,353.94
SDP-RT01	5,359.41	5,359.19	5,358.80	5,358.57
SDP-RT02	5,358.52	5,354.96	5,357.56	5,353.84

Inlets:

Name	Type	Existing or Proposed?	Q100	TC	FL	Invert Out
			cfs	ft	ft	ft
Inlet 01	Single-A on grade	Existing	11.10	5363.01	5362.19	5358.54
Inlet 02	Single-A on grade	Proposed	12.10	**5363.01**	**5362.34**	**5349.40**
Inlet 03	Double-C in sump	Existing	12.65	5361.06	5360.22	5355.67
Inlet 04	Double-A in sump	Existing	12.65	5361.08	5360.16	5356.85
Inlet 05	Double-C in sump	Proposed	11.10	**5361.06**	**5360.39**	**5355.88**
Inlet 06	Double-A in sump	Proposed	11.10	**5361.08**	**5360.41**	**5357.00**

Elevations:

From Plans

From As-Built Survey

Proposed

Manholes:

Name	Type	Existing or Proposed?	Q100	Rim	Invert Out
			cfs	ft	ft
SDMH 101	6' dia Type E	Existing	70.70	5362.27	5344.35
SDMH 102	5' dia Type E	Existing	47.50	5361.39	5349.54

Pipes:

Name	Type	Existing or Proposed?	Q100	Invert Up	Invert Down	Diameter	Length	Slope, from plans	Slope, calculated	Upstream Element	Downstream Element
			cfs	ft	ft	ft	ft	ft/ft	ft/ft		
SDP-LT01	CL-III RCP	Existing	12.65	5356.85	5356.45	1.5	20	0.0100	0.0200	Inlet 04	Inlet 03
SDP-LT02	CL-III RCP	Existing	25.30	5355.67	5352.89	2	38	0.0758	0.0732	Inlet 03	SDMH 102
SDP-RT01	CL-III RCP	Proposed	11.10	**5357.00**	**5356.88**	1.5	20	0.0060	0.0060	Inlet 06	Inlet 05
SDP-RT02	CL-III RCP	Proposed	22.20	**5355.88**	**5352.89**	2	38	0.0758	0.0787	Inlet 05	SDMH 102
SDP-03*	CL-III RCP	Existing	11.10	5358.54	5348.24	1.5	90	0.1200	0.1144	Inlet 01	SDMH 101
SDP-LT03*	CL-III RCP	Modified	11.10	5358.54	5349.40	1.5	78	0.1200	0.1167	Inlet 01	Inlet 02
SDP-RT03*	CL-III RCP	Modified	23.20	5349.40	5348.24	1.5	11	0.1200	0.1098	Inlet 02	SDMH 101
SDP-04	CL-IV RCP	Existing	47.50	5349.54	5346.10	2.5	200	0.0205	0.0172	SDMH 102	SDMH 101
SDP-05	CL-IV RCP	Existing	70.70	5344.35	5343.90	4	80	0.0050	0.0056	SDMH 101	Calabacillas

**as currently proposed, SDP-03 will be cut to accommodate Inlet 02, creating SDP-LT03 and SDP-RT03*

Attachment 3: Electronic Files

3-1 HEC-HMS Model

3-2 FlowMaster Workbook

3-3 StormCAD Model