

**PRELIMINARY (STAGE II)
CROSS DRAINAGE REPORT
FOR
TANGERINE ROAD CORRIDOR STUDY –
INTERSTATE-10 TO LA CANADA DRIVE**

VOLUME 2 OF 2

Location:

Portions of Sections 31 through 36 of Township 11 South, Range 12 East
Portions of Sections 31 through 34 of Township 11 South, Range 13 East
Portions of Sections 1 through 6 of Township 12 South, Range 12 East
Portions of Sections 3 through 6 of Township 12 South, Range 13 East
Pima County, Arizona

Prepared for:

Town of Marana Department of Public Works
11555 West Civic Center Drive
Marana, Arizona 85653

Prepared by:

CMG Drainage Engineering, Inc.
3555 N Mountain Ave.
Tucson, Arizona 85719

As a sub consultant to:

PSOMAS, Inc.
333 East Wetmore Road, Suite 450
Tucson, Arizona 85705

December 21, 2012
Revised January 31, 2013
CMG Project No. 10-027

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APPENDIX A

TECHNICAL MEMORANDUM OUTLINING DRAINAGE DESIGN PARAMETERS

Includes

- A Technical Memorandum (Dated February 14, 2011)

TECHNICAL MEMORANDUM
Hydrologic & Hydraulic Design Parameters for Cross Drainage
Tangerine Road Corridor Study: I-10 to La Canada Dr. – DCR Phase
February 14, 2011

Introduction

This memorandum has been prepared to provide technical guidelines for the cross drainage designs for the Tangerine Road Corridor Study, which extends from I-10 to La Canada Dr. for approximately 9.8 miles. This project area is located in the Town of Oro Valley, unincorporated Pima County, and the Town of Marana, Arizona.

Major watersheds that intersect the project include North Ranch Watershed, Canada Agua East Watershed, Canada Agua West Watershed, Prospect Canyon Watershed, Ruelas Canyon Watershed, and Wild Burro Watershed. The offsite drainage patterns is prevailing sheet flow from I-10 to Dove Mountain Blvd, while it is mainly channel flow from Dove Mountain Blvd to La Canada Dr. The methodologies and design parameters are listed below.

Hydrology:

1. Pima County Regional Flood Control District (PCRFCD) Technical Policies, TECH-015 and TECH-018, will be used for the entire project. This will allow consistency in hydrologic methods and parameters for this project;
2. Watershed delineation will be based on PAG topographic data and aerial photos. In an effort to control costs, PAG 2000 topography and 2005 aerial photography from the Marana Tortolita Alluvial flood study will be utilized for the hydrologic analyses. PAG aerial photos from 2010 will also be referred to at locations where land development has occurred after 2005. Otherwise, U.S. Geologic Survey Contour maps (7.5 minute series) will be used.
3. A threshold watershed size of 1 square mile will be used as a guideline to distinguish between larger “regional” watersheds and smaller “local” watersheds;
4. For “local” watersheds, PC-Hydro will be used to generate 100-year peak discharge rates;
5. For “regional” watersheds east of Dove Mountain Blvd, HEC-1 (per PCRFCD TECH-018) will be used to generate 100-year peak discharge rates;
6. For “regional” watersheds west of Dove Mountain Blvd, the FLO-2D model and HEC-1 models in the Town of Marana’s Tortolita Floodplain Study will be the basis for generating 100-year peak discharge rates. The only revisions to these models are the rainfall data (including inflow hydrographs for the FLO-2D model), which will be replaced by a suitable rainfall storm for this particular project;
7. PCRFCD’s 3-hour Type II rainfall distribution will be used in the HEC-1 and FLO-2D models for watershed areas < 10 sq. mi., and with Times of Concentration (Tc) < 3 hours. The SCS 24-hour Type I rainfall distribution will be evaluated for any watersheds that exceed 10 sq. mi. in size, or have Tc > 3 hours. Equation 4-1 (reference #3) will be used in estimating Tc for “regional” watersheds in determining suitable rainfall data;
8. The NOAA 14 Upper 90% rainfall will be used. Areal reduction factors for “regional” watersheds will be determined by using Table 3.0 in Reference #4.

If there are any technical methodologies or design parameters that are not covered above, PCRFCD’s Tech-015 and Tech-018 should be referred to.

Hydraulic Designs:

The current project consists of improvement of Tangerine Road to a four-lane divided cross section. The roadway cross-drainage designs support a four-lane roadway. However, it is intended that the roadway will ultimately be improved to a six-lane section. The proposed Tangerine Road alignments will take the future six-lane section into considerations to minimize future roadway expansion costs.

Existing hydraulic conditions

1. The FLO-2D model for this project (obtained by revising the FLO-2D model in the Town of Marana's Tortolita Floodplain Study, see Hydrology section item 6) will be used to determine existing hydraulic conditions (flow depths and velocities) for the portion of Tangerine Rd west of Dove Mountain Blvd;
2. For the Tangerine Rd section east of Dove Mountain Blvd, HEC-RAS/Manning's Method/HY-8 will be used in determining the existing hydraulic conditions.

Proposed Hydraulic Designs

1. Culvert design criteria:
 - Culvert design to convey full 100-yr flows beneath roadway;
 - Maximum headwater elevations will be kept at or below roadway subgrade level;
 - Culvert design lengths will be in concert with 4-lane roadway section;
 - Wildlife crossings will likely be incorporated into some of the drainage culvert crossing locations, est. 2 -3 crossings to include TOM HCP corridor crossings, etc.
 - If drop inlets coincide with wildlife crossing locations, modified culvert inlet designs will be considered, e.g. flatter pilot channels for wildlife or tiered culvert design;
2. Collector channel design:
 - Roadway design will be for a 4-lane roadway section and collector channel alignments will need to be adjacent to roadway embankment regardless where the roadway is placed within the ROW. Psomas is looking at possibility of aligning roadway within northern portion of ROW, which would alleviate possible need to reconstruct collector channels in event of future widening to 6-lane section, while not increasing 4-lane roadway costs for current project;
 - Per TOM standards, collector channel conveyance capacity design will be for 100-yr storm (plus freeboard) within erosion protected limits of channels. This will maximize containment of ponding on the ROW, and contain potential erosive longitudinal flows within the erosion protected x-section;
 - Collector channel erosion protection to be designed to avoid rigid pavement materials and incorporate "natural" materials, e.g. rock riprap, etc., and/or buried scour protection measures where possible;
3. West end area near I-10:
 - Low head room and flat drainage conditions will necessitate roadway/drainage design to pass flows over road in area near UPRR & I-10;
 - Future ADOT Tangerine Rd interchange plans will not be incorporated into this project design;
 - Regional drainage solutions on the west end will require further discussion and coordination with TOM staff as existing conditions discharges are determined and drainage design progresses.

The existing hydraulic data upstream and downstream of Tangerine Rd will be used to compare with those in proposed condition at the same locations. Allowable increase in flow depth is no more than 0.1 foot and allowable increase in velocities is no more than 1fps or 10% at the Right of Way (ROW), whichever is less, unless the proposed velocities are non-erosive. Otherwise, drainage easements will need to be obtained beyond the ROW.

References:

1. Pima County Regional Flood Control District Technical Policy, *TECH-015*, October, 2007
2. Pima County Regional Flood Control District Technical Policy, *TECH-018*, 2009
3. Arizona Department of Transportation, *Highway Drainage Design Manual*, March, 1993.
4. Arizona Department of Water Resources, State Standard for Hydrologic Modeling Guidelines (SS10-07, draft), August 2007.

APPENDIX B

FEMA FLOODPLAIN MAPS

Includes

- FEMA Floodplain Maps

Z:\PROJECTS\2010\10-027 Psomas-Tangerine Rd I-10 to La Canada(Dwg)\cmg_FEMA_FPL_Maps.dwg, Model, 12/27/2012 10:37:39 AM

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 and 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 North American Vertical Datum of 1988 (NAVD 88). 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 Central State Plane zone (FIPSZONE 0202), International Feet. The horizontal datum was NAD 83, HPGNHARN 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 North American Vertical Datum of 1988. 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:

NGS Information Services
NOAA, NNGS12
National Geodetic Survey
SSMC-3 #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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 imagery for eastern Pima County was provided in digital format by the Pima Association of Governments. These data were developed at 1-foot Ground Sample Distance (GSD) from color aerial photography flown in 2002. Base map imagery for western Pima County was derived from USGS Imagery available for the State of Arizona and produced at a scale of 1:12,000 from photography dated 2006 and 2007.

This map may reflect 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.

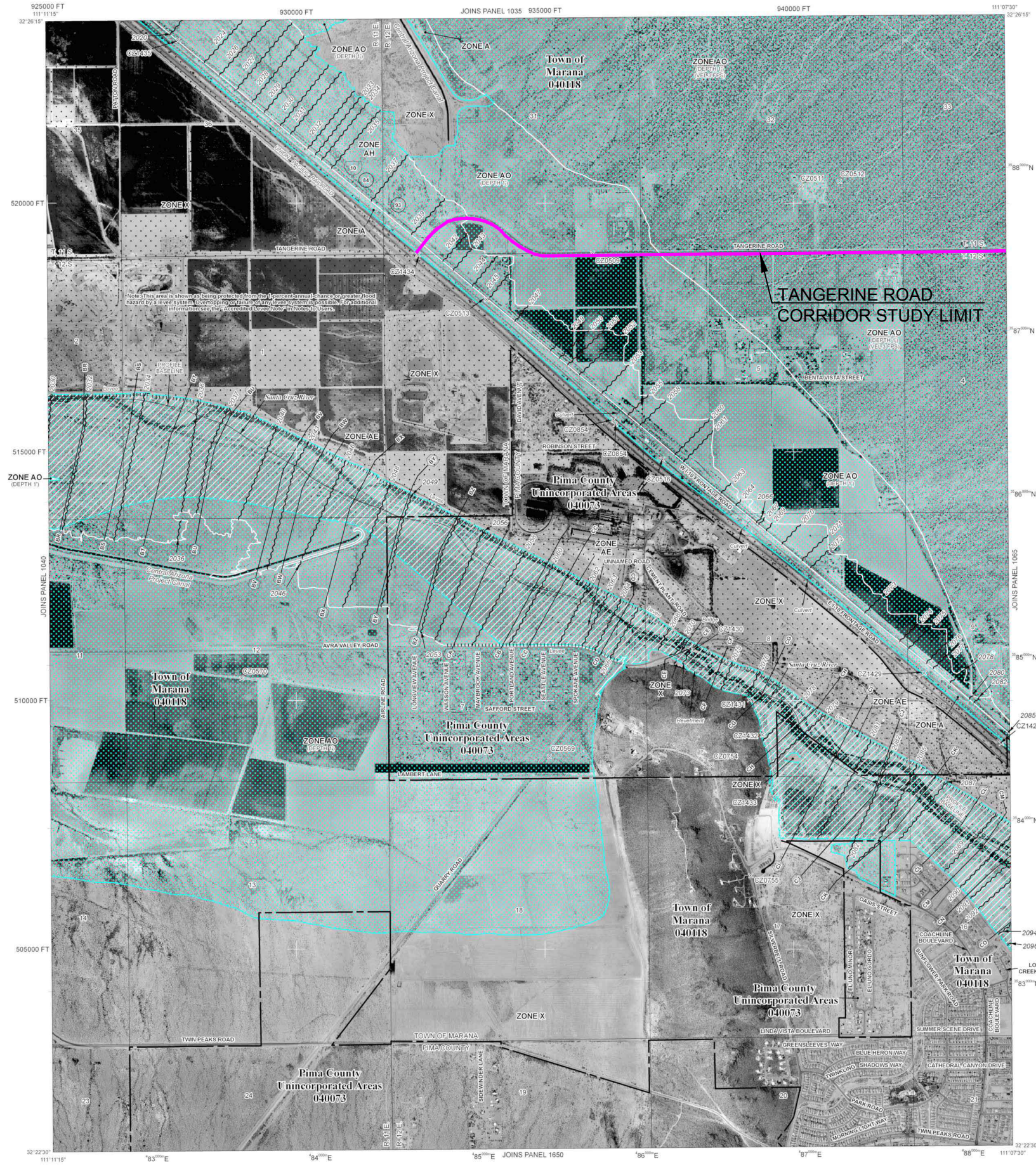
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Please refer to the separately printed Map Index for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community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

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Accredited Levee Notes to Users: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance-level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at <http://www.fema.gov/business/nfp/index.shtml>.



LEGEND

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

The 1% annual 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, AW, V, and VE. The Base Flood Elevation is the water-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 3 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 alluvial 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 decremented. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance of greater flood.

ZONE AW: Area to be protected from 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 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 D: Areas determined to be outside the 0.2% annual chance floodplain.

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 Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities
- Limit of Moderate Wave Action
- Base Flood Elevation line and value; elevation in feet* (EL 987)
- Base Flood Elevation value where uniform within zone; elevation in feet*
- * Referenced to the North American Vertical Datum of 1988
- Cross section line
- Transect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 1000-meter Universal Transverse Mercator grid values, zone 12
- 5000-foot grid values: Arizona State Plane coordinate system, Central zone (FIPSZONE 0202), Transverse Mercator projection
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M 1.5: River Mile

MAP REPOSITORY: Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP: February 8, 1999

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL: June 16, 2011 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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 1-800-638-6623.

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1045L

FIRM

FLOOD INSURANCE RATE MAP

PIMA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1045 OF 4750 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS	COMMUNITY	NUMBER	PANEL	SUFFIX
	MARANA, TOWN OF	040118	1045	L
	PIMA COUNTY	040073	1045	L

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

MAP NUMBER 04019C1045L

MAP REVISED JUNE 16, 2011

Federal Emergency Management Agency

Z:\PROJECTS\2010\10-027 Psomas-Tangerine Rd I-10 to La Canada\DWG\cmg_FEMA_FPL_Maps.dwg, Model, 12/27/2012 10:38:06 AM

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Pima County
Unincorporated Areas
040073

Town of Marana
040118

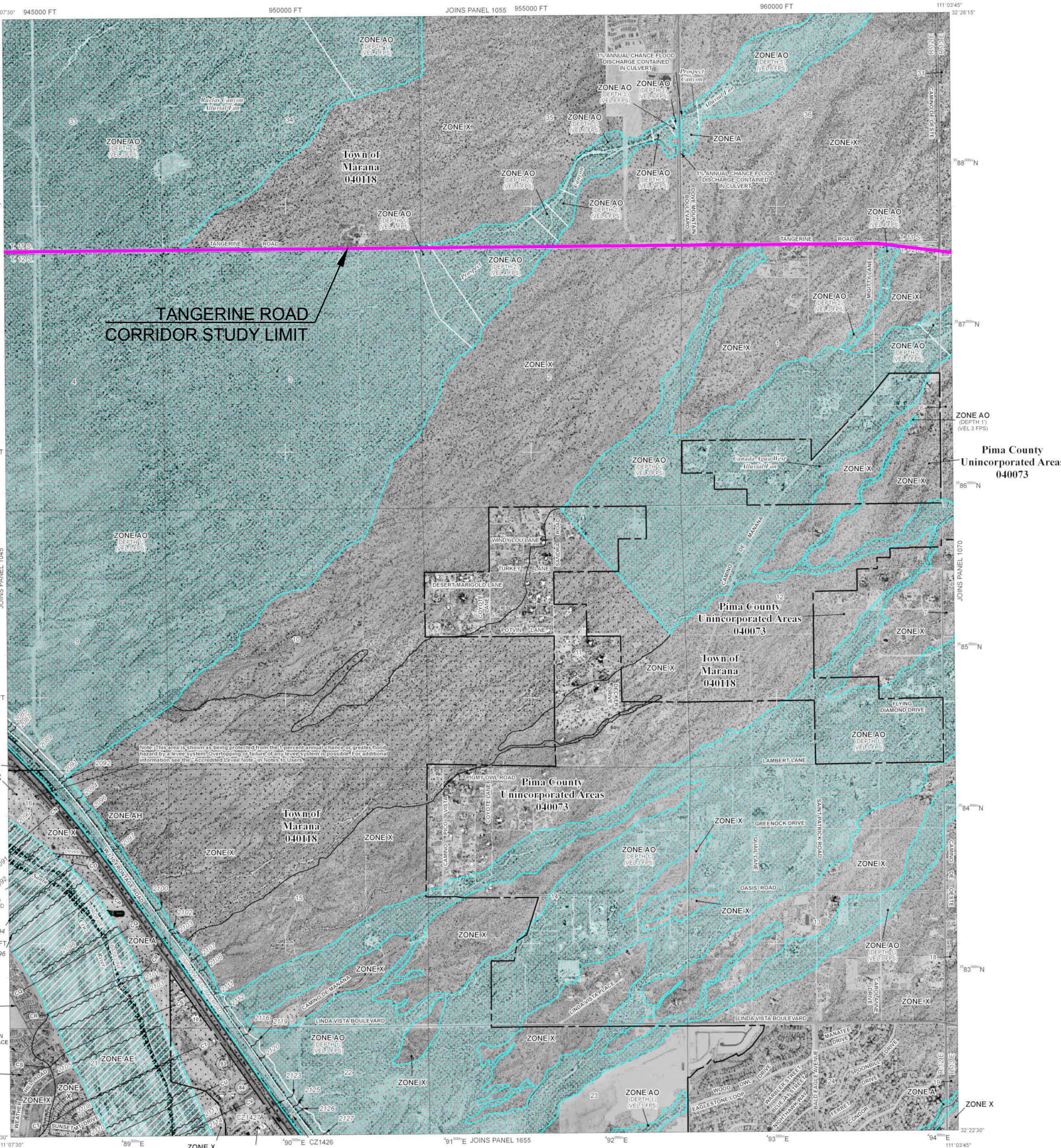
Pima County
Unincorporated Areas
040073

Town of Marana
040118

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Unincorporated Areas
040073

Town of Marana
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040073



LEGEND

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- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
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- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently destroyed. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE AV** Area to be protected from 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.

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OTHER AREAS
ZONE D Areas determined to be outside the 0.2% annual chance floodplain.
ZONE G 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.

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- Limit of Moderate Wave Action
- Base Flood Elevation line and value; elevation in feet* (EL 987)

* Referenced to the North American Vertical Datum of 1988

○ Cross section line
--- Transient line

87° 07' 45", 32° 22' 30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

76° N 1000-meter Universal Transverse Mercator grid values, zone 12

600000 FT 5000-foot grid values: Arizona State Plane coordinate system, Central zone (FIPSZONE 0202), Transverse Mercator projection

DX5510 x Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 River Mile

MAP REPOSITORY Refer to Listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP February 8, 1999

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL June 16, 2011 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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 1-800-438-6620.

REDUCED N.T.S.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET
300 0 300 600 METERS

NFP PANEL 1065L

FIRM
FLOOD INSURANCE RATE MAP

PIMA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1065 OF 4750
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
MARANA, TOWN OF PIMA COUNTY	040118	1065	L
	040073	1065	L

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

MAP NUMBER
04019C1065L

MAP REVISED
JUNE 16, 2011

Federal Emergency Management Agency

Z:\PROJECTS\2010\10-027 Psomas-Tangerine Rd I-10 to La Canada(Dwg)\cmg_FEMA_FPL_Maps.dwg, Model, 12/27/2012 10:38:33 AM

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 and 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 to landward of 0 North American Vertical Datum of 1988 (NAVD 88). 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 Central State Plane zone (FIPSZONE 0202), International Feet. The horizontal datum was NAD 83, HPGN/HARN 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 North American Vertical Datum of 1988. 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:

NGS Information Services
NOAA, NNGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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 imagery for eastern Pima County was provided in digital format by the Pima Association of Governments. These data were developed at 1-foot Ground Sample Distance (GSD) from color aerial photography flown in 2002. Base map imagery for western Pima County was derived from USGS Imagery available for the State of Arizona and produced at a scale of 1:12,000 from photography dated 2006 and 2007.

This map may reflect 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.

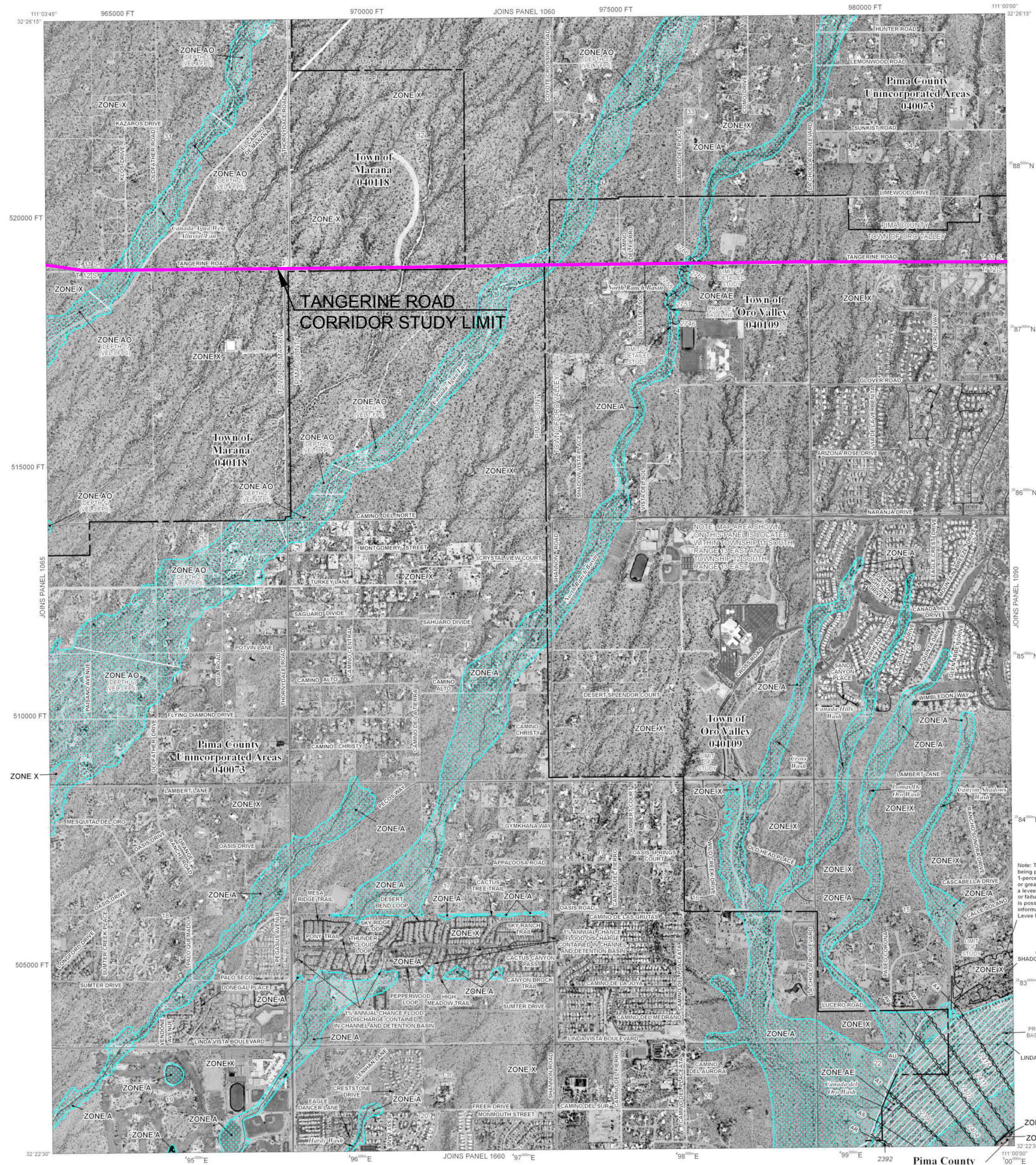
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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.

For information on **available products** associated with this FIRM, visit the Map Service Center (MSC) website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

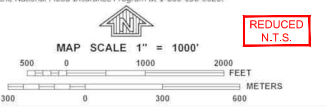
If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfp>.

Accredited Levee Notes to Users: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance-level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at <http://www.fema.gov/business/nfp/index.shtm>



LEGEND

- SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY 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 3 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 alluvial 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 destroyed. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
 - ZONE A99: Area to be protected from 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 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 Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities**
- Limit of Moderate Wave Action**
- Base Flood Elevation line and value; elevation in feet***
- Base Flood Elevation value where uniform within zone; elevation in feet***
- Cross section line**
- Traverse line**
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere**
- 1000-meter Universal Transverse Mercator grid values, zone 12**
- 5000-foot grid values; Arizona State Plane coordinate system, Central zone (FIPSZONE 0202), Transverse Mercator projection**
- Bench mark (see explanation in Notes to Users section of this FIRM panel)**
- MAP REPOSITORY**
- EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP**
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**
- June 16, 2011 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.**



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1070L

FIRM

FLOOD INSURANCE RATE MAP

PIMA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1070 OF 4750

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS	COMMUNITY	NUMBER	PANEL	SUFFIX
	MARANA, TOWNSHIP OF	040118	1070	L
	ORO VALLEY, TOWNSHIP OF	040109	1070	L
	PIMA COUNTY	040073	1070	L

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

MAP NUMBER 04019C1070L

MAP REVISED JUNE 16, 2011

Federal Emergency Management Agency

NOTES TO USERS

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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 and 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 North American Vertical Datum of 1988 (NAVD 88). 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 Central State Plane zone (FIPSZONE 0202), International Feet. The **horizontal datum** was NAD 83, HPGN/HARN 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 North American Vertical Datum of 1988. 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:

NGS Information Services
NOAA, NINGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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>.

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This map may reflect 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.

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Accredited Levee Notes to Users: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance-level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at <http://www.fema.gov/business/rfp/index.shtml>.

Pima County
Unincorporated Areas
040073

Town of
Oro Valley
040109

TANGERINE ROAD
CORRIDOR STUDY LIMIT

Pima County
Unincorporated Areas
040073

Pima County
Unincorporated Areas
040073

Pima County
Unincorporated Areas
040073

Pima County
Unincorporated Areas
040073

Pima County
Unincorporated Areas
040073

Pima County
Unincorporated Areas
040073

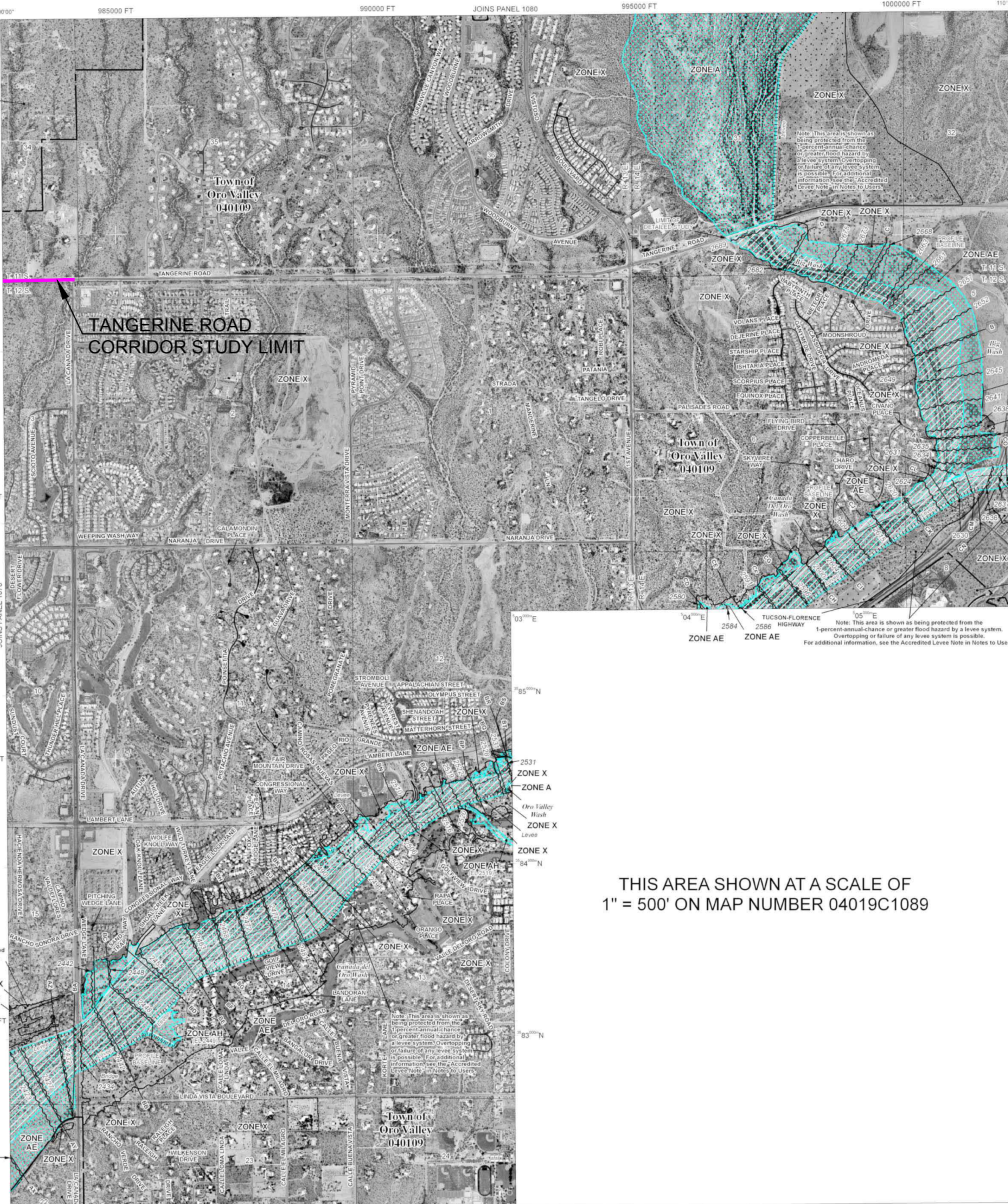
Pima County
Unincorporated Areas
040073

Pima County
Unincorporated Areas
040073

Pima County
Unincorporated Areas
040073

Pima County
Unincorporated Areas
040073

Pima County
Unincorporated Areas
040073



THIS AREA SHOWN AT A SCALE OF
1" = 500' ON MAP NUMBER 04019C1089

LEGEND

- SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY 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 3 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 alluvial 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 destroyed. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE AR9** 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.
- ZONE VE1** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE
- 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 Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Limit of Moderate Wave Action
- Base Flood Elevation line and value; elevation in feet* (EL 987)
- Base Flood Elevation value where uniform within zone; elevation in feet*
- * Referenced to the North American Vertical Datum of 1988.
- Cross section line
- Transect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 1200-meter Universal Transverse Mercator grid values, zone 12
- 5000-foot grid values; Arizona State Plane coordinate system, Central zone (FIPSZONE 0202), Transverse Mercator projection
- DX5510 x
- M 1.5
- River Mile
- MAP REPOSITORY
- Refer to listing of Map Repositories on Map Index
- EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP: February 8, 1999
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL: June 16, 2011 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.
- 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 1-800-638-6620.

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1090L

FIRM

FLOOD INSURANCE RATE MAP

PIMA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1090 OF 4750 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS	COMMUNITY	NUMBER	PANEL	SUFFIX
	ORO VALLEY TOWN OF PIMA COUNTY	040109	1090	L
	PIMA COUNTY	040073	1090	L

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

MAP NUMBER 04019C1090L

MAP REVISED JUNE 16, 2011

Federal Emergency Management Agency

Z:\PROJECTS\2010\10-027 Psomas-Tangerine Rd I-10 to La Canada(Dwg)\cmg_FEMA_FPL_Maps.dwg, Model, 12/27/2012 10:38:57 AM

APPENDIX C

EXISTING CONDITIONS HYDROLOGIC COMPUTATION SHEETS

(PC-HYDRO)

Includes

- PC-HYDRO computations

(HEC-1 MODELS)

Includes

- Time of Concentration Computation for the Biggest Watershed (CP-68) in Determining Suitable Storm for Regional Watersheds
- Rainfall data sheets
- Exhibit for rainfall data and aerial reduction factor for major watersheds
- Watershed Characters Summary Table
- Rainfall Summary Table
- Soil Characteristics, Vegetation Cover, and Impervious Cover Summary Table
- Watershed Characters to be used for Computing Time of Concentration (TR-55)
- Lagging Time Computation Summary Table
- Routing Channel Summary Table
- HEC-1 Models Inputs & Outputs

(FLO-2D MODELS)

Includes

- 100-Year FLO-2D Model (100-ft Grid) included in the Compact Disk attached to the Report

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 10/25/2010
 Concentration Point: 1 Job #: 10-027

Watershed Area: 89.8 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	28.0	1,616	0.0173	.035
2	62.0	3,896	0.0159	.035

Length of Watercourse (Lc): 5,512 feet Mean Slope: 0.0163
 Length to Cen. of Gravity (Lca): 1,842 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4242		Longitude: 110.9977	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	7	83.	87.24	0.560
C	53	88.	91.02	0.669
D	40	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.705
 Time of Concentration: 14.9 min
 Rainfall Intensity (i) @ Tc: 6.62 in/hr
 Runoff Supply Rate (q) @ Tc: 4.67 in/hr
PEAK DISCHARGE: 422 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	42
5-year	0.23	97
10-year	0.35	148
25-year	0.55	232
50-year	0.75	317

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 10/25/2010
 Concentration Point: 2 Job #: 10-027

Watershed Area: 180.9 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	66.0	3,992	0.0165	.035
2	78.0	5,796	0.0135	.035

Length of Watercourse (Lc): 9,788 feet Mean Slope: 0.0146
 Length to Cen. of Gravity (Lca): 4,322 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4242		Longitude: 110.9977	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	34	83.	87.24	0.560
C	36	88.	91.02	0.669
D	30	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.670
 Time of Concentration: 28.3 min
 Rainfall Intensity (i) @ Tc: 4.57 in/hr
 Runoff Supply Rate (q) @ Tc: 3.06 in/hr
PEAK DISCHARGE: 558 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	56
5-year	0.23	128
10-year	0.35	195
25-year	0.55	307
50-year	0.75	418

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 3 Job #: 10-027

Watershed Area: 7.8 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	16.0	1,001	0.0160	.035

Length of Watercourse (Lc): 1,001 feet Mean Slope: 0.0160
 Length to Cen. of Gravity (Lca): 447 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4242					Longitude: 110.9977				
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>						
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60						
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60						

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	0	83.	87.24	0.560
C	53	88.	91.02	0.669
D	47	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.717
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 7.49 in/hr
PEAK DISCHARGE: 59 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	5.9
5-year	0.23	14
10-year	0.35	21
25-year	0.55	32
50-year	0.75	44

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 4 Job #: 10-027

Watershed Area: 265.9 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	25.0	1,396	0.0179	.035
2	167.0	12,227	0.0137	.035

Length of Watercourse (Lc): 13,623 feet Mean Slope: 0.0140
 Length to Cen. of Gravity (Lca): 7,382 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4242		Longitude: 110.9977	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	31	83.	87.24	0.560
C	33	88.	91.02	0.669
D	36	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.677
 Time of Concentration: 41.2 min
 Rainfall Intensity (i) @ Tc: 3.52 in/hr
 Runoff Supply Rate (q) @ Tc: 2.39 in/hr
PEAK DISCHARGE: 639 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	64
5-year	0.23	147
10-year	0.35	224
25-year	0.55	352
50-year	0.75	480

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 5 Job #: 10-027

Watershed Area: 53.3 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	14.0	428	0.0327	.035
2	48.0	2,909	0.0165	.035

Length of Watercourse (Lc): 3,337 feet Mean Slope: 0.0178
 Length to Cen. of Gravity (Lca): 1,643 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4242		Longitude: 110.9977	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	13	83.	87.24	0.560
C	52	88.	91.02	0.669
D	35	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.695
 Time of Concentration: 11.5 min
 Rainfall Intensity (i) @ Tc: 7.44 in/hr
 Runoff Supply Rate (q) @ Tc: 5.17 in/hr
PEAK DISCHARGE: 278 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	28
5-year	0.23	64
10-year	0.35	97
25-year	0.55	153
50-year	0.75	209

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 6 Job #: 10-027

Watershed Area: 3.5 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	10.0	729	0.0137	.035

Length of Watercourse (Lc): 729 feet Mean Slope: 0.0137
 Length to Cen. of Gravity (Lca): 345 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4242		Longitude: 110.9977	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	0	83.	87.24	0.560
C	53	88.	91.02	0.669
D	47	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.717
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 7.49 in/hr
PEAK DISCHARGE: 26 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	2.6
5-year	0.23	6.0
10-year	0.35	9.2
25-year	0.55	14
50-year	0.75	20

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 7 Job #: 10-027

Watershed Area: 185.4 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	68.0	4,472	0.0152	.035
2	86.0	6,465	0.0133	.035

Length of Watercourse (Lc): 10,937 feet Mean Slope: 0.0140
 Length to Cen. of Gravity (Lca): 4,970 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4242		Longitude: 110.9977	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	67	83.	87.24	0.560
C	31	88.	91.02	0.669
D	2	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.616
 Time of Concentration: 33.5 min
 Rainfall Intensity (i) @ Tc: 4.09 in/hr
 Runoff Supply Rate (q) @ Tc: 2.52 in/hr
PEAK DISCHARGE: 470 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	47
5-year	0.23	108
10-year	0.35	165
25-year	0.55	259
50-year	0.75	353

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 8 Job #: 10-027

Watershed Area: 30.8 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	22.0	1,183	0.0186	.035
2	34.0	2,013	0.0169	.035

Length of Watercourse (Lc): 3,196 feet Mean Slope: 0.0175
 Length to Cen. of Gravity (Lca): 1,383 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4242		Longitude: 110.9977	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	58	83.	87.24	0.560
C	42	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.624
 Time of Concentration: 11.3 min
 Rainfall Intensity (i) @ Tc: 7.51 in/hr
 Runoff Supply Rate (q) @ Tc: 4.68 in/hr
PEAK DISCHARGE: 145 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	15
5-year	0.23	33
10-year	0.35	51
25-year	0.55	80
50-year	0.75	109

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 9 Job #: 10-027

Watershed Area: 34.5 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	44.0	2,657	0.0166	.035
2	20.0	1,157	0.0173	.035

Length of Watercourse (Lc): 3,814 feet Mean Slope: 0.0168
 Length to Cen. of Gravity (Lca): 2,307 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4242		Longitude: 110.9977	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.21	3.52	3.82	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	88	83.	87.24	0.560
C	12	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.593
 Time of Concentration: 15.2 min
 Rainfall Intensity (i) @ Tc: 6.54 in/hr
 Runoff Supply Rate (q) @ Tc: 3.88 in/hr
PEAK DISCHARGE: 135 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	13
5-year	0.23	31
10-year	0.35	47
25-year	0.55	74
50-year	0.75	101

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 10 Job #: 10-027

Watershed Area: 28.3 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	21.0	1,291	0.0163	.035
2	30.0	1,785	0.0168	.035

Length of Watercourse (Lc): 3,076 feet Mean Slope: 0.0166
 Length to Cen. of Gravity (Lca): 1,824 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	73	83.	87.24	0.560
C	27	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.608
 Time of Concentration: 12.8 min
 Rainfall Intensity (i) @ Tc: 7.07 in/hr
 Runoff Supply Rate (q) @ Tc: 4.30 in/hr
PEAK DISCHARGE: 123 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	12
5-year	0.23	28
10-year	0.35	43
25-year	0.55	67
50-year	0.75	92

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 11 Job #: 10-027

Watershed Area: 35.7 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	44.0	2,668	0.0165	.035

Length of Watercourse (Lc): 2,668 feet Mean Slope: 0.0165
 Length to Cen. of Gravity (Lca): 1,016 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	84	83.	87.24	0.560
C	16	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.597
 Time of Concentration: 9.9 min
 Rainfall Intensity (i) @ Tc: 8.01 in/hr
 Runoff Supply Rate (q) @ Tc: 4.78 in/hr
PEAK DISCHARGE: 172 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	17
5-year	0.23	39
10-year	0.35	60
25-year	0.55	94
50-year	0.75	129

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 12 Job #: 10-027

Watershed Area: 12.3 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	34.0	2,039	0.0167	.035

Length of Watercourse (Lc): 2,039 feet Mean Slope: 0.0167
 Length to Cen. of Gravity (Lca): 942 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.24	0.560
C	0	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.580
 Time of Concentration: 8.9 min
 Rainfall Intensity (i) @ Tc: 8.30 in/hr
 Runoff Supply Rate (q) @ Tc: 4.81 in/hr
PEAK DISCHARGE: 60 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	6.0
5-year	0.23	14
10-year	0.35	21
25-year	0.55	33
50-year	0.75	45

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 14 Job #: 10-027

Watershed Area: 17.9 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	44.0	2,910	0.0151	.035

Length of Watercourse (Lc): 2,910 feet Mean Slope: 0.0151
 Length to Cen. of Gravity (Lca): 1,271 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129		
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>	
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63	
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63	

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.24	0.560
C	0	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.580
 Time of Concentration: 11.8 min
 Rainfall Intensity (i) @ Tc: 7.36 in/hr
 Runoff Supply Rate (q) @ Tc: 4.27 in/hr
PEAK DISCHARGE: 77 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	7.7
5-year	0.23	18
10-year	0.35	27
25-year	0.55	42
50-year	0.75	58

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 15 Job #: 10-027

Watershed Area: 6.7 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	20.0	1,121	0.0178	.035

Length of Watercourse (Lc): 1,121 feet Mean Slope: 0.0178
 Length to Cen. of Gravity (Lca): 455 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.24	0.560
C	0	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.580
 Time of Concentration: 5.4 min
 Rainfall Intensity (i) @ Tc: 10.12 in/hr
 Runoff Supply Rate (q) @ Tc: 5.87 in/hr
PEAK DISCHARGE: 40 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	4.0
5-year	0.23	9.2
10-year	0.35	14
25-year	0.55	22
50-year	0.75	30

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 16 Job #: 10-027

Watershed Area: 37.1 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	26.0	1,745	0.0149	.035
2	32.0	1,991	0.0161	.035

Length of Watercourse (Lc): 3,736 feet Mean Slope: 0.0155
 Length to Cen. of Gravity (Lca): 1,368 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	98	83.	87.24	0.560
C	2	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.582
 Time of Concentration: 13.1 min
 Rainfall Intensity (i) @ Tc: 7.01 in/hr
 Runoff Supply Rate (q) @ Tc: 4.08 in/hr
PEAK DISCHARGE: 153 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	15
5-year	0.23	35
10-year	0.35	53
25-year	0.55	84
50-year	0.75	114

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 17 Job #: 10-027

Watershed Area: 25.6 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	37.0	2,182	0.0170	.035

Length of Watercourse (Lc): 2,182 feet Mean Slope: 0.0170
 Length to Cen. of Gravity (Lca): 900 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129		
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>	
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63	
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63	

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	95	83.	87.24	0.560
C	5	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.585
 Time of Concentration: 8.8 min
 Rainfall Intensity (i) @ Tc: 8.31 in/hr
 Runoff Supply Rate (q) @ Tc: 4.86 in/hr
PEAK DISCHARGE: 126 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	13
5-year	0.23	29
10-year	0.35	44
25-year	0.55	69
50-year	0.75	94

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 18 Job #: 10-027

Watershed Area: 4.3 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	29.0	1,145	0.0253	.035

Length of Watercourse (Lc): 1,145 feet Mean Slope: 0.0253
 Length to Cen. of Gravity (Lca): 562 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	50	83.	87.24	0.560
C	50	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.632
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 6.60 in/hr
PEAK DISCHARGE: 28 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	2.8
5-year	0.23	6.5
10-year	0.35	9.9
25-year	0.55	16
50-year	0.75	21

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 20 Job #: 10-027

Watershed Area: 31.6 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	18.0	945	0.0190	.035
2	32.0	1,515	0.0211	.035

Length of Watercourse (Lc): 2,460 feet Mean Slope: 0.0203
 Length to Cen. of Gravity (Lca): 1,104 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	50	83.	87.24	0.560
C	50	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.632
 Time of Concentration: 8.8 min
 Rainfall Intensity (i) @ Tc: 8.33 in/hr
 Runoff Supply Rate (q) @ Tc: 5.26 in/hr
PEAK DISCHARGE: 168 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	17
5-year	0.23	39
10-year	0.35	59
25-year	0.55	92
50-year	0.75	126

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 21 Job #: 10-027

Watershed Area: 86.7 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	10.0	430	0.0233	.035
2	66.0	3,757	0.0176	.035
3	22.0	1,554	0.0142	.035

Length of Watercourse (Lc): 5,741 feet Mean Slope: 0.0169
 Length to Cen. of Gravity (Lca): 2,838 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	50	83.	87.24	0.560
C	50	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.632
 Time of Concentration: 18.8 min
 Rainfall Intensity (i) @ Tc: 5.73 in/hr
 Runoff Supply Rate (q) @ Tc: 3.62 in/hr
PEAK DISCHARGE: 316 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	32
5-year	0.23	73
10-year	0.35	111
25-year	0.55	174
50-year	0.75	237

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 22 Job #: 10-027

Watershed Area: 474.0 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	30.0	1,628	0.0184	.035
2	150.0	9,554	0.0157	.035
3	26.0	1,908	0.0136	.035

Length of Watercourse (Lc): 13,090 feet Mean Slope: 0.0157
 Length to Cen. of Gravity (Lca): 6,552 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	62	83.	87.24	0.560
C	34	88.	91.02	0.669
D	4	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.622
 Time of Concentration: 37.9 min
 Rainfall Intensity (i) @ Tc: 3.73 in/hr
 Runoff Supply Rate (q) @ Tc: 2.32 in/hr
PEAK DISCHARGE: 1,110 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	111
5-year	0.23	255
10-year	0.35	388
25-year	0.55	610
50-year	0.75	832

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 23 Job #: 10-027

Watershed Area: 1.8 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	9.0	465	0.0194	.025

Length of Watercourse (Lc): 465 feet Mean Slope: 0.0194
 Length to Cen. of Gravity (Lca): 217 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	50	83.	87.24	0.560
C	50	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.632
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 6.60 in/hr
PEAK DISCHARGE: 12 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	1.2
5-year	0.23	2.8
10-year	0.35	4.2
25-year	0.55	6.6
50-year	0.75	9.0

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 24 Job #: 10-027

Watershed Area: 26.1 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	50.0	2,527	0.0198	.025

Length of Watercourse (Lc): 2,527 feet Mean Slope: 0.0198
 Length to Cen. of Gravity (Lca): 1,263 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	50	83.	87.24	0.560
C	50	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.632
 Time of Concentration: 6.3 min
 Rainfall Intensity (i) @ Tc: 9.41 in/hr
 Runoff Supply Rate (q) @ Tc: 5.95 in/hr
PEAK DISCHARGE: 157 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	16
5-year	0.23	36
10-year	0.35	55
25-year	0.55	86
50-year	0.75	118

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 25 Job #: 10-027

Watershed Area: 72.8 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	102.0	5,958	0.0171	.025

Length of Watercourse (Lc): 5,958 feet Mean Slope: 0.0171
 Length to Cen. of Gravity (Lca): 2,600 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129		
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>	
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63	
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63	

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	50	83.	87.24	0.560
C	50	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.632
 Time of Concentration: 11.9 min
 Rainfall Intensity (i) @ Tc: 7.32 in/hr
 Runoff Supply Rate (q) @ Tc: 4.62 in/hr
PEAK DISCHARGE: 339 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	34
5-year	0.23	78
10-year	0.35	119
25-year	0.55	187
50-year	0.75	254

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 26.1 (Existing) Job #: 10-027

Watershed Area: 19.7 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	10.0	347	0.0288	.025
2	34.0	2,237	0.0152	.025

Length of Watercourse (Lc): 2,584 feet Mean Slope: 0.0164
 Length to Cen. of Gravity (Lca): 1,411 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	53	83.	87.24	0.560
C	47	88.	91.02	0.669
D	0	.	.	0.000
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.629
 Time of Concentration: 7.3 min
 Rainfall Intensity (i) @ Tc: 8.91 in/hr
 Runoff Supply Rate (q) @ Tc: 5.60 in/hr
PEAK DISCHARGE: 111 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	11
5-year	0.23	26
10-year	0.35	39
25-year	0.55	61
50-year	0.75	83

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2011
 Concentration Point: 26.2 (Existing) Job #: 10-027

Watershed Area: 1.1 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	4.0	270	0.0148	.025

Length of Watercourse (Lc): 270 feet Mean Slope: 0.0148
 Length to Cen. of Gravity (Lca): 4 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	53	83.	87.24	0.560
C	47	88.	91.02	0.669
D	0	.	.	0.000
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.629
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 6.57 in/hr
PEAK DISCHARGE: 7.0 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	0.7
5-year	0.23	1.6
10-year	0.35	2.5
25-year	0.55	3.9
50-year	0.75	5.3

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 27 Job #: 10-027

Watershed Area: 9.5 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	22.0	1,101	0.0200	.025

Length of Watercourse (Lc): 1,101 feet Mean Slope: 0.0200
 Length to Cen. of Gravity (Lca): 528 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0129	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63
Areal Values (in)	0.87	1.33	1.65	2.22	2.75	3.06	3.22	3.52	3.82	4.63

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	50	83.	87.24	0.560
C	50	88.	91.02	0.669
D	0	91.	93.32	0.744
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.632
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 6.60 in/hr
PEAK DISCHARGE: 63 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	6.3
5-year	0.23	15
10-year	0.35	22
25-year	0.55	35
50-year	0.75	47

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 28 Job #: 10-027

Watershed Area: 321.4 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	58.0	3,748	0.0155	.035
2	136.0	8,252	0.0165	.035

Length of Watercourse (Lc): 12,000 feet Mean Slope: 0.0162
 Length to Cen. of Gravity (Lca): 5,232 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	66	83.	87.2	0.557
C	34	88.	90.99	0.667
D	0	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.612
 Time of Concentration: 33.1 min
 Rainfall Intensity (i) @ Tc: 4.08 in/hr
 Runoff Supply Rate (q) @ Tc: 2.50 in/hr
PEAK DISCHARGE: 810 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	81
5-year	0.23	186
10-year	0.35	283
25-year	0.55	445
50-year	0.75	607

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 29 Job #: 10-027

Watershed Area: 27.6 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	26.0	1,158	0.0225	.035
2	40.0	2,356	0.0170	.035

Length of Watercourse (Lc): 3,514 feet Mean Slope: 0.0185
 Length to Cen. of Gravity (Lca): 1,610 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	50	83.	87.2	0.557
C	50	88.	90.99	0.667
D	0	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.629
 Time of Concentration: 12.0 min
 Rainfall Intensity (i) @ Tc: 7.24 in/hr
 Runoff Supply Rate (q) @ Tc: 4.55 in/hr
PEAK DISCHARGE: 127 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	13
5-year	0.23	29
10-year	0.35	44
25-year	0.55	70
50-year	0.75	95

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 30 Job #: 10-027

Watershed Area: 27.6 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	58.0	2,934	0.0198	.035

Length of Watercourse (Lc): 2,934 feet Mean Slope: 0.0198
 Length to Cen. of Gravity (Lca): 1,199 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	50	83.	87.2	0.557
C	50	88.	90.99	0.667
D	0	.	.	0.000
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.629
 Time of Concentration: 9.8 min
 Rainfall Intensity (i) @ Tc: 7.98 in/hr
 Runoff Supply Rate (q) @ Tc: 5.02 in/hr
PEAK DISCHARGE: 140 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	14
5-year	0.23	32
10-year	0.35	49
25-year	0.55	77
50-year	0.75	105

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 31 Job #: 10-027

Watershed Area: 4.7 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	20.0	867	0.0231	.035

Length of Watercourse (Lc): 867 feet Mean Slope: 0.0231
 Length to Cen. of Gravity (Lca): 346 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	50	83.	87.2	0.557
C	50	88.	90.99	0.667
D	0	.	.	0.000
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.629
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 6.57 in/hr
PEAK DISCHARGE: 31 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	3.1
5-year	0.23	7.2
10-year	0.35	11
25-year	0.55	17
50-year	0.75	23

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 33 Job #: 10-027

Watershed Area: 8.5 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	27.0	1,210	0.0223	.035

Length of Watercourse (Lc): 1,210 feet Mean Slope: 0.0223
 Length to Cen. of Gravity (Lca): 488 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469		
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>	
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66	
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66	

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	0	83.	87.2	0.557
C	53	88.	90.99	0.667
D	47	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.714
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 7.46 in/hr
PEAK DISCHARGE: 64 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	6.4
5-year	0.23	15
10-year	0.35	22
25-year	0.55	35
50-year	0.75	48

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 34 Job #: 10-027

Watershed Area: 2.6 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	20.0	636	0.0314	.035

Length of Watercourse (Lc): 636 feet Mean Slope: 0.0314
 Length to Cen. of Gravity (Lca): 251 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	0	83.	87.2	0.557
C	53	88.	90.99	0.667
D	47	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.714
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 7.46 in/hr
PEAK DISCHARGE: 20 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	2.0
5-year	0.23	4.5
10-year	0.35	6.9
25-year	0.55	11
50-year	0.75	15

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 35 Job #: 10-027

Watershed Area: 166.5 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	26.0	996	0.0261	.035
2	158.0	8,440	0.0187	.035

Length of Watercourse (Lc): 9,436 feet Mean Slope: 0.0193
 Length to Cen. of Gravity (Lca): 4,736 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	27	83.	87.2	0.557
C	39	88.	90.99	0.667
D	34	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.677
 Time of Concentration: 25.0 min
 Rainfall Intensity (i) @ Tc: 4.83 in/hr
 Runoff Supply Rate (q) @ Tc: 3.27 in/hr
PEAK DISCHARGE: 549 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	55
5-year	0.23	126
10-year	0.35	192
25-year	0.55	302
50-year	0.75	411

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 36 Job #: 10-027

Watershed Area: 9.9 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	35.0	1,964	0.0178	.035

Length of Watercourse (Lc): 1,964 feet Mean Slope: 0.0178
 Length to Cen. of Gravity (Lca): 807 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	0	83.	87.2	0.557
C	53	88.	90.99	0.667
D	47	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.714
 Time of Concentration: 7.3 min
 Rainfall Intensity (i) @ Tc: 8.85 in/hr
 Runoff Supply Rate (q) @ Tc: 6.33 in/hr
PEAK DISCHARGE: 63 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	6.3
5-year	0.23	15
10-year	0.35	22
25-year	0.55	35
50-year	0.75	47

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 37 Job #: 10-027

Watershed Area: 4.2 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	21.0	910	0.0231	.035

Length of Watercourse (Lc): 910 feet Mean Slope: 0.0231
 Length to Cen. of Gravity (Lca): 360 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	0	83.	87.2	0.557
C	53	88.	90.99	0.667
D	47	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.714
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 7.46 in/hr
PEAK DISCHARGE: 32 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	3.2
5-year	0.23	7.3
10-year	0.35	11
25-year	0.55	18
50-year	0.75	24

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 38 Job #: 10-027

Watershed Area: 3.3 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	25.0	821	0.0305	.035

Length of Watercourse (Lc): 821 feet Mean Slope: 0.0305
 Length to Cen. of Gravity (Lca): 325 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	0	83.	87.2	0.557
C	53	88.	90.99	0.667
D	47	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.714
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 7.46 in/hr
PEAK DISCHARGE: 25 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	2.5
5-year	0.23	5.7
10-year	0.35	8.6
25-year	0.55	14
50-year	0.75	18

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 39 Job #: 10-027

Watershed Area: 166.4 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	153.0	7,283	0.0210	.035
2	32.0	1,604	0.0200	.035

Length of Watercourse (Lc): 8,887 feet Mean Slope: 0.0208
 Length to Cen. of Gravity (Lca): 5,192 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	34	83.	87.2	0.557
C	35	88.	90.99	0.667
D	31	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.668
 Time of Concentration: 24.6 min
 Rainfall Intensity (i) @ Tc: 4.87 in/hr
 Runoff Supply Rate (q) @ Tc: 3.25 in/hr
PEAK DISCHARGE: 546 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	55
5-year	0.23	126
10-year	0.35	191
25-year	0.55	300
50-year	0.75	409

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 40 Job #: 10-027

Watershed Area: 95.9 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	30.0	1,098	0.0273	.035
2	138.0	6,192	0.0223	.035

Length of Watercourse (Lc): 7,290 feet Mean Slope: 0.0230
 Length to Cen. of Gravity (Lca): 3,843 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	24	83.	87.2	0.557
C	40	88.	90.99	0.667
D	36	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.682
 Time of Concentration: 19.1 min
 Rainfall Intensity (i) @ Tc: 5.64 in/hr
 Runoff Supply Rate (q) @ Tc: 3.84 in/hr
PEAK DISCHARGE: 372 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	37
5-year	0.23	85
10-year	0.35	130
25-year	0.55	204
50-year	0.75	279

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 41 Job #: 10-027

Watershed Area: 10.2 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	31.0	943	0.0329	.025
2	22.0	1,049	0.0210	.025

Length of Watercourse (Lc): 1,992 feet Mean Slope: 0.0256
 Length to Cen. of Gravity (Lca): 943 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	50	83.	87.2	0.557
C	27	88.	90.99	0.667
D	23	91.	93.29	0.741
Imp.	35	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.744
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 7.76 in/hr
PEAK DISCHARGE: 80 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.20	16
5-year	0.30	24
10-year	0.45	36
25-year	0.65	52
50-year	0.85	68

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 42 Job #: 10-027

Watershed Area: 112.2 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	20.0	784	0.0255	.035
2	54.0	2,545	0.0212	.035
3	30.0	1,414	0.0212	.035
4	116.0	5,160	0.0225	.035

Length of Watercourse (Lc): 9,903 feet Mean Slope: 0.0222
 Length to Cen. of Gravity (Lca): 3,970 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4238 Longitude: 111.0469										
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	34	83.	87.2	0.557
C	35	88.	90.99	0.667
D	31	91.	93.29	0.741
Imp.	10	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.683
 Time of Concentration: 22.1 min
 Rainfall Intensity (i) @ Tc: 5.17 in/hr
 Runoff Supply Rate (q) @ Tc: 3.53 in/hr
PEAK DISCHARGE: 399 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	40
5-year	0.23	92
10-year	0.35	140
25-year	0.55	220
50-year	0.75	299

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 43 Job #: 10-027

Watershed Area: 12.2 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	34.0	1,082	0.0314	.025
2	24.0	1,129	0.0213	.025

Length of Watercourse (Lc): 2,211 feet Mean Slope: 0.0255
 Length to Cen. of Gravity (Lca): 1,263 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	0	83.	87.2	0.557
C	53	88.	90.99	0.667
D	47	91.	93.29	0.741
Imp.	20	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.753
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 7.86 in/hr
PEAK DISCHARGE: 97 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.20	19
5-year	0.30	29
10-year	0.45	44
25-year	0.65	63
50-year	0.85	82

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 44 Job #: 10-027

Watershed Area: 133.0 ac Watershed Type: Low Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	35.0	1,236	0.0283	.035
2	26.0	1,144	0.0227	.035
3	96.0	4,240	0.0226	.030

Length of Watercourse (Lc): 6,620 feet Mean Slope: 0.0236
 Length to Cen. of Gravity (Lca): 2,903 feet Weighted Basin Fac.: 0.032
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	1	83.	87.2	0.557
C	53	88.	90.99	0.667
D	46	91.	93.29	0.741
Imp.	20	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.751
 Time of Concentration: 13.6 min
 Rainfall Intensity (i) @ Tc: 6.84 in/hr
 Runoff Supply Rate (q) @ Tc: 5.14 in/hr
PEAK DISCHARGE: 689 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.15	103
5-year	0.28	193
10-year	0.40	276
25-year	0.60	413
50-year	0.80	551

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 45 Job #: 10-027

Watershed Area: 22.9 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	42.0	1,708	0.0246	.025

Length of Watercourse (Lc): 1,708 feet Mean Slope: 0.0246
 Length to Cen. of Gravity (Lca): 801 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	1	83.	87.2	0.557
C	53	88.	90.99	0.667
D	46	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.713
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 7.44 in/hr
PEAK DISCHARGE: 172 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.20	34
5-year	0.30	52
10-year	0.45	77
25-year	0.65	112
50-year	0.85	146

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 46 Job #: 10-027

Watershed Area: 79.1 ac Watershed Type: Low Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	60.0	2,442	0.0246	.025
2	44.0	1,813	0.0243	.025
3	50.0	2,327	0.0215	.025

Length of Watercourse (Lc): 6,582 feet Mean Slope: 0.0233
 Length to Cen. of Gravity (Lca): 2,513 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469		
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>	
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66	
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66	

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	40	83.	87.2	0.557
C	32	88.	90.99	0.667
D	28	91.	93.29	0.741
Imp.	15	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.691
 Time of Concentration: 10.0 min
 Rainfall Intensity (i) @ Tc: 7.90 in/hr
 Runoff Supply Rate (q) @ Tc: 5.46 in/hr
PEAK DISCHARGE: 435 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.20	87
5-year	0.30	131
10-year	0.45	196
25-year	0.65	283
50-year	0.85	370

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 47 Job #: 10-027

Watershed Area: 8.2 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	21.0	1,026	0.0205	.025

Length of Watercourse (Lc): 1,026 feet Mean Slope: 0.0205
 Length to Cen. of Gravity (Lca): 492 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469		
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>	
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66	
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66	

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.2	0.557
C	0	88.	90.99	0.667
D	0	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.577
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 6.02 in/hr
PEAK DISCHARGE: 50 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.20	9.9
5-year	0.30	15
10-year	0.45	22
25-year	0.65	32
50-year	0.85	42

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 48 Job #: 10-027

Watershed Area: 13.1 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	34.0	1,453	0.0234	.025

Length of Watercourse (Lc): 1,453 feet Mean Slope: 0.0234
 Length to Cen. of Gravity (Lca): 761 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.2	0.557
C	0	88.	90.99	0.667
D	0	91.	93.29	0.741
Imp.	20	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.637
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 6.65 in/hr
PEAK DISCHARGE: 88 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.20	18
5-year	0.30	26
10-year	0.45	40
25-year	0.65	57
50-year	0.85	75

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 49 Job #: 10-027

Watershed Area: 19.4 ac Watershed Type: Low Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	64.0	3,137	0.0204	.030

Length of Watercourse (Lc): 3,137 feet Mean Slope: 0.0204
 Length to Cen. of Gravity (Lca): 1,633 feet Weighted Basin Fac.: 0.030
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469		
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>	
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66	
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66	

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.2	0.557
C	0	88.	90.99	0.667
D	0	91.	93.29	0.741
Imp.	10	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.597
 Time of Concentration: 9.4 min
 Rainfall Intensity (i) @ Tc: 8.09 in/hr
 Runoff Supply Rate (q) @ Tc: 4.83 in/hr
PEAK DISCHARGE: 94 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.20	19
5-year	0.30	28
10-year	0.45	42
25-year	0.65	61
50-year	0.85	80

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 50 Job #: 10-027

Watershed Area: 4.3 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	26.0	904	0.0288	.035

Length of Watercourse (Lc): 904 feet Mean Slope: 0.0288
 Length to Cen. of Gravity (Lca): 452 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.2	0.557
C	0	88.	90.99	0.667
D	0	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.577
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 6.02 in/hr
PEAK DISCHARGE: 26 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.20	5.3
5-year	0.30	7.9
10-year	0.45	12
25-year	0.65	17
50-year	0.85	22

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 51 Job #: 10-027

Watershed Area: 15.0 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	50.0	1,989	0.0251	.035

Length of Watercourse (Lc): 1,989 feet Mean Slope: 0.0251
 Length to Cen. of Gravity (Lca): 931 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469		
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>	
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66	
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66	

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.2	0.557
C	0	88.	90.99	0.667
D	0	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.577
 Time of Concentration: 7.2 min
 Rainfall Intensity (i) @ Tc: 8.88 in/hr
 Runoff Supply Rate (q) @ Tc: 5.12 in/hr
PEAK DISCHARGE: 77 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	7.7
5-year	0.23	18
10-year	0.35	27
25-year	0.55	43
50-year	0.75	58

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 53 Job #: 10-027

Watershed Area: 39.3 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	110.0	3,535	0.0311	.060

Length of Watercourse (Lc): 3,535 feet Mean Slope: 0.0311
 Length to Cen. of Gravity (Lca): 1,890 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.2	0.557
C	0	88.	90.99	0.667
D	0	91.	93.29	0.741
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.557
 Time of Concentration: 20.8 min
 Rainfall Intensity (i) @ Tc: 5.35 in/hr
 Runoff Supply Rate (q) @ Tc: 2.98 in/hr
PEAK DISCHARGE: 118 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	12
5-year	0.23	27
10-year	0.35	41
25-year	0.55	65
50-year	0.75	88

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 54 Job #: 10-027

Watershed Area: 59.2 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	28.0	1,105	0.0253	.060
2	42.0	1,555	0.0270	.060
3	100.0	3,265	0.0306	.060

Length of Watercourse (Lc): 5,925 feet Mean Slope: 0.0286
 Length to Cen. of Gravity (Lca): 3,307 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4247 Longitude: 111.0981										
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 34.3 min
 Rainfall Intensity (i) @ Tc: 3.85 in/hr
 Runoff Supply Rate (q) @ Tc: 2.09 in/hr
PEAK DISCHARGE: 124 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	12
5-year	0.23	29
10-year	0.35	44
25-year	0.55	68
50-year	0.75	93

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 55 Job #: 10-027

Watershed Area: 86.4 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	12.0	302	0.0397	.060
2	208.0	7,293	0.0285	.060

Length of Watercourse (Lc): 7,595 feet Mean Slope: 0.0289
 Length to Cen. of Gravity (Lca): 4,223 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 42.0 min
 Rainfall Intensity (i) @ Tc: 3.34 in/hr
 Runoff Supply Rate (q) @ Tc: 1.81 in/hr
PEAK DISCHARGE: 157 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	16
5-year	0.23	36
10-year	0.35	55
25-year	0.55	86
50-year	0.75	118

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 56 Job #: 10-027

Watershed Area: 145.9 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	272.0	9,417	0.0289	.060

Length of Watercourse (Lc): 9,417 feet Mean Slope: 0.0289
 Length to Cen. of Gravity (Lca): 5,607 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 51.4 min
 Rainfall Intensity (i) @ Tc: 2.91 in/hr
 Runoff Supply Rate (q) @ Tc: 1.58 in/hr
PEAK DISCHARGE: 232 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	23
5-year	0.23	53
10-year	0.35	81
25-year	0.55	127
50-year	0.75	174

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 57 Job #: 10-027

Watershed Area: 13.4 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	53.0	1,757	0.0302	.060

Length of Watercourse (Lc): 1,757 feet Mean Slope: 0.0302
 Length to Cen. of Gravity (Lca): 890 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 12.5 min
 Rainfall Intensity (i) @ Tc: 6.89 in/hr
 Runoff Supply Rate (q) @ Tc: 3.73 in/hr
PEAK DISCHARGE: 50 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	5.0
5-year	0.23	12
10-year	0.35	18
25-year	0.55	28
50-year	0.75	38

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 58 Job #: 10-027

Watershed Area: 9.0 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	45.0	1,498	0.0300	.060

Length of Watercourse (Lc): 1,498 feet Mean Slope: 0.0300
 Length to Cen. of Gravity (Lca): 822 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 11.4 min
 Rainfall Intensity (i) @ Tc: 7.18 in/hr
 Runoff Supply Rate (q) @ Tc: 3.89 in/hr
PEAK DISCHARGE: 35 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	3.5
5-year	0.23	8.1
10-year	0.35	12
25-year	0.55	19
50-year	0.75	26

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 59 Job #: 10-027

Watershed Area: 90.7 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	246.0	8,524	0.0289	.060

Length of Watercourse (Lc): 8,524 feet Mean Slope: 0.0289
 Length to Cen. of Gravity (Lca): 3,886 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 42.5 min
 Rainfall Intensity (i) @ Tc: 3.30 in/hr
 Runoff Supply Rate (q) @ Tc: 1.79 in/hr
PEAK DISCHARGE: 164 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	16
5-year	0.23	38
10-year	0.35	57
25-year	0.55	90
50-year	0.75	123

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 60 Job #: 10-027

Watershed Area: 231.6 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	200.0	6,358	0.0315	.060
2	192.0	6,872	0.0279	.060

Length of Watercourse (Lc): 13,230 feet Mean Slope: 0.0296
 Length to Cen. of Gravity (Lca): 7,134 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 1.1 hrs
 Rainfall Intensity (i) @ Tc: 2.47 in/hr
 Runoff Supply Rate (q) @ Tc: 1.34 in/hr
PEAK DISCHARGE: 312 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	31
5-year	0.23	72
10-year	0.35	109
25-year	0.55	172
50-year	0.75	234

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 61 Job #: 10-027

Watershed Area: 31.4 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	84.0	3,034	0.0277	.060
2	48.0	1,805	0.0266	.060

Length of Watercourse (Lc): 4,839 feet Mean Slope: 0.0273
 Length to Cen. of Gravity (Lca): 2,786 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 30.0 min
 Rainfall Intensity (i) @ Tc: 4.26 in/hr
 Runoff Supply Rate (q) @ Tc: 2.30 in/hr
PEAK DISCHARGE: 73 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	7.3
5-year	0.23	17
10-year	0.35	26
25-year	0.55	40
50-year	0.75	55

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 62 Job #: 10-027

Watershed Area: 686.3 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	110.0	2,760	0.0399	.060
2	140.0	3,996	0.0350	.060
3	206.0	584	0.3527	.060
4	306.0	10,931	0.0280	.060

Length of Watercourse (Lc): 18,271 feet Mean Slope: 0.0324
 Length to Cen. of Gravity (Lca): 11,428 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 1.5 hrs
 Rainfall Intensity (i) @ Tc: 1.89 in/hr
 Runoff Supply Rate (q) @ Tc: 1.02 in/hr
PEAK DISCHARGE: 708 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	71
5-year	0.23	163
10-year	0.35	248
25-year	0.55	390
50-year	0.75	531

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 63 Job #: 10-027

Watershed Area: 19.8 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	12.0	394	0.0305	.060
2	76.0	2,804	0.0271	.060

Length of Watercourse (Lc): 3,198 feet Mean Slope: 0.0275
 Length to Cen. of Gravity (Lca): 1,384 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 19.5 min
 Rainfall Intensity (i) @ Tc: 5.38 in/hr
 Runoff Supply Rate (q) @ Tc: 2.91 in/hr
PEAK DISCHARGE: 58 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	5.8
5-year	0.23	13
10-year	0.35	20
25-year	0.55	32
50-year	0.75	44

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 64 Job #: 10-027

Watershed Area: 94.0 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	8.0	263	0.0304	.060
2	30.0	1,209	0.0248	.060
3	70.0	2,650	0.0264	.060
4	114.0	4,255	0.0268	.060

Length of Watercourse (Lc): 8,377 feet Mean Slope: 0.0265
 Length to Cen. of Gravity (Lca): 4,254 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 46.0 min
 Rainfall Intensity (i) @ Tc: 3.14 in/hr
 Runoff Supply Rate (q) @ Tc: 1.70 in/hr
PEAK DISCHARGE: 161 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	16
5-year	0.23	37
10-year	0.35	56
25-year	0.55	88
50-year	0.75	121

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 65 Job #: 10-027

Watershed Area: 22.5 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	4.0	149	0.0268	.060
2	92.0	3,386	0.0272	.060

Length of Watercourse (Lc): 3,535 feet Mean Slope: 0.0272
 Length to Cen. of Gravity (Lca): 1,871 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 23.0 min
 Rainfall Intensity (i) @ Tc: 4.90 in/hr
 Runoff Supply Rate (q) @ Tc: 2.65 in/hr
PEAK DISCHARGE: 60 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	6.0
5-year	0.23	14
10-year	0.35	21
25-year	0.55	33
50-year	0.75	45

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 66 Job #: 10-027

Watershed Area: 638.7 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	244.0	6,454	0.0378	.060
2	178.0	6,266	0.0284	.060
3	268.0	9,931	0.0270	.060

Length of Watercourse (Lc): 22,651 feet Mean Slope: 0.0300
 Length to Cen. of Gravity (Lca): 12,632 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 1.8 hrs
 Rainfall Intensity (i) @ Tc: 1.62 in/hr
 Runoff Supply Rate (q) @ Tc: 0.87 in/hr
PEAK DISCHARGE: 563 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	56
5-year	0.23	130
10-year	0.35	197
25-year	0.55	310
50-year	0.75	422

Time of Concentration for desert/mountain

(Highway Drainage Design Manual Hydrology, Arizona Department of Transportation, March, 1993)

$$T_c = (2.4)(A^{-1})(L^{.25})(L_{CA}^{.25})(S^{-.2})$$

Where:

T_c: time of concentration, in hours

A: area, in square miles

S: watercourse slope, in ft/mile

L: length of the watercourse to the hydraulically most distant point, in miles

L_{ca}: length measured from the concentration point along L to a point on L that is perpendicular to the watershed centroid, in miles

Watershed	A	L	L _{ca}	Elevation Difference (ft)	S	T _c
CP-68	8.83	9.65	6.71	1978	205.0	2.92

*CP-68 is the biggest watershed for the Tangerine Rd project. The computed time of concentration 2.92 hours. Therefore, 3-hour Type II storm was used for the regional watersheds for this project.

Rainfall ID = A



POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14



Arizona 32.48154 N 111.0501 W 3402 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2006

Extracted: Fri Aug 20 2010

Confidence Limits	Seasonality	Related Info	GIS data	Maps	Docs	Return to State Map
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Precipitation Frequency Estimates (inches)																		
ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.27	0.41	0.50	0.68	0.84	0.95	1.02	1.21	1.41	1.59	1.82	2.08	2.42	2.73	3.64	4.44	5.42	6.21
2	0.35	0.53	0.65	0.88	1.09	1.22	1.30	1.52	1.77	1.99	2.29	2.62	3.05	3.43	4.58	5.59	6.82	7.83
5	0.46	0.70	0.86	1.17	1.44	1.60	1.68	1.92	2.21	2.51	2.91	3.36	3.94	4.40	5.86	7.05	8.54	9.80
10	0.54	0.83	1.02	1.38	1.71	1.89	1.97	2.24	2.57	2.93	3.41	3.99	4.70	5.22	6.91	8.23	9.86	11.32
25	0.66	1.00	1.24	1.67	2.06	2.28	2.39	2.70	3.07	3.52	4.12	4.89	5.81	6.42	8.39	9.86	11.63	13.33
50	0.74	1.13	1.40	1.88	2.33	2.58	2.72	3.06	3.46	3.98	4.68	5.64	6.73	7.41	9.59	11.14	12.97	14.85
100	0.83	1.26	1.56	2.10	2.60	2.90	3.07	3.43	3.86	4.47	5.28	6.45	7.76	8.50	10.86	12.48	14.35	16.39
200	0.91	1.39	1.72	2.32	2.87	3.22	3.43	3.82	4.28	4.98	5.90	7.32	8.87	9.67	12.22	13.88	15.74	17.93
500	1.03	1.56	1.94	2.61	3.23	3.64	3.92	4.35	4.84	5.68	6.75	8.58	10.49	11.37	14.13	15.79	17.60	19.99
1000	1.11	1.70	2.10	2.83	3.51	3.98	4.32	4.78	5.28	6.23	7.44	9.62	11.85	12.79	15.68	17.31	19.04	21.58

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval. Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting forces estimates near zero to appear as zero.

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.31	0.47	0.58	0.78	0.96	1.09	1.17	1.37	1.58	1.76	2.01	2.31	2.70	3.03	4.01	4.87	5.92	6.79
2	0.40	0.61	0.75	1.01	1.25	1.40	1.48	1.73	1.98	2.21	2.53	2.90	3.40	3.81	5.06	6.12	7.46	8.57
5	0.53	0.80	0.99	1.33	1.65	1.82	1.92	2.17	2.47	2.78	3.21	3.73	4.39	4.89	6.48	7.73	9.34	10.73
10	0.62	0.94	1.17	1.57	1.95	2.14	2.25	2.53	2.87	3.25	3.77	4.42	5.23	5.81	7.64	9.03	10.81	12.39
25	0.75	1.14	1.41	1.90	2.35	2.58	2.72	3.04	3.42	3.91	4.56	5.43	6.48	7.14	9.30	10.83	12.76	14.63
50	0.84	1.28	1.59	2.14	2.65	2.93	3.09	3.44	3.85	4.43	5.20	6.28	7.55	8.28	10.65	12.27	14.27	16.35
100	0.94	1.44	1.78	2.40	2.97	3.29	3.49	3.87	4.31	4.99	5.89	7.21	8.75	9.55	12.14	13.82	15.86	18.12
200	1.05	1.59	1.97	2.66	3.29	3.65	3.92	4.32	4.80	5.59	6.63	8.25	10.08	10.96	13.74	15.46	17.49	19.93
500	1.19	1.80	2.23	3.01	3.73	4.17	4.52	4.95	5.48	6.43	7.68	9.78	12.07	13.03	16.07	17.78	19.73	22.45
1000	1.30	1.98	2.45	3.30	4.08	4.59	5.01	5.48	6.03	7.11	8.56	11.08	13.80	14.82	18.04	19.68	21.53	24.45

* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.

** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.

Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

* Lower bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.23	0.36	0.44	0.60	0.74	0.84	0.91	1.08	1.27	1.44	1.65	1.89	2.19	2.47	3.29	4.05	4.96	5.68
2	0.31	0.47	0.58	0.78	0.96	1.08	1.15	1.36	1.59	1.81	2.08	2.38	2.76	3.10	4.16	5.09	6.24	7.15
5	0.40	0.61	0.76	1.02	1.26	1.41	1.48	1.70	1.98	2.28	2.64	3.04	3.55	3.96	5.30	6.41	7.79	8.94
10	0.47	0.72	0.89	1.20	1.49	1.65	1.73	1.98	2.28	2.65	3.09	3.59	4.21	4.69	6.22	7.45	8.98	10.30
25	0.56	0.86	1.07	1.44	1.78	1.97	2.07	2.35	2.70	3.16	3.69	4.36	5.14	5.70	7.49	8.86	10.53	12.06

Rainfall ID = B



**POINT PRECIPITATION
FREQUENCY ESTIMATES
FROM NOAA ATLAS 14**



Arizona 32.44565 N 111.05924 W 2818 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2006

Extracted: Fri Aug 20 2010

Confidence Limits	Seasonality	Related Info	GIS data	Maps	Docs	Return to State Map
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Precipitation Frequency Estimates (inches)																		
ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.24	0.37	0.46	0.62	0.77	0.89	0.95	1.11	1.28	1.51	1.68	1.91	2.20	2.46	3.22	3.90	4.73	5.36
2	0.32	0.48	0.60	0.81	1.00	1.14	1.21	1.39	1.60	1.89	2.11	2.40	2.76	3.09	4.05	4.90	5.94	6.73
5	0.42	0.64	0.80	1.07	1.32	1.49	1.56	1.76	2.00	2.39	2.67	3.06	3.54	3.94	5.16	6.16	7.40	8.39
10	0.50	0.76	0.94	1.27	1.57	1.76	1.84	2.06	2.32	2.79	3.13	3.62	4.21	4.66	6.07	7.18	8.52	9.66
25	0.61	0.92	1.14	1.54	1.91	2.13	2.23	2.48	2.77	3.34	3.77	4.43	5.19	5.71	7.35	8.57	10.01	11.34
50	0.69	1.04	1.29	1.74	2.16	2.42	2.54	2.81	3.12	3.78	4.28	5.10	6.00	6.58	8.38	9.66	11.13	12.60
100	0.77	1.17	1.45	1.95	2.42	2.72	2.86	3.16	3.49	4.24	4.81	5.82	6.90	7.53	9.48	10.80	12.26	13.86
200	0.85	1.30	1.61	2.16	2.68	3.02	3.20	3.53	3.86	4.72	5.36	6.59	7.86	8.55	10.65	11.98	13.39	15.12
500	0.96	1.46	1.81	2.44	3.02	3.43	3.67	4.03	4.37	5.38	6.12	7.71	9.28	10.03	12.28	13.59	14.88	16.77
1000	1.05	1.59	1.98	2.66	3.29	3.75	4.05	4.43	4.78	5.89	6.73	8.62	10.46	11.25	13.60	14.86	16.01	18.02

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval. Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting forces estimates near zero to appear as zero.

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.28	0.43	0.53	0.71	0.89	1.01	1.08	1.26	1.43	1.68	1.86	2.11	2.44	2.73	3.55	4.28	5.15	5.85
2	0.36	0.56	0.69	0.93	1.15	1.30	1.38	1.58	1.79	2.10	2.33	2.65	3.08	3.43	4.47	5.37	6.48	7.34
5	0.48	0.73	0.91	1.23	1.52	1.70	1.78	2.00	2.23	2.65	2.95	3.39	3.94	4.37	5.70	6.75	8.07	9.15
10	0.57	0.87	1.08	1.45	1.79	2.00	2.09	2.33	2.59	3.09	3.46	4.00	4.68	5.18	6.70	7.85	9.30	10.54
25	0.69	1.05	1.30	1.75	2.17	2.41	2.53	2.79	3.09	3.71	4.17	4.90	5.78	6.35	8.13	9.39	10.94	12.40
50	0.78	1.19	1.48	1.99	2.46	2.74	2.88	3.17	3.48	4.20	4.75	5.66	6.73	7.34	9.30	10.62	12.19	13.82
100	0.88	1.34	1.66	2.23	2.76	3.08	3.26	3.57	3.89	4.74	5.36	6.49	7.78	8.45	10.59	11.93	13.48	15.26
200	0.98	1.49	1.84	2.48	3.07	3.43	3.66	3.99	4.34	5.30	6.02	7.41	8.94	9.67	11.96	13.31	14.80	16.73
500	1.11	1.69	2.10	2.82	3.50	3.93	4.23	4.59	4.96	6.09	6.95	8.76	10.68	11.47	13.96	15.26	16.59	18.75
1000	1.22	1.85	2.30	3.10	3.83	4.33	4.70	5.09	5.46	6.73	7.72	9.91	12.19	13.03	15.63	16.85	18.00	20.32

* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.

** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.

Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

* Lower bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.22	0.33	0.41	0.55	0.68	0.79	0.84	0.99	1.15	1.37	1.53	1.74	1.99	2.23	2.92	3.57	4.34	4.91
2	0.28	0.43	0.53	0.71	0.88	1.01	1.07	1.24	1.44	1.72	1.92	2.18	2.50	2.79	3.67	4.48	5.45	6.17
5	0.37	0.56	0.70	0.94	1.16	1.31	1.38	1.57	1.79	2.15	2.43	2.77	3.20	3.56	4.67	5.61	6.77	7.69
10	0.43	0.66	0.82	1.11	1.37	1.54	1.61	1.82	2.07	2.51	2.83	3.27	3.78	4.19	5.47	6.51	7.79	8.83
25	0.52	0.79	0.98	1.32	1.64	1.85	1.93	2.16	2.44	2.99	3.38	3.95	4.61	5.08	6.57	7.72	9.09	10.32

Rainfall ID: F

11226

F



POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14



Arizona 32.43936 N 111.11636 W 2372 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2006

Extracted: Fri Aug 20 2010

Confidence Limits	Seasonality	Related Info	GIS data	Maps	Docs	Return to State Map
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Precipitation Frequency Estimates (inches)																		
ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.23	0.35	0.43	0.59	0.72	0.84	0.90	1.04	1.20	1.46	1.60	1.81	2.07	2.30	2.97	3.57	4.29	4.80
2	0.30	0.46	0.56	0.76	0.94	1.07	1.14	1.31	1.50	1.83	2.01	2.28	2.60	2.88	3.73	4.48	5.38	6.03
5	0.40	0.60	0.75	1.01	1.25	1.41	1.47	1.66	1.88	2.30	2.54	2.91	3.33	3.68	4.75	5.63	6.69	7.50
10	0.47	0.72	0.89	1.20	1.49	1.66	1.74	1.95	2.18	2.69	2.98	3.44	3.94	4.34	5.58	6.55	7.70	8.63
25	0.57	0.88	1.08	1.46	1.81	2.02	2.11	2.34	2.60	3.22	3.58	4.20	4.85	5.31	6.75	7.81	9.03	10.11
50	0.65	0.99	1.23	1.66	2.06	2.30	2.40	2.66	2.93	3.65	4.06	4.82	5.60	6.11	7.68	8.79	10.02	11.21
100	0.73	1.12	1.39	1.87	2.31	2.58	2.71	2.99	3.27	4.09	4.56	5.49	6.42	6.98	8.68	9.81	11.01	12.31
200	0.82	1.24	1.54	2.07	2.56	2.87	3.04	3.34	3.62	4.55	5.08	6.21	7.31	7.91	9.73	10.86	11.99	13.39
500	0.92	1.41	1.74	2.35	2.91	3.27	3.49	3.83	4.10	5.18	5.79	7.25	8.60	9.25	11.19	12.29	13.26	14.80
1000	1.01	1.53	1.90	2.56	3.17	3.58	3.85	4.22	4.49	5.68	6.36	8.10	9.67	10.37	12.37	13.41	14.21	15.85

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval. Please refer to [NOAA Atlas 14 Document](#) for more information. NOTE: Formatting forces estimates near zero to appear as zero.

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.27	0.40	0.50	0.68	0.83	0.96	1.02	1.19	1.34	1.62	1.77	2.01	2.30	2.55	3.27	3.91	4.67	5.23
2	0.34	0.52	0.65	0.88	1.08	1.23	1.30	1.49	1.68	2.03	2.23	2.52	2.89	3.20	4.12	4.90	5.86	6.57
5	0.46	0.69	0.86	1.16	1.44	1.61	1.68	1.89	2.10	2.56	2.81	3.21	3.69	4.08	5.24	6.16	7.29	8.17
10	0.54	0.82	1.02	1.37	1.70	1.90	1.98	2.20	2.43	2.99	3.30	3.79	4.38	4.82	6.16	7.16	8.39	9.40
25	0.66	1.00	1.24	1.67	2.06	2.29	2.40	2.65	2.90	3.59	3.97	4.63	5.39	5.90	7.46	8.54	9.84	11.03
50	0.75	1.14	1.41	1.90	2.35	2.60	2.73	3.00	3.26	4.07	4.51	5.34	6.26	6.81	8.52	9.64	10.94	12.27
100	0.84	1.28	1.59	2.14	2.64	2.93	3.10	3.38	3.65	4.58	5.09	6.12	7.22	7.82	9.67	10.81	12.07	13.52
200	0.94	1.43	1.77	2.38	2.95	3.27	3.48	3.79	4.07	5.12	5.71	6.98	8.29	8.93	10.90	12.04	13.21	14.78
500	1.07	1.63	2.02	2.72	3.36	3.75	4.03	4.37	4.65	5.89	6.58	8.23	9.86	10.57	12.69	13.77	14.74	16.49
1000	1.17	1.79	2.21	2.98	3.69	4.14	4.49	4.85	5.13	6.50	7.31	9.30	11.24	11.98	14.18	15.17	15.93	17.81

* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.

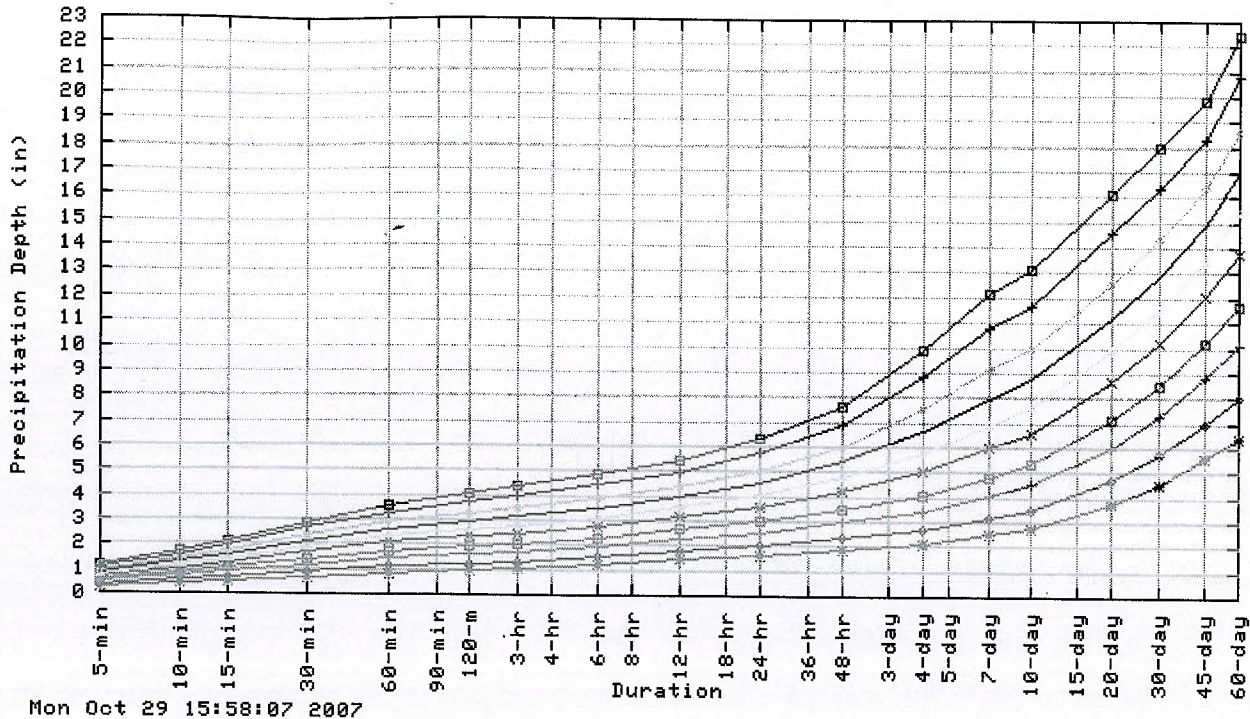
** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.

Please refer to [NOAA Atlas 14 Document](#) for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

* Lower bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.20	0.31	0.38	0.52	0.64	0.74	0.79	0.93	1.07	1.32	1.45	1.65	1.87	2.08	2.69	3.27	3.94	4.41
2	0.26	0.40	0.50	0.67	0.83	0.95	1.01	1.17	1.35	1.66	1.83	2.06	2.35	2.61	3.39	4.09	4.94	5.54
5	0.35	0.53	0.66	0.88	1.09	1.24	1.30	1.47	1.68	2.08	2.31	2.63	3.00	3.32	4.30	5.13	6.14	6.89
10	0.41	0.63	0.78	1.04	1.29	1.45	1.52	1.72	1.94	2.42	2.69	3.09	3.54	3.91	5.03	5.95	7.06	7.91
25	0.49	0.75	0.93	1.25	1.55	1.74	1.82	2.04	2.29	2.88	3.21	3.74	4.32	4.72	6.03	7.04	8.23	9.22

Rainfall ID = I

Partial duration based Point Precipitation Frequency Estimates Version: 4
32.50616 N 111.0643 W 3792 ft



Average Recurrence Interval (years)	
1	*
2	+
5	+
10	+
25	*
100	—
200	+
500	+
1000	+

Confidence Limits -

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.31	0.47	0.58	0.79	0.97	1.10	1.19	1.41	1.63	1.78	2.04	2.35	2.76	3.10	4.12	4.99	6.08	6.99
2	0.40	0.61	0.76	1.02	1.26	1.42	1.52	1.76	2.04	2.23	2.57	2.96	3.48	3.90	5.20	6.29	7.67	8.82
5	0.53	0.81	1.00	1.35	1.67	1.86	1.96	2.22	2.55	2.81	3.27	3.81	4.50	5.01	6.67	7.96	9.63	11.08
10	0.63	0.95	1.18	1.59	1.97	2.19	2.31	2.59	2.96	3.29	3.84	4.52	5.37	5.96	7.87	9.31	11.16	12.82
25	0.76	1.15	1.42	1.92	2.37	2.63	2.78	3.10	3.52	3.95	4.65	5.56	6.66	7.34	9.59	11.19	13.21	15.16
50	0.85	1.30	1.61	2.17	2.68	2.98	3.16	3.51	3.96	4.48	5.31	6.43	7.77	8.50	10.98	12.70	14.80	16.96
100	0.95	1.45	1.80	2.42	3.00	3.35	3.57	3.95	4.44	5.04	6.01	7.39	9.00	9.81	12.52	14.31	16.46	18.82
200	1.06	1.61	2.00	2.69	3.33	3.72	4.00	4.41	4.93	5.65	6.76	8.45	10.37	11.26	14.17	16.01	18.18	20.72
500	1.20	1.82	2.26	3.04	3.77	4.24	4.61	5.04	5.63	6.50	7.84	10.02	12.41	13.38	16.56	18.44	20.57	23.37
1000	1.31	2.00	2.48	3.33	4.13	4.66	5.11	5.56	6.18	7.18	8.74	11.35	14.19	15.22	18.57	20.41	22.48	25.48

* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.
** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

* Lower bound of the 90% confidence interval																	
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Rainfall ID: 0



POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14



Arizona 32.49723 N 111.01905 W 4107 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2006

Extracted: Fri Aug 20 2010

Confidence Limits	Seasonality	Related Info	GIS data	Maps	Docs	Return to State Map
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Precipitation Frequency Estimates (inches)																		
ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.26	0.40	0.49	0.67	0.82	0.95	1.01	1.20	1.40	1.58	1.79	2.06	2.39	2.69	3.58	4.37	5.33	6.11
2	0.34	0.52	0.64	0.86	1.07	1.21	1.28	1.50	1.75	1.98	2.26	2.59	3.01	3.38	4.51	5.50	6.70	7.68
5	0.45	0.69	0.85	1.14	1.42	1.59	1.66	1.90	2.19	2.50	2.87	3.32	3.88	4.33	5.76	6.93	8.39	9.62
10	0.53	0.81	1.01	1.35	1.68	1.87	1.95	2.22	2.54	2.92	3.37	3.94	4.62	5.13	6.79	8.09	9.69	11.10
25	0.65	0.98	1.22	1.64	2.03	2.26	2.37	2.67	3.04	3.50	4.06	4.83	5.71	6.31	8.24	9.69	11.42	13.07
50	0.73	1.11	1.38	1.85	2.29	2.57	2.69	3.02	3.42	3.96	4.62	5.57	6.62	7.28	9.41	10.95	12.74	14.55
100	0.81	1.24	1.54	2.07	2.56	2.88	3.04	3.40	3.82	4.44	5.20	6.37	7.62	8.34	10.66	12.26	14.09	16.05
200	0.90	1.37	1.70	2.29	2.83	3.20	3.40	3.78	4.23	4.94	5.81	7.22	8.71	9.49	11.98	13.62	15.44	17.56
500	1.01	1.54	1.91	2.58	3.19	3.62	3.89	4.31	4.79	5.63	6.65	8.45	10.30	11.16	13.85	15.50	17.25	19.57
1000	1.10	1.68	2.08	2.80	3.46	3.96	4.28	4.74	5.22	6.18	7.32	9.47	11.63	12.54	15.36	16.98	18.66	21.11

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval. Please refer to [NOAA Atlas 14 Document](#) for more information. NOTE: Formatting forces estimates near zero to appear as zero.

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.30	0.46	0.57	0.76	0.95	1.08	1.15	1.35	1.56	1.75	1.98	2.28	2.66	2.98	3.94	4.79	5.82	6.68
2	0.39	0.59	0.74	0.99	1.23	1.38	1.47	1.70	1.96	2.19	2.50	2.86	3.35	3.75	4.97	6.02	7.33	8.41
5	0.52	0.78	0.97	1.31	1.62	1.80	1.89	2.15	2.44	2.76	3.16	3.67	4.32	4.81	6.36	7.59	9.17	10.52
10	0.61	0.93	1.15	1.55	1.91	2.13	2.23	2.50	2.84	3.22	3.71	4.35	5.14	5.71	7.49	8.87	10.60	12.14
25	0.73	1.12	1.38	1.86	2.31	2.56	2.69	3.00	3.38	3.87	4.48	5.34	6.37	7.02	9.11	10.64	12.51	14.33
50	0.83	1.26	1.57	2.11	2.61	2.90	3.06	3.39	3.80	4.38	5.11	6.17	7.42	8.12	10.44	12.05	13.99	16.01
100	0.93	1.42	1.75	2.36	2.92	3.26	3.46	3.82	4.26	4.94	5.78	7.09	8.60	9.37	11.89	13.57	15.54	17.74
200	1.03	1.57	1.95	2.62	3.24	3.63	3.88	4.27	4.75	5.53	6.50	8.11	9.90	10.75	13.45	15.17	17.13	19.50
500	1.17	1.78	2.21	2.97	3.68	4.14	4.48	4.90	5.42	6.36	7.53	9.61	11.85	12.78	15.72	17.46	19.32	21.96
1000	1.28	1.95	2.42	3.26	4.03	4.57	4.97	5.42	5.97	7.03	8.39	10.88	13.55	14.53	17.64	19.31	21.07	23.89

* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.
** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.

Please refer to [NOAA Atlas 14 Document](#) for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

* Lower bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.23	0.35	0.44	0.59	0.73	0.84	0.90	1.07	1.25	1.44	1.64	1.87	2.16	2.43	3.24	3.99	4.88	5.58
2	0.30	0.46	0.57	0.76	0.94	1.08	1.14	1.34	1.57	1.81	2.06	2.35	2.73	3.06	4.09	5.01	6.14	7.03
5	0.40	0.60	0.75	1.00	1.24	1.40	1.47	1.69	1.96	2.27	2.61	3.01	3.50	3.91	5.21	6.31	7.67	8.78
10	0.47	0.71	0.88	1.18	1.46	1.64	1.71	1.96	2.26	2.63	3.05	3.55	4.15	4.62	6.12	7.34	8.84	10.11
25	0.56	0.85	1.05	1.41	1.75	1.96	2.06	2.33	2.67	3.14	3.65	4.31	5.07	5.61	7.35	8.72	10.35	11.84

Rainfall ID : Q



POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14



Arizona 32.49723 N 111.01905 W 4107 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2006

Extracted: Fri Aug 20 2010

Confidence Limits	Seasonality	Related Info	GIS data	Maps	Docs	Return to State Map
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Precipitation Frequency Estimates (inches)																		
ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.26	0.40	0.49	0.67	0.82	0.95	1.01	1.20	1.40	1.58	1.79	2.06	2.39	2.69	3.58	4.37	5.33	6.11
2	0.34	0.52	0.64	0.86	1.07	1.21	1.28	1.50	1.75	1.98	2.26	2.59	3.01	3.38	4.51	5.50	6.70	7.68
5	0.45	0.69	0.85	1.14	1.42	1.59	1.66	1.90	2.19	2.50	2.87	3.32	3.88	4.33	5.76	6.93	8.39	9.62
10	0.53	0.81	1.01	1.35	1.68	1.87	1.95	2.22	2.54	2.92	3.37	3.94	4.62	5.13	6.79	8.09	9.69	11.10
25	0.65	0.98	1.22	1.64	2.03	2.26	2.37	2.67	3.04	3.50	4.06	4.83	5.71	6.31	8.24	9.69	11.42	13.07
50	0.73	1.11	1.38	1.85	2.29	2.57	2.69	3.02	3.42	3.96	4.62	5.57	6.62	7.28	9.41	10.95	12.74	14.55
100	0.81	1.24	1.54	2.07	2.56	2.88	3.04	3.40	3.82	4.44	5.20	6.37	7.62	8.34	10.66	12.26	14.09	16.05
200	0.90	1.37	1.70	2.29	2.83	3.20	3.40	3.78	4.23	4.94	5.81	7.22	8.71	9.49	11.98	13.62	15.44	17.56
500	1.01	1.54	1.91	2.58	3.19	3.62	3.89	4.31	4.79	5.63	6.65	8.45	10.30	11.16	13.85	15.50	17.25	19.57
1000	1.10	1.68	2.08	2.80	3.46	3.96	4.28	4.74	5.22	6.18	7.32	9.47	11.63	12.54	15.36	16.98	18.66	21.11

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting forces estimates near zero to appear as zero.

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.30	0.46	0.57	0.76	0.95	1.08	1.15	1.35	1.56	1.75	1.98	2.28	2.66	2.98	3.94	4.79	5.82	6.68
2	0.39	0.59	0.74	0.99	1.23	1.38	1.47	1.70	1.96	2.19	2.50	2.86	3.35	3.75	4.97	6.02	7.33	8.41
5	0.52	0.78	0.97	1.31	1.62	1.80	1.89	2.15	2.44	2.76	3.16	3.67	4.32	4.81	6.36	7.59	9.17	10.52
10	0.61	0.93	1.15	1.55	1.91	2.13	2.23	2.50	2.84	3.22	3.71	4.35	5.14	5.71	7.49	8.87	10.60	12.14
25	0.73	1.12	1.38	1.86	2.31	2.56	2.69	3.00	3.38	3.87	4.48	5.34	6.37	7.02	9.11	10.64	12.51	14.33
50	0.83	1.26	1.57	2.11	2.61	2.90	3.06	3.39	3.80	4.38	5.11	6.17	7.42	8.12	10.44	12.05	13.99	16.01
100	0.93	1.42	1.75	2.36	2.92	3.26	3.46	3.82	4.26	4.94	5.78	7.09	8.60	9.37	11.89	13.57	15.54	17.74
200	1.03	1.57	1.95	2.62	3.24	3.63	3.88	4.27	4.75	5.53	6.50	8.11	9.90	10.75	13.45	15.17	17.13	19.50
500	1.17	1.78	2.21	2.97	3.68	4.14	4.48	4.90	5.42	6.36	7.53	9.61	11.85	12.78	15.72	17.46	19.32	21.96
1000	1.28	1.95	2.42	3.26	4.03	4.57	4.97	5.42	5.97	7.03	8.39	10.88	13.55	14.53	17.64	19.31	21.07	23.89

* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.
** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.

Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

* Lower bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.23	0.35	0.44	0.59	0.73	0.84	0.90	1.07	1.25	1.44	1.64	1.87	2.16	2.43	3.24	3.99	4.88	5.58
2	0.30	0.46	0.57	0.76	0.94	1.08	1.14	1.34	1.57	1.81	2.06	2.35	2.73	3.06	4.09	5.01	6.14	7.03
5	0.40	0.60	0.75	1.00	1.24	1.40	1.47	1.69	1.96	2.27	2.61	3.01	3.50	3.91	5.21	6.31	7.67	8.78
10	0.47	0.71	0.88	1.18	1.46	1.64	1.71	1.96	2.26	2.63	3.05	3.55	4.15	4.62	6.12	7.34	8.84	10.11
25	0.56	0.85	1.05	1.41	1.75	1.96	2.06	2.33	2.67	3.14	3.65	4.31	5.07	5.61	7.35	8.72	10.35	11.84

policies that differ from those in the Standard should be considered and used in concurrence with guidance from local officials.

Storm duration is a function of watershed T_c . This allows for all portions of the watershed to contribute runoff at the basin outlet. Storm durations for most conditions will either be 3-, 6- or 24-hours. Other storm durations can be used, but will require careful selection of appropriate depth-area reduction factors.

3.3.3 Depth – Area Reduction

The rainfall values discussed above are point rainfall values. However, these depths are not the areally averaged rainfall over the watershed in question. A reduction factor is used to convert the point rainfall to an equivalent uniform depth of rainfall over the entire watershed. The reduction factor varies depending on storm duration and watershed location. Two depth-area relations appropriate for use in Arizona are presented in the NOAA Technical Memorandum NWS HYDRO-40. The two relations represent different depth-area zones. The different zones are illustrated in Figure 1. Depth-area reduction factors for each zone are listed in Table 3.0 and presented graphically in Figures 3.2 and 3.3. The reduction factor (read from the vertical axis) is used as a multiplier for the point precipitation value of interest (e.g., if rainfall = 3.00 inches and reduction factor = 0.8, then areally-reduced rainfall $3.00 \times 0.80 = 2.40$ inches). The resulting rainfall value (in inches) and the total watershed area being modeled (in square miles) are entered on fields 1 and 2, respectively, of the JD record (see example input file in Figure 3.12).

Table 3.0
Depth-Area Reduction Factors

Area (sq.miles)	3-hour*		6-hour		24-hour	
	Western	Eastern	Western	Eastern	Western	Eastern
0	1.000	1.000	1.000	1.000	1.000	1.000
5	0.875	0.860	0.90	0.860	0.970	0.930
10	0.800	0.800	0.85	0.800	0.950	0.890
20	0.730	0.740	0.79	0.740	0.923	0.850
40	0.670	0.680	0.72	0.680	0.890	0.795
60	0.630	0.638	0.687	0.645	0.867	0.760
80	0.603	0.610	0.665	0.620	0.850	0.734
100	0.585	0.590	0.65	0.600	0.840	0.715
150	0.552	0.560	0.62	0.574	0.826	0.690
200	0.530	0.540	0.60	0.555	0.818	0.670
300	0.505	0.515	0.575	0.530	0.810	0.650
400	0.490	0.495	0.560	0.515	0.800	0.640
500	0.480	0.480	0.550	0.510	0.790	0.630

*used to determine the reduction factor

Note: This page is excerpted from Arizona State Standard for Hydrology Modeling Guidelines.

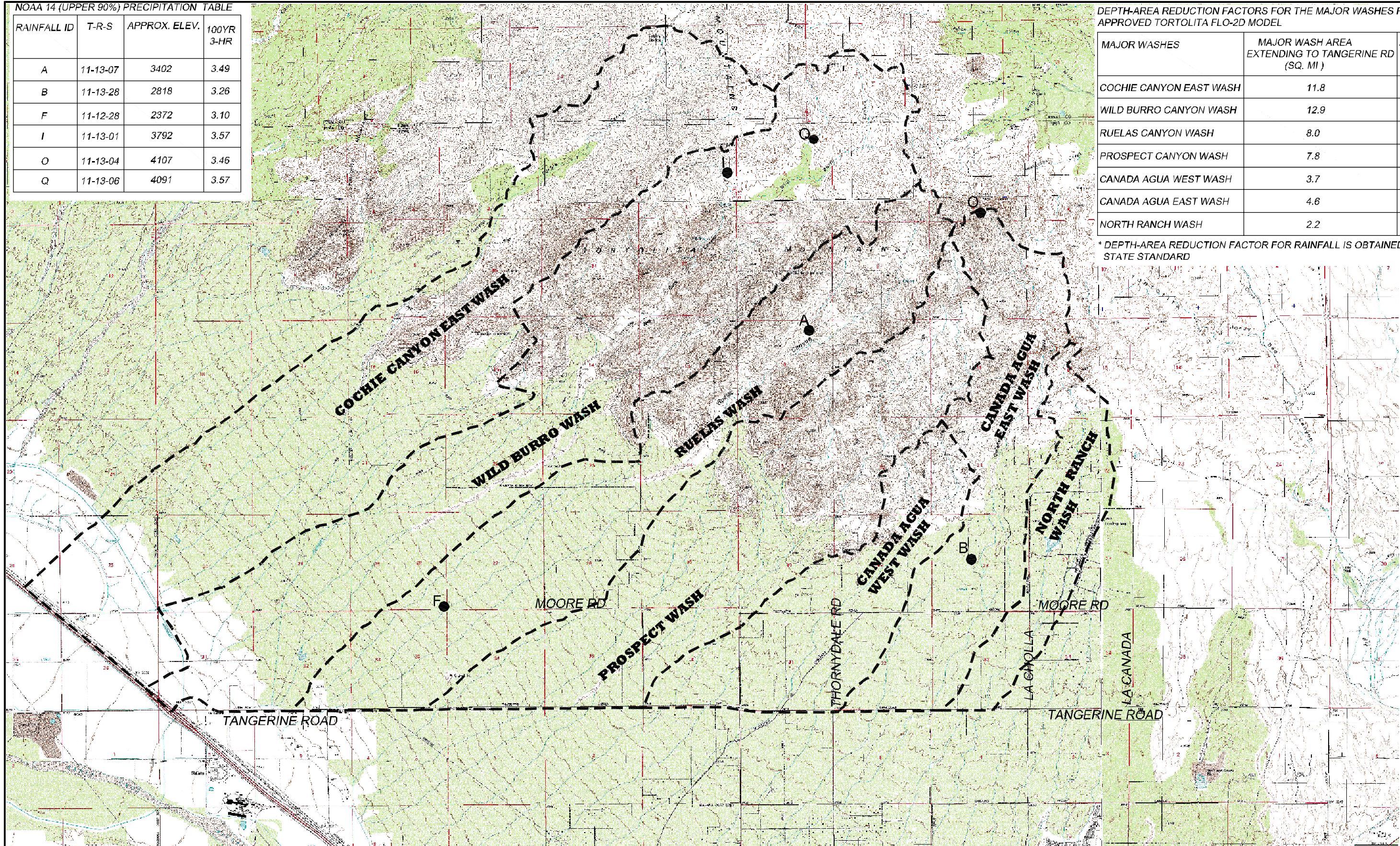
NOAA 14 (UPPER 90%) PRECIPITATION TABLE

RAINFALL ID	T-R-S	APPROX. ELEV.	100YR 3-HR
A	11-13-07	3402	3.49
B	11-13-28	2818	3.26
F	11-12-28	2372	3.10
I	11-13-01	3792	3.57 </td
O	11-13-04	4107	3.46
Q	11-13-06	4091	3.57

DEPTH-AREA REDUCTION FACTORS FOR THE MAJOR WASHES FOR FEMA APPROVED TORTOLITA FLO-2D MODEL

MAJOR WASHES	MAJOR WASH AREA EXTENDING TO TANGERINE RD (SQ. MI)	AERIAL REDUCTION FACTOR FOR 3-HR RAINFALL*
COCHIE CANYON EAST WASH	11.8	0.789
WILD BURRO CANYON WASH	12.9	0.783
RUELAS CANYON WASH	8.0	0.824
PROSPECT CANYON WASH	7.8	0.826
CANADA AGUA WEST WASH	3.7	0.896
CANADA AGUA EAST WASH	4.6	0.871
NORTH RANCH WASH	2.2	0.938

* DEPTH-AREA REDUCTION FACTOR FOR RAINFALL IS OBTAINED FROM ARIZONA STATE STANDARD



LEGEND

----- MAJOR WATERSHED BOUNDARY

E ● POINT RAINFALL ID AND LOCATION

RAINFALL DATA AND AERIAL REDUCTION FACTOR FOR MAJOR WATERSHEDS

CMG JOB No. 10-027
DATE: FEBRUARY 10, 2011



SCALE: 1"=5000'

Watershed Characters Summary Table

Watershed ID	WaterShed Area	Overall Flow Length (L)	Overall Δ Height (Δ H)	Overall Land Slope (S)
	(sq mile)	(ft)	(ft)	(ft/ft)
N1	0.615	9797	670	0.068
N2A	0.602	9339	146	0.016
N2B	0.258	9459	130	0.014
N3	0.412	7854	112	0.014
A1	0.540	7666	975	0.127
A2	0.814	12259	887	0.072
A3	0.732	9145	580	0.063
A4	0.919	9824	618	0.063
A5	0.625	7864	136	0.017
A6	0.286	7280	122	0.017
A7	0.572	9409	170	0.018
A8A	0.529	6114	102	0.017
A8B	0.434	7611	132	0.017

Rainfall Summary Table

Watershed ID	3-hr NOAA 14 (upper 90%) Rainfall Depth (inch)	Aerial Reduction Factor for Rainfall	Adjusted 3-hr Rainfall Depth (inch)
N1	3.26	0.947	3.09
N2A	3.26	0.947	3.09
N2B	3.26	0.947	3.09
N3	3.26	0.947	3.09
A1	3.46	0.899	3.11
A2	3.46	0.899	3.11
A3	3.26	0.899	2.93
A4	3.46	0.949	3.28
A5	3.26	0.949	3.09
A6	3.26	0.949	3.09
A7	3.26	0.899	2.93
A8A	3.26	0.899	2.93
A8B	3.26	0.899	2.93

Soil Characteristics, Vegetation Cover, and Impevious Cover Summary Table							
Watershed ID	% Impervious	Hydrological Soil Group (%)			Hydrological Vegetation Type	Vegetation Cover Density (%)	Curve Number*
		B	C	D			
N1	5	0	0	100	Desert Brush	20	91.0
N2A	5	27.5	3.5	69	Desert Brush	20	88.7
N2B	5	34.5	6	59.5	Desert Brush	20	88.1
N3	5	99	1	0	Desert Brush	20	83.1
A1	5	0	0	100	Desert Brush	20	91.0
A2	5	0	1	99	Desert Brush	20	91.0
A3	5	0.5	0	99.5	Desert Brush	20	91.0
A4	5	0	0.5	99.5	Desert Brush	30	91.0
A5	5	23	34.5	42.5	Desert Brush	30	88.1
A6	5	45	42	13	Desert Brush	30	86.1
A7	5	58.5	0	41.5	Desert Brush	30	86.3
A8A	5	41	26	33	Desert Brush	30	86.9
A8B	5	59	41	0	Desert Brush	30	85.1

* Curve Number does not include impervious cover

Watershed Characters to be Used for Computing Time of Concentration (TR-55)

Watershed ID	Flow Length (L1)	ΔHeight (H1)	Land Slope (S1)	Flow Length (L2)	ΔHeight (H2)	Land Slope (S2)	Flow Length (L3)	ΔHeight (H3)	Land Slope (S3)
	(ft)	(ft)	(ft/ft)	(ft)	(ft)	(ft/ft)	(ft)	(ft)	(ft/ft)
N1	100	17	0.170	1734	385	0.222	7963	268	0.034
N2A	100	6	0.060	1846	42	0.023	7393	98	0.013
N2B	100	3	0.030	2947	39	0.013	6412	88	0.014
N3	100	1	0.010	2199	31	0.014	5555	80	0.014
A1	100	30	0.300	1954	410	0.210	5612	535	0.095
A2	100	45	0.450	1865	255	0.137	10294	587	0.057
A3	100	21	0.210	2110	388	0.184	6935	171	0.025
A4	100	50	0.500	2091	386	0.185	7633	182	0.024
A5	100	5	0.050	2638	55	0.021	5126	76	0.015
A6	100	2	0.020	1984	42	0.021	5196	78	0.015
A7	100	8	0.080	2085	66	0.032	7224	96	0.013
A8A	100	2	0.020	2092	34	0.016	3922	66	0.017
A8B	100	2	0.020	2089	40	0.019	5422	90	0.017

Lagging Time Computation Summary Table

Watershed ID	T ₁	T ₂	T ₃	T _c	T _{lag}
	(hr)				
N1	0.076	0.063	0.333	0.472	0.283
N2A	0.115	0.211	0.463	0.788	0.473
N2B	0.151	0.441	0.479	1.071	0.643
N3	0.235	0.319	0.366	0.920	0.552
A1	0.060	0.073	0.181	0.314	0.189
A2	0.051	0.087	0.362	0.500	0.300
A3	0.070	0.085	0.335	0.489	0.293
A4	0.049	0.084	0.356	0.489	0.294
A5	0.123	0.315	0.306	0.744	0.446
A6	0.178	0.235	0.367	0.780	0.468
A7	0.102	0.202	0.457	0.761	0.456
A8A	0.178	0.283	0.232	0.692	0.415
A8B	0.178	0.260	0.355	0.793	0.476

Where
 $T_c = T_1 + T_2 + T_3$
 $T_{lag} = 0.6T_c$

Routing Channel Summary Table

Watershed ID	HEC Channel Length (ft)	From (Upstream Watershed)	To (Downstream Watershed)	Δ Height (ft)	Slope (ft/ft)	RS Card Field #1
N2A	8560	N1	N2A	110	0.0129	8
N3	7166	N2A	N3	88	0.0123	7
A2	7620	A1	A2	451	0.0592	4
A3	5634	A2	A3	105	0.0186	4
A5	5778	A4	A5	89	0.0154	5
A6	6473	A5	A6	96	0.0148	7
A7	4077	A3	A7	56	0.0137	4
A8A	4550	A7	A8A	66	0.0145	4
A8B	6344	A8A	A8B	94	0.0148	6

* RS Card Field #1 was computed using 4 minutes computation interval and estimated channel velocities

CP-13

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*   JUN 1998
*   VERSION 4.1
*
* RUN DATE 12MAY11 TIME 15:31:54
*
*****

```

```

*****
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
*****

```

```

X X XXXXXXX XXXX X
X X X X X XX
X X X X X X
XXXXXXXX XXXX X XXXX X
X X X X X X
X X X X X X
X X XXXXXXX XXXX XXX

```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID PROJECT # (10-027)
2 ID FOR TANGERINE RD DESIGNS
3 ID 100-YEAR RUNOFF ANALYSIS
4 ID CMG DRAINAGE ENGINEERING---JIANKANG WANG
5 ID REGIONAL WATERSHED HEC-1 MODEL
6 ID NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
7 ID SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
8 ID CONCENTRATION POINT 13 (CP-13)
9 ID REVISED 10/26/2010
*DIAGRAM
10 IT 4 500
11 IO 5 0
*
12 KK N1
13 KM HEADWATERS OF NORTH RANCH WATERSHEDS (MAIN CHANNEL)
14 KM BASIN N1
15 BA 0.615
16 IN 5
17 KM RAINFALL DEPTH IS 3.26
18 KM THIS BASINS USED RAINFALL REDUCTION FACTOR OF .947
19 PB 3.08
20 PC .000 .008 .015 .024 .033 .042 .052 .063 .074 .087
21 PC .102 .116 .133 .163 .223 .305 .452 .647 .771 .801
22 PC .821 .844 .863 .879 .892 .904 .916 .926 .936 .946
23 PC .955 .963 .971 .979 .986 .993 1.000
24 LS 0 91.0 10
25 UD 0.283
*
26 KK ITO2A
27 KM MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
28 KM FROM NODE N1 TO N2A
29 RS 8 FLOW -1
30 RC 0.080 0.060 0.080 8560 0.0130
31 RX 0 12 21 24 42 45 54 66
32 RY 6 2 0.5 0 0 0.5 2 6
*
33 KK N2B
34 KM LOCAL RUNOFF AT N2B
35 KM BASIN N2B
36 BA 0.258
37 LS 0 88.1 5
38 UD 0.643
*
39 KK N2A
40 KM LOCAL RUNOFF AT N2A
41 KM BASIN N2A
42 BA 0.602
43 LS 0 88.7 5
44 UD 0.473
*

```

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
45 KK CO_N2A
46 KM COMBINE HYDROGRAPHS
47 KM AT NODE N2A
48 HC 3

```

```

*
49      KK 2ATO3
50      KM MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
51      KM FROM NODE N2A TO N3
52      RS 7 FLOW -1
53      RC 0.070 0.040 0.070 7166 0.0123
54      RX 0 18 27 30 48 51 60 78
55      RY 7 2 0.5 0 0 0.5 2 7
*

```

```

56      KK N3
57      KM LOCAL RUNOFF AT N3
58      KM BASIN N3
59      BA 0.412
60      LS 0 83.1 5
61      UD 0.552
*

```

```

62      KK CO_N3
63      KM COMBINE HYDROGRAPHS
64      KM AT NODE N3
65      HC 2
*
*
*
*
*
*

```

```

66      ZZ

```

```

1
SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

```

```

12  _N1
    V
    V
26  1TO2A
    .
    .
33  .      _N2B
    .      .
    .      .
39  .      .      _N2A
    .      .      .
    .      .      .
45  CO_N2A .....
    V
49  2ATO3
    .
    .
56  .      _N3
    .      .
    .      .
62  CO_N3 .....

```

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 12MAY11 TIME 15:31:54 *
*
*****

```

```

*****
*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*
*****

```

```

PROJECT # (10-027)
FOR TANGERINE RD DESIGNS
100-YEAR RUNOFF ANALYSIS
CMG DRAINAGE ENGINEERING---JIANKANG WANG
REGIONAL WATERSHED HEC-1 MODEL
NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
CONCENTRATION POINT 13 (CP-13)
REVISED 10/26/2010

```

```

11 IO OUTPUT CONTROL VARIABLES
      IPRNT 5 PRINT CONTROL
      IPLOT 0 PLOT CONTROL
      QSCAL 0. HYDROGRAPH PLOT SCALE

```

```

IT HYDROGRAPH TIME DATA
      NMIN 4 MINUTES IN COMPUTATION INTERVAL
      IDATE 1 0 STARTING DATE
      ITIME 0000 STARTING TIME
      NQ 500 NUMBER OF HYDROGRAPH ORDINATES
      NDDATE 2 0 ENDING DATE
      NDTIME 0916 ENDING TIME
      ICENT 19 CENTURY MARK

```

```

COMPUTATION INTERVAL .07 HOURS
TOTAL TIME BASE 33.27 HOURS

```

ENGLISH UNITS
 DRAINAGE AREA SQUARE MILES
 PRECIPITATION DEPTH INCHES
 LENGTH, ELEVATION FEET
 FLOW CUBIC FEET PER SECOND
 STORAGE VOLUME ACRE-FEET
 SURFACE AREA ACRES
 TEMPERATURE DEGREES FAHRENHEIT

RUNOFF SUMMARY
 FLOW IN CUBIC FEET PER SECOND
 TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	_N1	1227.	1.67	148.	37.	27.	.62		
ROUTED TO	1TO2A	1083.	2.00	148.	37.	27.	.62	4.47	2.00
HYDROGRAPH AT	_N2B	324.	2.00	69.	17.	12.	.26		
HYDROGRAPH AT	_N2A	942.	1.87	163.	41.	29.	.60		
3 COMBINED AT	CO_N2A	2283.	1.93	380.	95.	69.	1.48		
ROUTED TO	2ATO3	2221.	2.13	379.	95.	69.	1.48	5.50	2.13
HYDROGRAPH AT	_N3	526.	1.93	102.	25.	18.	.41		
2 COMBINED AT	CO_N3	2683.	2.13	481.	120.	87.	1.89		

*** NORMAL END OF HEC-1 ***

CP-13

CP-19

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 12MAY11 TIME 15:31:00
*

*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*

X X XXXXXXX XXXXX X
X X X X X XX
X X X X X X
XXXXXXX XXXX X XXXXX X
X X X X X X
X X X X X X
X X XXXXXXX XXXXX XXX

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID PROJECT # (10-027)
2 ID FOR TANGERINE RD DESIGNS
3 ID 100-YEAR RUNOFF ANALYSIS
4 ID CMG DRAINAGE ENGINEERING---JIANKANG WANG
5 ID REGIONAL WATERSHED HEC-1 MODEL
6 ID NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
7 ID SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
8 ID CONCENTRATION POINT 19 (CP-19)
9 ID REVISED 10/26/2010
*DIAGRAM
10 IT 4 500
11 IO 5 0
*
12 KK A1
13 KM HEADWATERS OF CANADA AGUA EAST CANYON WASH (MAIN CHANNEL)
14 KM BASIN A1
15 BA 0.540
16 IN 5
17 KM RAINFALL DEPTH IS 3.46
18 KM THIS BASINS USED RAINFALL REDUCTION FACTOR OF .899
19 PB 3.11
20 PC .000 .008 .015 .024 .033 .042 .052 .063 .074 .087
21 PC .102 .116 .133 .163 .223 .305 .452 .647 .771 .801
22 PC .821 .844 .863 .879 .892 .904 .916 .926 .936 .946
23 PC .955 .963 .971 .979 .986 .993 1.000
24 LS 0 91.0 5
25 UD 0.189
*
26 KK 1TO2
27 KM MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
28 KM FROM NODE A1 TO A2
29 RS 4 FLOW -1
30 RC 0.100 0.080 0.100 7620 0.0592
31 RX 0 12 21 24 44 47 56 68
32 RY 8 2 0.5 0 0 0.5 2 8
*
33 KK A2
34 KM LOCAL RUNOFF AT A2
35 KM BASIN A2
36 BA 0.814
37 LS 0 91.0 5
38 UD 0.300
*
39 KK CO_A2
40 KM COMBINE HYDROGRAPHS
41 KM AT NODE A2
42 HC 2
*

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
43 KK 2TO3
44 KM MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
45 KM FROM NODE A2 TO A3
46 RS 4 FLOW -1
47 RC 0.100 0.080 0.100 5634 0.0186
48 RX 0 18 27 30 50 53 62 80

```

49      RY      8      2      0.5      0      0      0.5      2      8
*
50      KK      A3
51      KM      LOCAL RUNOFF AT A3
52      KM      BASIN A3
53      KM      RAINFALL DEPTH IS 3.26
54      KM      THIS BASINS USED RAINFALL REDUCTION FACTOR OF .899
55      PB      2.93
56      BA      0.732
57      LS      0      91.0      5
58      UD      0.293
*
59      KK      CO A3
60      KM      COMBINE HYDROGRAPHS
61      KM      AT NODE A3
62      HC      2
*
63      KK      3T07
64      KM      MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
65      KM      FROM NODE A3 TO A7
66      RS      4      FLOW      -1
67      RC      0.070      0.040      0.070      4077      0.0137
68      RX      0      10      17.5      20      45      47.5      55      65
69      RY      8      2      0.5      0      0      0.5      2      8
*
70      KK      A7
71      KM      LOCAL RUNOFF AT A7
72      KM      BASIN A7
73      BA      0.572
74      LS      0      86.3      5
75      UD      0.456
*
76      KK      CO A7
77      KM      COMBINE HYDROGRAPHS
78      KM      AT NODE A7
79      HC      2
*

```

HEC-1 INPUT

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

```

80      KK      7T08A
81      KM      MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
82      KM      FROM NODE A7 TO A8A
83      RS      4      FLOW      -1
84      RC      0.070      0.040      0.070      4550      0.0145
85      RX      0      15      27.5      30      55      57.5      70      85
86      RY      8      3      0.5      0      0      0.5      3      8
*
87      KK      8A
88      KM      LOCAL RUNOFF AT A8A
89      KM      BASIN A8A
90      BA      0.529
91      LS      0      86.9      5
92      UD      0.415
*
93      KK      CO 8A
94      KM      COMBINE HYDROGRAPHS
95      KM      AT NODE 8A
96      HC      2
*
97      KK      8AT08B
98      KM      MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
99      KM      FROM NODE A8A TO A8B
100     RS      6      FLOW      -1
101     RC      0.070      0.040      0.070      6344      0.0148
102     RX      0      15      27.5      30      55      57.5      70      85
103     RY      8      3      0.5      0      0      0.5      3      8
*
104     KK      8B
105     KM      LOCAL RUNOFF AT A8B
106     KM      BASIN A8B
107     BA      0.434
108     LS      0      85.1      5
109     UD      0.476
*
110     KK      CO 8B
111     KM      COMBINE HYDROGRAPHS
112     KM      AT NODE A8B
113     HC      2
*
*
*
114     ZZ
*

```

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW


```

NO.      (.) CONNECTOR      (<---) RETURN OF DIVERTED OR PUMPED FLOW
12      _A1
        V
26      1TO2
        .
33      .
        .
        .
39      CO_A2 .....
        V
43      2TO3
        .
50      .
        .
        .
59      CO_A3 .....
        V
63      3TO7
        .
70      .
        .
        .
76      CO_A7 .....
        V
80      7TO8A
        .
87      .
        .
        .
93      CO_8A .....
        V
97      8ATO8B
        .
104     .
        .
        .
110     CO_8B .....

```

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*   JUN 1998 *
*   VERSION 4.1 *
* RUN DATE 12MAY11 TIME 15:31:00 *
* *****

```

```

*****
*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
* *****

```

```

PROJECT # (10-027)
FOR TANGERINE RD DESIGNS
100-YEAR RUNOFF ANALYSIS
CMG DRAINAGE ENGINEERING---JIANKANG WANG
REGIONAL WATERSHED HEC-1 MODEL
NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
CONCENTRATION POINT 19 (CP-19)
REVISED 10/26/2010

```

```

11 IO  OUTPUT CONTROL VARIABLES
        IPRNT      5  PRINT CONTROL
        IPLOT      0  PLOT CONTROL
        QSCAL      0. HYDROGRAPH PLOT SCALE

```

```

IT  HYDROGRAPH TIME DATA
        NMIN      4  MINUTES IN COMPUTATION INTERVAL
        IDATE     1  0  STARTING DATE
        ITIME     0000 STARTING TIME
        NQ        500 NUMBER OF HYDROGRAPH ORDINATES
        NDDATE    2  0  ENDING DATE
        NDTIME    0916 ENDING TIME
        ICENT     19  CENTURY MARK

```

```

        COMPUTATION INTERVAL .07 HOURS
        TOTAL TIME BASE 33.27 HOURS

```

```

ENGLISH UNITS
DRAINAGE AREA      SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW               CUBIC FEET PER SECOND
STORAGE VOLUME    ACRE-FEET
SURFACE AREA      ACRES
TEMPERATURE        DEGREES FAHRENHEIT

```

RUNOFF SUMMARY

FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	_A1	1301.	1.60	129.	32.	23.	.54		
ROUTED TO	1T02	1133.	1.73	129.	32.	23.	.54	3.45	1.73
HYDROGRAPH AT	_A2	1567.	1.67	194.	49.	35.	.81		
2 COMBINED AT	CO_A2	2664.	1.73	323.	81.	58.	1.35		
ROUTED TO	2T03	2419.	1.93	323.	81.	58.	1.35	6.86	1.93
HYDROGRAPH AT	_A3	1320.	1.67	162.	40.	29.	.73		
2 COMBINED AT	CO_A3	3345.	1.87	485.	121.	87.	2.09		
ROUTED TO	3T07	3310.	1.93	485.	121.	87.	2.09	6.24	1.93
HYDROGRAPH AT	_A7	638.	1.87	104.	26.	19.	.57		
2 COMBINED AT	CO_A7	3932.	1.93	588.	147.	106.	2.66		
ROUTED TO	7T08A	3863.	2.00	588.	147.	106.	2.66	6.48	2.00
HYDROGRAPH AT	_8A	645.	1.80	99.	25.	18.	.53		
2 COMBINED AT	CO_8A	4402.	2.00	686.	172.	124.	3.19		
ROUTED TO	8AT08B	4330.	2.13	686.	172.	124.	3.19	6.84	2.13
HYDROGRAPH AT	_8B	444.	1.87	75.	19.	14.	.43		
2 COMBINED AT	CO_8B	4678.	2.13	761.	191.	138.	3.62		

*** NORMAL END OF HEC-1 ***

CP-19

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 12MAY11 TIME 15:31:28
*
*****

```

CP-32

```

*****
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
*****

```

```

X X XXXXXXX XXXX X
X X X X X XX
X X X X X X
XXXXXX XXXX X XXXX X
X X X X X X
X X X X X X
X X XXXXXXX XXXX XXX

```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID PROJECT # (10-027)
2 ID FOR TANGERINE RD DESIGNS
3 ID 100-YEAR RUNOFF ANALYSIS
4 ID CMG DRAINAGE ENGINEERING---JIANKANG WANG
5 ID REGIONAL WATERSHED HEC-1 MODEL
6 ID NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
7 ID SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
8 ID CONCENTRATION POINT 32 (CP-32)
9 ID REVISED 10/26/2010
*DIAGRAM
10 IT 4 500
11 IO 5 0
*
12 KK 4
13 KM LOCAL RUNOFF AT A4
14 KM BASIN A4
15 BA 0.919
16 IN 5
17 KM RAINFALL DEPTH IS 3.46
18 KM THIS BASINS USED RAINFALL REDUCTION FACTOR OF .949
19 PB 3.28
20 PC .000 .008 .015 .024 .033 .042 .052 .063 .074 .087
21 PC .102 .116 .133 .163 .223 .305 .452 .647 .771 .801
22 PC .821 .844 .863 .879 .892 .904 .916 .926 .936 .946
23 PC .955 .963 .971 .979 .986 .993 1.000
24 LS 0 91.0 5
25 UD 0.294
*
26 KK 4T05
27 KM MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
28 KM FROM NODE A4 TO A5
29 RS 4 FLOW -1
30 RC 0.070 0.040 0.070 5778 0.0154
31 RX 0 10 17.5 20 40 42.5 50 60
32 RY 4 2 0.5 0 0 0.5 2 4
*
33 KK 5
34 KM LOCAL RUNOFF AT A5
35 KM BASIN A5
36 BA 0.625
37 KM RAINFALL DEPTH IS 3.26
38 KM THIS BASINS USED RAINFALL REDUCTION FACTOR OF .949
39 PB 3.09
40 LS 0 88.1 5
41 UD 0.446
*

```

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
42 KK CO_5
43 KM COMBINE HYDROGRAPHS
44 KM AT NODE A5
45 HC 2
*
*
46 KK 5T06
47 KM MODIFIED PULS NORMAL DEPTH STORAGE ROUTING

```

```

48      KM FROM NODE A5 TO A6
49      RS 4 FLOW -1
50      RC 0.070 0.040 0.070 6473 0.0148
51      RX 0 10 17.5 20 40 42.5 50 60
52      RY 4 2 0.5 0 0 0.5 2 4
      *

53      KK 6
54      KM LOCAL RUNOFF AT A6
55      KM BASIN A6
56      BA 0.286
57      LS 0 86.1 5
58      UD 0.468
      *

59      KK CO_6
60      KM COMBINE HYDROGRAPHS
61      KM AT NODE A6
62      HC 2
      *
      *
      *
      *
63      ZZ

```

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

12  _4
    V
26  4T05
    .
33  . _5
    .
42  CO_5 .....
    V
46  5T06
    .
53  . _6
    .
59  CO_6 .....

```

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 12MAY11 TIME 15:31:28 *
*****

```

```

*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*****

```

```

PROJECT # (10-027)
FOR TANGERINE RD DESIGNS
100-YEAR RUNOFF ANALYSIS
CMG DRAINAGE ENGINEERING---JIANKANG WANG
REGIONAL WATERSHED HEC-1 MODEL
NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
CONCENTRATION POINT 32 (CP-32)
REVISED 10/26/2010

```

```

11 IO OUTPUT CONTROL VARIABLES
      IPRNT 5 PRINT CONTROL
      IPLOT 0 PLOT CONTROL
      QSCAL 0. HYDROGRAPH PLOT SCALE

```

```

IT HYDROGRAPH TIME DATA
      NMIN 4 MINUTES IN COMPUTATION INTERVAL
      IDATE 1 0 STARTING DATE
      ITIME 0000 STARTING TIME
      NQ 500 NUMBER OF HYDROGRAPH ORDINATES
      NDDATE 2 0 ENDING DATE
      NDTIME 0916 ENDING TIME
      ICENT 19 CENTURY MARK

```

```

COMPUTATION INTERVAL .07 HOURS
TOTAL TIME BASE 33.27 HOURS

```

```

ENGLISH UNITS
DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-FEET
SURFACE AREA ACRES

```

TEMPERATURE

DEGREES FAHRENHEIT

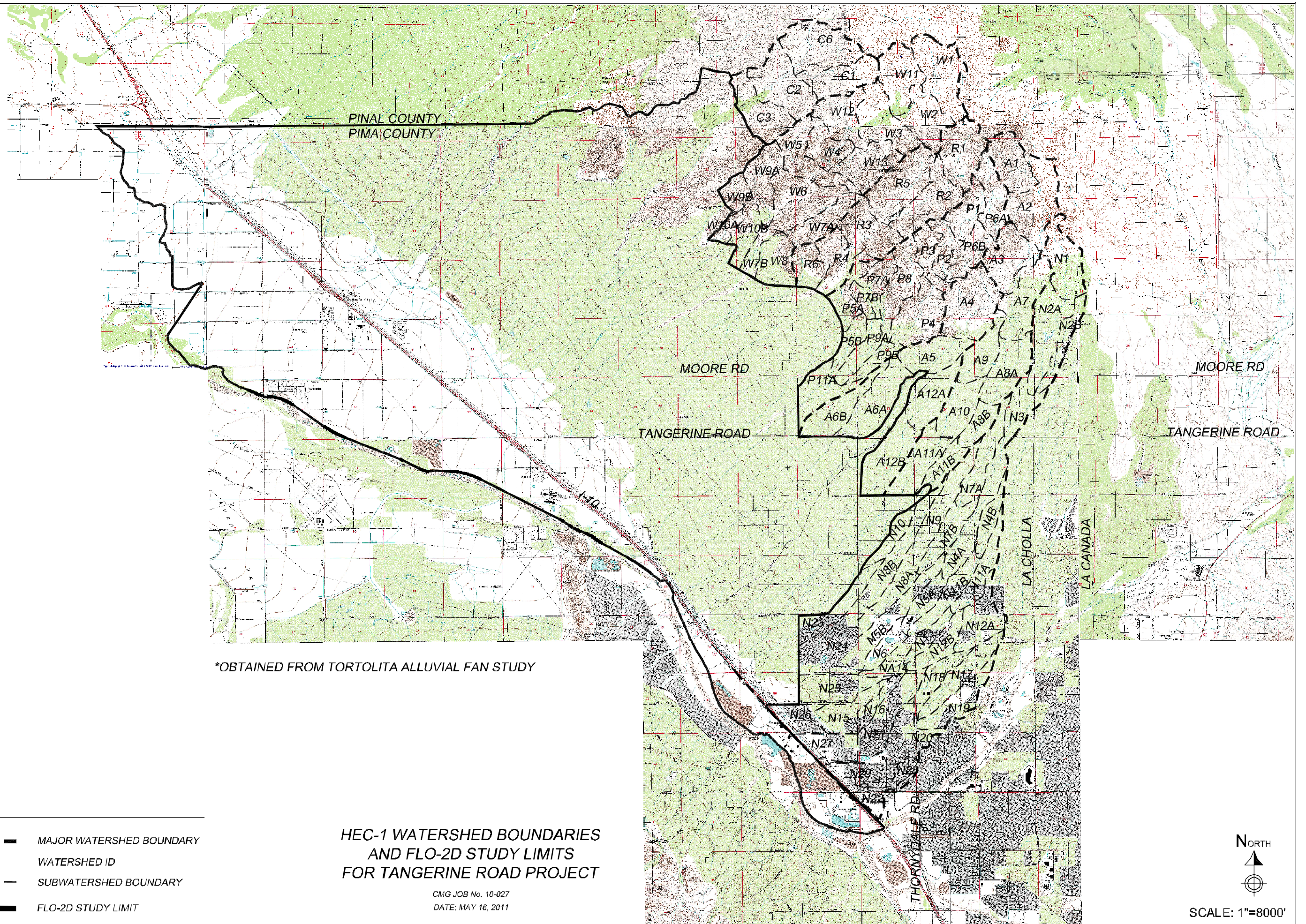
RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	_4	1918.	1.67	235.	59.	42.	.92		
ROUTED TO	4T05	1691.	1.93	235.	59.	42.	.92	3.76 1.93	
HYDROGRAPH AT	_5	827.	1.87	132.	33.	24.	.63		
2 COMBINED AT	CO_5	2512.	1.87	367.	92.	66.	1.54		
ROUTED TO	5T06	2317.	2.13	367.	92.	66.	1.54	4.45 2.13	
HYDROGRAPH AT	_6	337.	1.87	56.	14.	10.	.29		
2 COMBINED AT	CO_6	2574.	2.07	423.	106.	76.	1.83		

*** NORMAL END OF HEC-1 ***





CP-32

Z:\PROJECTS\2010\10-027 P somas-Tangerine Rd I-10 to La Canada\Draw\cmg base_watershed.dwg, HEC 1 & FLO-2D, 5/16/2011 10:54:34 AM



*OBTAINED FROM TORTOLITA ALLUVIAL FAN STUDY

LEGEND

	MAJOR WATERSHED BOUNDARY
	WATERSHED ID
	SUBWATERSHED BOUNDARY
	FLO-2D STUDY LIMIT

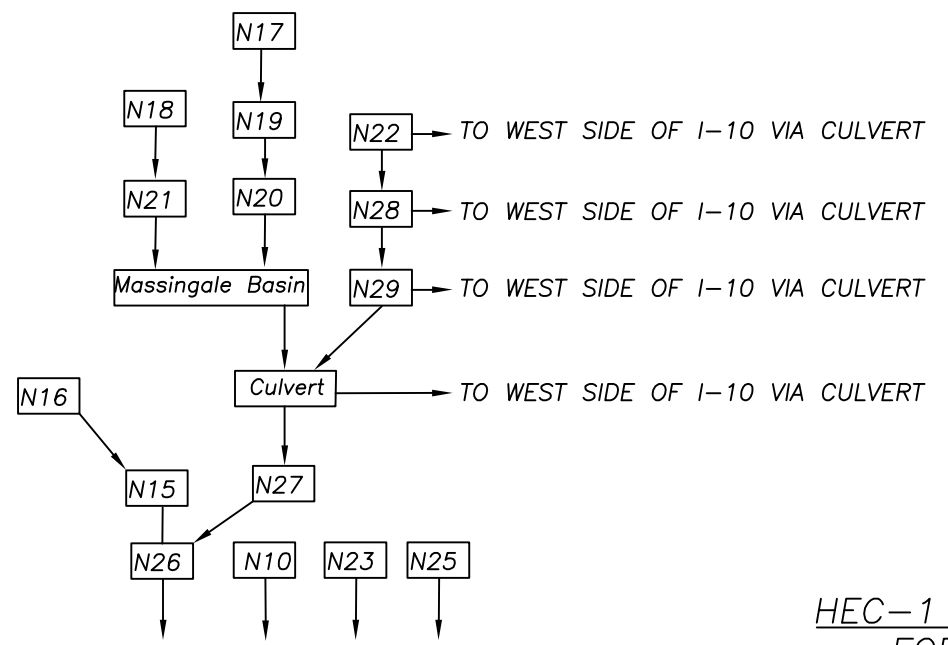
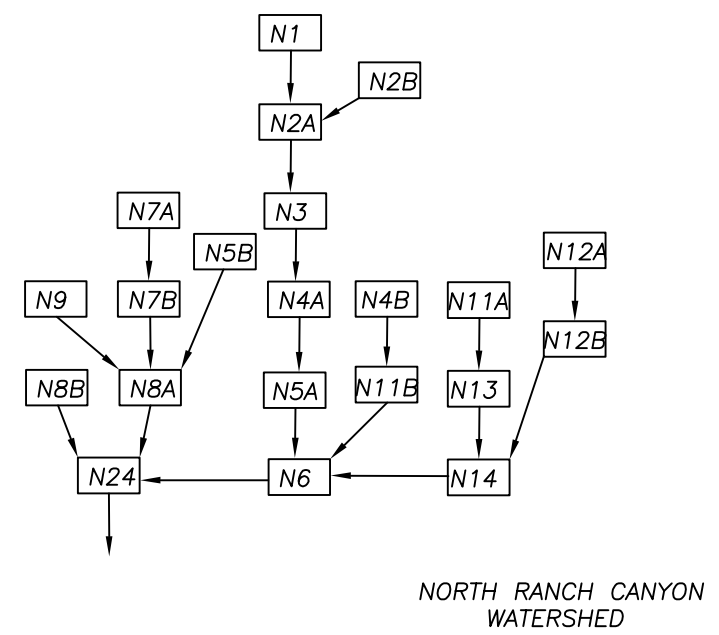
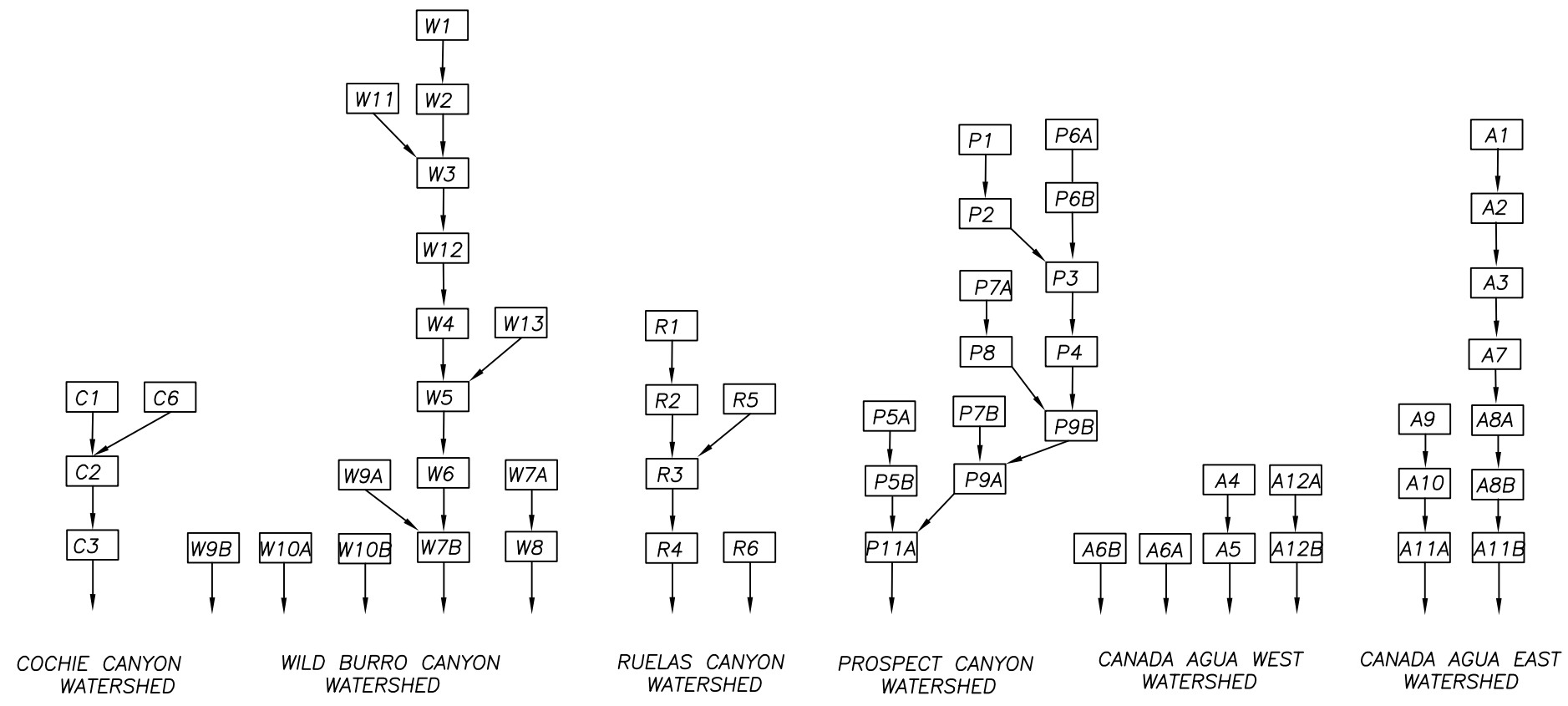
**HEC-1 WATERSHED BOUNDARIES
AND FLO-2D STUDY LIMITS
FOR TANGERINE ROAD PROJECT**

CMG JOB No. 10-027
DATE: MAY 16, 2011



SCALE: 1"=8000'

Z:\PROJECTS\2010\10-027 Psomas-Tangerine Rd I-10 to La Canada\From Others\27079\HEC1-FLOW-CHART.dwg, Layout2, 5/16/2011 10:53:14 AM



HEC-1 MODEL SCHEMATIC FLOW CHART
FOR TANGERINE ROAD PROJECT
(TO PROVIDE FLO-2D INFLOW HYDROGRAPHS)

LEGEND
SUBBASIN [G]
FLOW DIRECTION →

*OBTAINED FROM TORTOLITA ALLUVIAL FAN STUDY

CMG JOB No. 10-027
DATE: MAY 16, 2011

APPENDIX D

PROPOSED CONDITIONS HYDROLOGIC COMPUTATIONS

Includes

- Only the hydrology computations that are different from the existing ones
- Portion of the proposed hydrologic data are obtained from the 20-ft Grid FLO-2D model prepared for Tangerine Rd West End Regional Drainage Analyses.

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2011
 Concentration Point: 33.1 (PRP) Job #: 10-027
 Watershed Area: 3.5 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	18.0	670	0.0269	.035

Length of Watercourse (Lc): 670 feet Mean Slope: 0.0269
 Length to Cen. of Gravity (Lca): 310 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	0	83.	87.2	0.557
C	53	88.	90.99	0.667
D	47	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.714
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 7.46 in/hr
PEAK DISCHARGE: 26 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	2.6
5-year	0.23	6.0
10-year	0.35	9.1
25-year	0.55	14
50-year	0.75	20

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 33.2 (PRP) Job #: 10-027
 Watershed Area: 5.0 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	27.0	1,210	0.0223	.035

Length of Watercourse (Lc): 1,210 feet Mean Slope: 0.0223
 Length to Cen. of Gravity (Lca): 488 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	0	83.	87.2	0.557
C	53	88.	90.99	0.667
D	47	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.714
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 7.46 in/hr
PEAK DISCHARGE: 38 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	3.8
5-year	0.23	8.7
10-year	0.35	13
25-year	0.55	21
50-year	0.75	28

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: wjg
 Project Name: Tangerine Rd Date: 10-22-2012
 Concentration Point: 36 (PRP) Job #: 10-027
 Watershed Area: 10.3 ac Watershed Type: Suburban-Foothills

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	35.0	1,964	0.0178	.035

Length of Watercourse (Lc): 1,964 feet Mean Slope: 0.0178
 Length to Cen. of Gravity (Lca): 807 feet Weighted Basin Fac.: 0.035
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	0	83.	87.2	0.557
C	53	88.	90.99	0.667
D	47	91.	93.29	0.741
Imp.	5	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.714
 Time of Concentration: 7.3 min
 Rainfall Intensity (i) @ Tc: 8.85 in/hr
 Runoff Supply Rate (q) @ Tc: 6.33 in/hr
PEAK DISCHARGE: 66 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	6.6
5-year	0.23	15
10-year	0.35	23
25-year	0.55	36
50-year	0.75	49

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: bjk
 Project Name: Tangerine Rd Date: 09/11/2012
 Concentration Point: 49.1 (PRP) Job #: 10-027
 Watershed Area: 2.3 ac Watershed Type: Low Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	18.0	634	0.0284	.030

Length of Watercourse (Lc): 634 feet Mean Slope: 0.0284
 Length to Cen. of Gravity (Lca): 340 feet Weighted Basin Fac.: 0.030
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.2	0.557
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	10	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.597
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.44 in/hr
 Runoff Supply Rate (q) @ Tc: 6.23 in/hr
PEAK DISCHARGE: 14 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.20	2.8
5-year	0.30	4.2
10-year	0.45	6.4
25-year	0.65	9.2
50-year	0.85	12

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: BJK
 Project Name: Tangerine Rd Date: 09/11/2012
 Concentration Point: 49.2 (PRP) Job #: 10-027

Watershed Area: 17.1 ac Watershed Type: Low Density Urbanized

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	64.0	3,137	0.0204	.030

Length of Watercourse (Lc): 3,137 feet Mean Slope: 0.0204
 Length to Cen. of Gravity (Lca): 1,633 feet Weighted Basin Fac.: 0.030
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.2	0.557
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	10	99.	99.	0.957

Weighted Runoff Coef. (Cw): 0.597
 Time of Concentration: 9.4 min
 Rainfall Intensity (i) @ Tc: 8.09 in/hr
 Runoff Supply Rate (q) @ Tc: 4.83 in/hr
PEAK DISCHARGE: 83 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.20	17
5-year	0.30	25
10-year	0.45	37
25-year	0.65	54
50-year	0.85	71

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: BJK
 Project Name: Tangerine Rd Date: 11/02/2012
 Concentration Point: 53 (PRP) Job #: 10-027
 Watershed Area: 49.2 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	110.0	3,535	0.0311	.060

Length of Watercourse (Lc): 3,535 feet Mean Slope: 0.0311
 Length to Cen. of Gravity (Lca): 1,890 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4238		Longitude: 111.0469	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66
Areal Values (in)	0.87	1.32	1.64	2.20	2.73	3.04	3.21	3.50	3.80	4.66

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.2	0.557
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.557
 Time of Concentration: 20.8 min
 Rainfall Intensity (i) @ Tc: 5.35 in/hr
 Runoff Supply Rate (q) @ Tc: 2.98 in/hr
PEAK DISCHARGE: 148 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	15
5-year	0.23	34
10-year	0.35	52
25-year	0.55	81
50-year	0.75	111

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Note: CP-55 includes run off from CP-55.1

Client: _____
 Project Name: Tangerine Rd
 Concentration Point: 55

Prepared by: Jiankang Wang
 Date: 11/16/2010
 Job #: 10-027

Watershed Area: 86.4 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	12.0	302	0.0397	.060
2	208.0	7,293	0.0285	.060

Length of Watercourse (Lc): 7,595 feet Mean Slope: 0.0289
 Length to Cen. of Gravity (Lca): 4,223 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4247 Longitude: 111.0981										
Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 42.0 min
 Rainfall Intensity (i) @ Tc: 3.34 in/hr
 Runoff Supply Rate (q) @ Tc: 1.81 in/hr
PEAK DISCHARGE: 157 cfs

Lesser Return Periods		
Return Period	Ratio	Qpeak
2-year	0.10	16
5-year	0.23	36
10-year	0.35	55
25-year	0.55	86
50-year	0.75	118

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: CRB
 Project Name: Tangerine Rd Date: 11/20/2012
 Concentration Point: 55.1 (PRP) Job #: 10-027
 Watershed Area: 4.5 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	32.0	1,000	0.0320	.060

Length of Watercourse (Lc): 1,000 feet Mean Slope: 0.0320
 Length to Cen. of Gravity (Lca): 500 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	5	99.	99.	0.956

Weighted Runoff Coef. (Cw): 0.562
 Time of Concentration: 7.9 min
 Rainfall Intensity (i) @ Tc: 8.32 in/hr
 Runoff Supply Rate (q) @ Tc: 4.67 in/hr
PEAK DISCHARGE: 21 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	2.1
5-year	0.23	4.9
10-year	0.35	7.4
25-year	0.55	12
50-year	0.75	16

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 58 (PRP) Job #: 10-027

Watershed Area: 10.4 ac Watershed Type: Shallow Streetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	45.0	1,498	0.0300	.060

Length of Watercourse (Lc): 1,498 feet Mean Slope: 0.0300
 Length to Cen. of Gravity (Lca): 822 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 11.4 min
 Rainfall Intensity (i) @ Tc: 7.18 in/hr
 Runoff Supply Rate (q) @ Tc: 3.89 in/hr
PEAK DISCHARGE: 41 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	4.1
5-year	0.23	9.4
10-year	0.35	14
25-year	0.55	22
50-year	0.75	31

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/16/2010
 Concentration Point: 59 (PRP) Job #: 10-027
 Watershed Area: 89.3 ac Watershed Type: Shallow Streetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	246.0	8,524	0.0289	.060

Length of Watercourse (Lc): 8,524 feet Mean Slope: 0.0289
 Length to Cen. of Gravity (Lca): 3,886 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	88.	90.83	0.653
D	0	91.	93.17	0.730
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 42.5 min
 Rainfall Intensity (i) @ Tc: 3.30 in/hr
 Runoff Supply Rate (q) @ Tc: 1.79 in/hr
PEAK DISCHARGE: 161 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	16
5-year	0.23	37
10-year	0.35	56
25-year	0.55	89
50-year	0.75	121

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Note: runoff at CP-62.1 and CP-62.2 are 90% and 10% of the runoff at CP-62 respectively.

Client: _____
 Project Name: Tangerine Rd
 Concentration Point: 62

Prepared by: Jiankang Wang
 Date: 11/16/2010
 Job #: 10-027

Watershed Area: 686.3 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	110.0	2,760	0.0399	.060
2	140.0	3,996	0.0350	.060
3	206.0	584	0.3527	.060
4	306.0	10,931	0.0280	.060

Length of Watercourse (Lc): 18,271 feet Mean Slope: 0.0324
 Length to Cen. of Gravity (Lca): 11,428 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4247 Longitude: 111.0981										
Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	83.	87.	0.541
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.541
 Time of Concentration: 1.5 hrs
 Rainfall Intensity (i) @ Tc: 1.89 in/hr
 Runoff Supply Rate (q) @ Tc: 1.02 in/hr
PEAK DISCHARGE: 708 cfs

Lesser Return Periods		
Return Period	Ratio	Opeak
2-year	0.10	71
5-year	0.23	163
10-year	0.35	248
25-year	0.55	390
50-year	0.75	531

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: CRB
 Project Name: Tangerine Rd Date: 10/19/2011
 Concentration Point: 62.3 (PRP) Job #: 10-027
 Watershed Area: 2.4 ac Watershed Type: Shallow Streetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	14.0	545	0.0257	.060

Length of Watercourse (Lc): 545 feet Mean Slope: 0.0257
 Length to Cen. of Gravity (Lca): 200 feet Weighted Basin Fac.: 0.060
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 10 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	85.	88.5	0.583
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	5	99.	99.	0.956

Weighted Runoff Coef. (Cw): 0.602
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.08 in/hr
 Runoff Supply Rate (q) @ Tc: 6.07 in/hr
PEAK DISCHARGE: 15 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	1.5
5-year	0.23	3.4
10-year	0.35	5.1
25-year	0.55	8.1
50-year	0.75	11

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/01/2012
 Concentration Point: FR1 (PRP) Job #: 10-027
 Watershed Area: 3.2 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	26.8	955	0.0281	.025

Length of Watercourse (Lc): 955 feet Mean Slope: 0.0281
 Length to Cen. of Gravity (Lca): 478 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	30	99.	99.	0.956

Weighted Runoff Coef. (Cw): 0.666
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.08 in/hr
 Runoff Supply Rate (q) @ Tc: 6.71 in/hr
PEAK DISCHARGE: 22 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	2.2
5-year	0.23	5.0
10-year	0.35	7.6
25-year	0.55	12
50-year	0.75	16

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/01/2012
 Concentration Point: FR2 (PRP) Job #: 10-027
 Watershed Area: 1.0 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	14.0	430	0.0326	.025

Length of Watercourse (Lc): 430 feet Mean Slope: 0.0326
 Length to Cen. of Gravity (Lca): 215 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	30	99.	99.	0.956

Weighted Runoff Coef. (Cw): 0.666
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.08 in/hr
 Runoff Supply Rate (q) @ Tc: 6.71 in/hr
PEAK DISCHARGE: 7.0 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	0.7
5-year	0.23	1.6
10-year	0.35	2.4
25-year	0.55	3.8
50-year	0.75	5.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/01/2012
 Concentration Point: FR3 (PRP) Job #: 10-027
 Watershed Area: 1.7 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	13.5	493	0.0274	.025

Length of Watercourse (Lc): 493 feet Mean Slope: 0.0274
 Length to Cen. of Gravity (Lca): 246 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981		
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>	
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60	
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60	

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	30	99.	99.	0.956

Weighted Runoff Coef. (Cw): 0.666
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.08 in/hr
 Runoff Supply Rate (q) @ Tc: 6.71 in/hr
PEAK DISCHARGE: 11 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	1.1
5-year	0.23	2.6
10-year	0.35	3.9
25-year	0.55	6.2
50-year	0.75	8.4

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District



Client: _____ Prepared by: Jiankang Wang
 Project Name: Tangerine Rd Date: 11/01/2012
 Concentration Point: FR4 (PRP) Job #: 10-027
 Watershed Area: 1.6 ac Watershed Type: Shallow Steetflow - Paved

Watercourse Data By Reach				
<u>Reach No.</u>	<u>Height (Hi)</u>	<u>Length (Li)</u>	<u>Slope (Si)</u>	<u>Basin Factor (Nb)</u>
1	17.0	581	0.0293	.025

Length of Watercourse (Lc): 581 feet Mean Slope: 0.0293
 Length to Cen. of Gravity (Lca): 290 feet Weighted Basin Fac.: 0.025
 Veg. Cover Type(s): Desert Brush Veg. Cover Density: 20 %

RETURN PERIOD: 100-years

Rainfall Depths:		NOAA Atlas 14 (90% UCL) @					Latitude: 32.4247		Longitude: 111.0981	
Duration:	<u>5-min</u>	<u>10-min</u>	<u>15-min</u>	<u>30-min</u>	<u>60-min</u>	<u>2-hr</u>	<u>3-hr</u>	<u>6-hr</u>	<u>12-hr</u>	<u>24-hr</u>
Point Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60
Areal Values (in)	0.84	1.28	1.59	2.13	2.64	2.93	3.09	3.37	3.63	4.60

Soils Data				
<u>Soil Type</u>	<u>Percent</u>	<u>Curve # (CN)</u>	<u>Adj. Curve # (CN*)</u>	<u>Runoff Coef. (C)</u>
B	100	83.	87.	0.541
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	30	99.	99.	0.956

Weighted Runoff Coef. (Cw): 0.666
 Time of Concentration: 5.0 min
 Rainfall Intensity (i) @ Tc: 10.08 in/hr
 Runoff Supply Rate (q) @ Tc: 6.71 in/hr
PEAK DISCHARGE: 11 cfs

Lesser Return Periods		
<u>Return Period</u>	<u>Ratio</u>	<u>Qpeak</u>
2-year	0.10	1.1
5-year	0.23	2.5
10-year	0.35	3.9
25-year	0.55	6.1
50-year	0.75	8.3

Proposed

CP-67 and CP-67.1

N ↑
N.T.S.

Station 510+00

Station 515+00

Station 520+00

Station 525+00

CP-67
 $Q_{100} = 785 \text{ cfs}$

CP-67.1
 $Q_{100} = 156 \text{ cfs}$

Tangerine Rd



Proposed CP-70

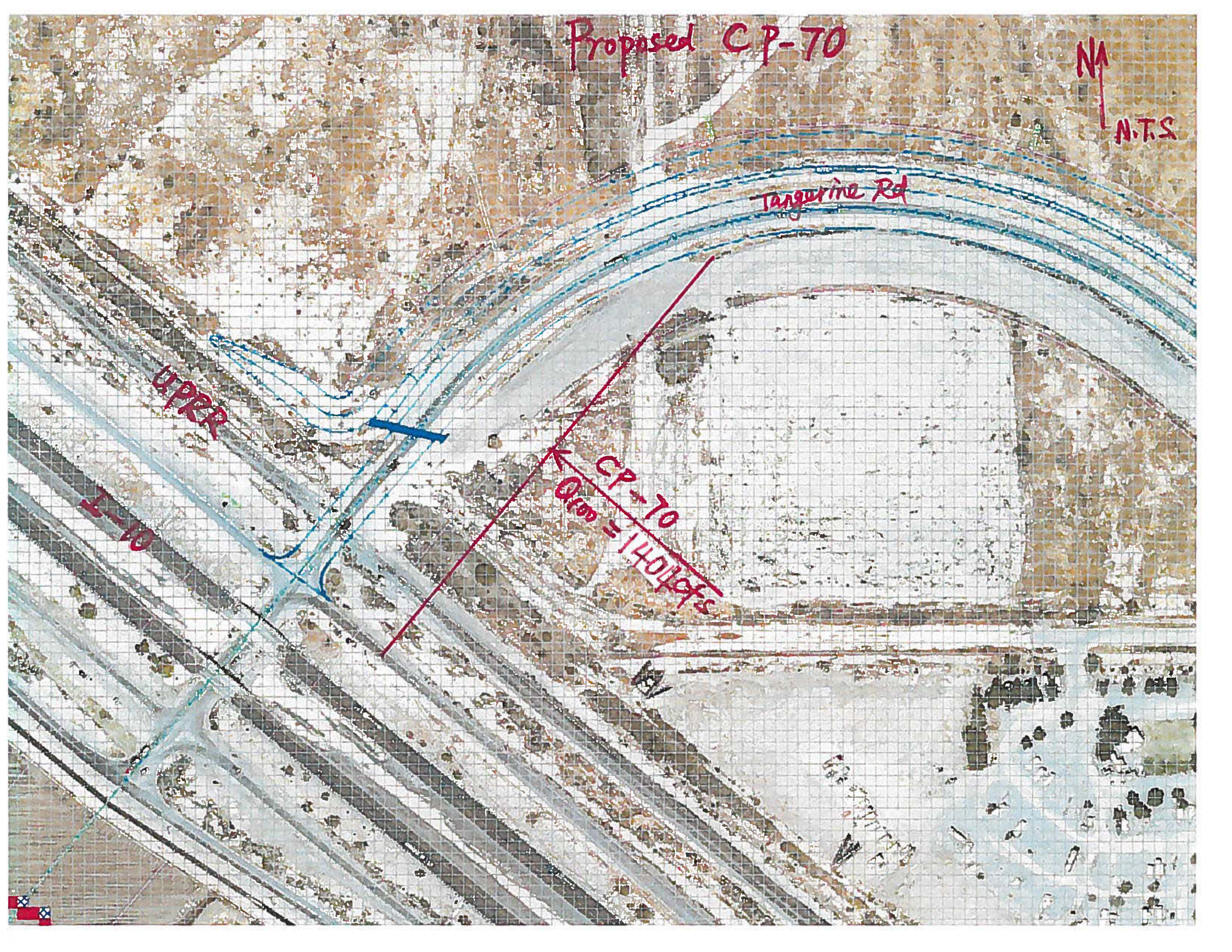
NA
N.T.S.

Tangerine Rd

UPPER

CP-70

CP-70
 $Q_{100} = 140 \text{ cfs}$



Proposed Trico east driveway Regional Watershed



TRICO

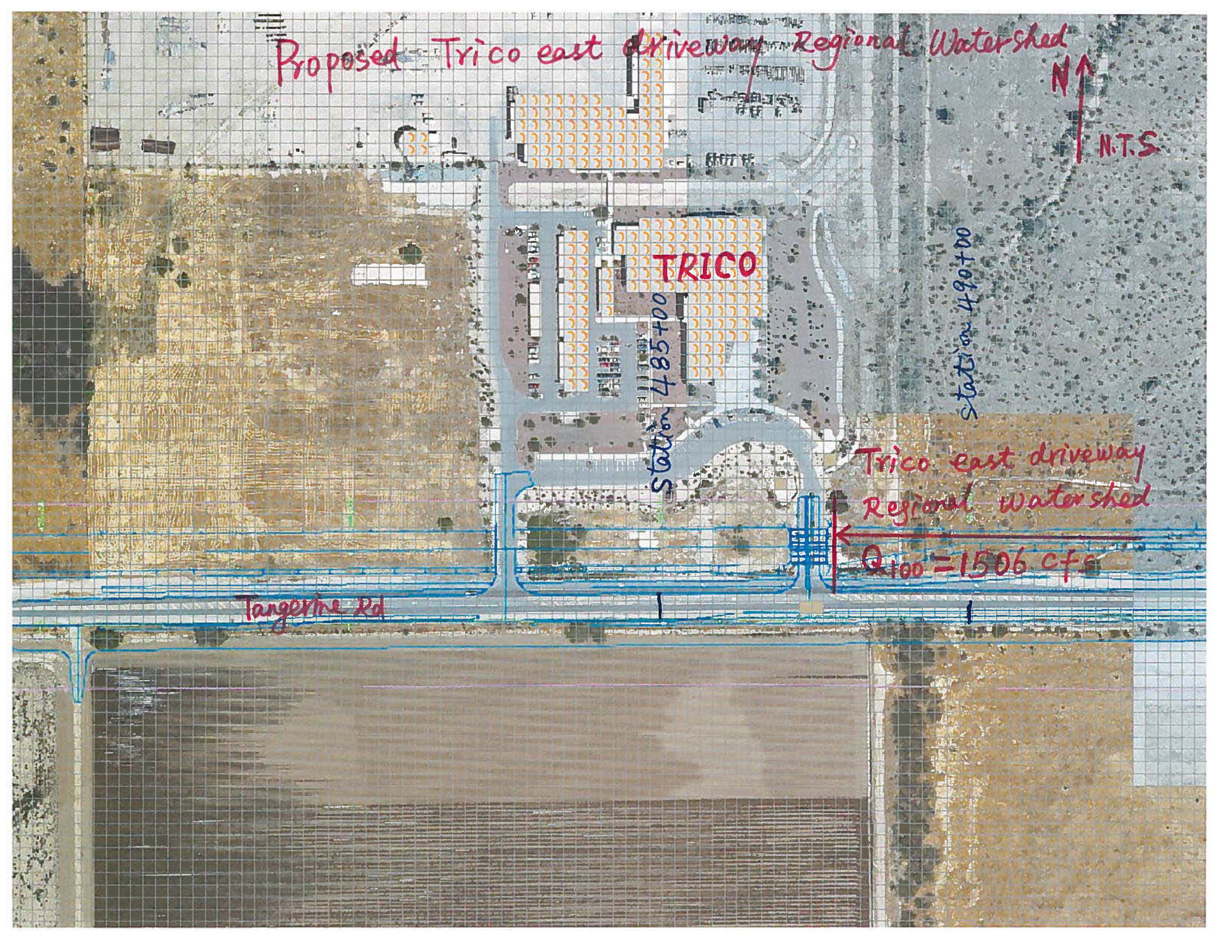
Station 485+00

Station 490+00

Trico east driveway
Regional watershed

$$Q_{100} = 1506 \text{ cfs}$$

Tangerine Rd



APPENDIX E

EXISTING CONDITIONS HYDRAULIC COMPUTATIONS

Includes

- Existing Conditions Hydraulic Computations

Tangerine Road: Existing Cross Culvert Summary Table - 12-3-2012

Roadway Station	Watershed		Existing Culvert	Culvert Length (ft)	Culvert Invert Elev.		Culvert Slope	Headwater Elevation	Culvert Outlet Velocity (fps)	Tailwater Depth (ft)	Tailwater Velocity (ft/s)
	Watershed ID	Q100 (cfs)			Upstream	Downstream					
962+13	La Canada Dr										
955+49	1	422	1-48" RCP	123	2785.19	2780.99	3.4%	2792.6	23.4	6.1	4.4
947+08	2	558	1-48" CMP	70	2785.11	2783.66	2.1%	2792.4	10.8	2.3	8.2
918+44	7	470	1-48" CMP	74	2776.46	2774.50	2.6%	2783.9	11.4	3.4	6.3
913+54	8	145	3-36" RCP	90	2776.50	2775.88	0.7%	2780.4	9.4	1.2	3.2
910+25	9	135	3-45"x29" HERCP	86	2776.13	2775.90	0.3%	2779.0	7.5	1.1	4.1
909+28	La Cholla Blvd										
904+54	10	123	2-36" RCP	82	2773.20	2772.40	1.0%	2777.8	11	0	0.0
857+50	Shannon Rd										
811+71	25	339	1-10'x4' RCBC	79	2687.60	2687.20	0.5%	2692.0	10.9	2.0	10.1
809+00	26.1	111	2-36" RCP	85	2686.20	2686.10	0.1%	2690.8	9.1	1.1	11.3
805+50	26.2	7	1-24" RCP	96	2687.60	2686.40	1.2%	2689.0	7.4	0.3	4.4
804+64	Thornycroft Road										
801+50	27	63	3-30" RCP	77	2680.13	2679.16	1.3%	2682.5	9.2	0.8	3.7
794+30	28	810	4-8'x5' RCBC	48	2671.30	2671.29	0.0%	2676.0	9.3	2.4	7.0
774+67	Camino de Manana										
769+08	33	64	1-36" RCP	142	2649.99	2647.93	1.5%	2654.1	12.8	1.2	5.6
752+90	Camino De Oeste										
Cmo de Oeste Sta. 29+05	36	63	1-36" RCP	99	2627.81	2625.77	2.1%	2632.0	13.4	0.9	5.2
750+53	37	85*	1-36" RCP	93	2620.91	2617.90	3.2%	2625.9	15.8	0.8	4.7
745+70	39	571**	1-36" RCP	105	2616.42	2613.01	3.2%	2621.4	16.5	2.4	9.4
700+00	Dove Mountain Blvd										
699+44	47	50	2-53"x34" HERCP	200	2544.20	2539.15	2.5%	2546.0	12.1	0.7	4.3
556+73	64	161	1-84" CMP	54	2185.76	2185.01	1.4%	2190.8	9.9	0.6	5.9
528+60	Breakers Rd.										
487+40, 235' Lt Trico Dwy	69 E	800	3-8'x4' RCBC	54	2056.07	2055.92	0.3%	2061.4	9.1	3.7	6.9
442+87	70	1874	2-24" RCP	98	2038.43	2038.08	0.4%	2042.7	8.6	2.1	2.5
441+87	UPRR R/W										

* includes estimated 53 cfs from CP-36

**include estimated 25 cfs from CP-38

CP-1 Sta 955+49

Table 1 - Summary of Culvert Flows at Crossing: CP-1 Sta 955+49

Headwater Elevation (ft)	Total Discharge (cfs)	CP-1 Sta 955+49 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2785.19	0.00	0.00	0.00	1
2787.88	42.20	42.20	0.00	1
2789.29	84.40	84.40	0.00	1
2791.00	126.60	126.60	0.00	1
2792.12	168.80	148.20	19.95	10
2792.24	211.00	150.32	60.34	7
2792.32	253.20	151.84	100.81	5
2792.40	295.40	153.08	141.52	4
2792.46	337.60	154.19	183.03	4
2792.52	379.80	155.17	224.46	4
2792.57	422.00	156.05	265.35	3
2792.00	146.02	146.02	0.00	Overtopping

Table 2 - Culvert Summary Table: CP-1 Sta 955+49

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2785.19	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
42.20	42.20	2787.88	2.688	0.0*	1-S2n	1.018	1.936	1.091	2.092	15.102	3.957
84.40	84.40	2789.29	4.100	0.0*	5-S2n	1.475	2.783	1.650	2.969	17.284	4.523
126.60	126.60	2791.00	5.811	0.0*	5-S2n	1.851	3.350	2.117	3.545	18.763	4.948
168.80	148.20	2792.12	6.930	0.0*	5-S2n	2.033	3.575	2.338	3.995	19.433	5.288
211.00	150.32	2792.24	7.049	0.0*	5-S2n	2.051	3.597	2.357	4.372	19.517	5.573
253.20	151.84	2792.32	7.135	0.0*	5-S2n	2.063	3.613	2.373	4.701	19.554	5.821
295.40	153.08	2792.40	7.206	0.0*	5-S2n	2.073	3.626	2.386	5.532	19.585	4.520
337.60	154.19	2792.46	7.270	0.0*	5-S2n	2.082	3.637	2.397	5.778	19.611	4.378
379.80	155.17	2792.52	7.327	0.0*	5-S2n	2.090	3.648	2.407	5.954	19.644	4.359
422.00	156.05	2792.57	7.378	4.016	4-FFf	2.097	3.657	2.097	6.104	23.404	4.359

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2785.19 ft, Outlet Elevation (invert): 2780.99 ft
 Culvert Length: 123.07 ft, Culvert Slope: 0.0341

Site Data - CP-1 Sta 955+49

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2785.19 ft
 Outlet Station: 123.00 ft
 Outlet Elevation: 2780.99 ft
 Number of Barrels: 1

Culvert Data Summary - CP-1 Sta 955+49

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Grooved End in Headwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: CP-1 Sta 955+49)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2779.00	0.00	0.00	0.00	0.00
42.20	2781.09	2.09	3.96	0.91	0.58
84.40	2781.97	2.97	4.52	1.30	0.61
126.60	2782.54	3.54	4.95	1.55	0.63
168.80	2782.99	3.99	5.29	1.74	0.64
211.00	2783.37	4.37	5.57	1.91	0.65
253.20	2783.70	4.70	5.82	2.05	0.66
295.40	2784.53	5.53	4.52	2.42	0.64
337.60	2784.78	5.78	4.38	2.52	0.64
379.80	2784.95	5.95	4.36	2.60	0.64
422.00	2785.10	6.10	4.36	2.67	0.64

Tailwater Channel Data - CP-1 Sta 955+49

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0070

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2791.00	0.0350
2	38.00	2790.00	0.0350
3	48.00	2789.00	0.0350
4	63.00	2788.00	0.0350
5	77.00	2787.00	0.0350
6	91.00	2786.00	0.0350
7	126.00	2785.00	0.0350
8	157.00	2784.00	0.0350
9	159.00	2783.00	0.0350
10	161.00	2782.00	0.0350
11	163.00	2781.00	0.0350
12	165.00	2779.00	0.0350
13	168.00	2779.00	0.0350
14	170.00	2781.00	0.0350
15	172.00	2782.00	0.0350
16	174.00	2783.00	0.0350
17	176.00	2784.00	0.0350
18	189.00	2785.00	0.0350
19	203.00	2786.00	0.0350
20	218.00	2787.00	0.0350
21	234.00	2788.00	0.0350
22	248.00	2789.00	0.0350
23	262.00	2790.00	0.0000

Roadway Data for Crossing: CP-1 Sta 955+49

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2793.00
1	139.00	2792.00
2	290.00	2792.00
3	423.00	2793.00

Roadway Surface: Paved

Roadway Top Width: 70.00 ft

CP-2 Sta 947+08

Table 4 - Summary of Culvert Flows at Crossing: CP-2 Sta 947+08

Headwater Elevation (ft)	Total Discharge (cfs)	CP-2 Sta 947+08 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2785.11	0.00	0.00	0.00	1
2788.70	55.80	55.80	0.00	1
2791.62	111.60	108.34	3.22	10
2791.88	167.40	111.85	54.73	10
2792.00	223.20	113.43	108.87	6
2792.07	279.00	114.44	163.91	4
2792.14	334.80	115.32	219.23	4
2792.20	390.60	116.11	273.71	3
2792.26	446.40	116.87	329.00	3
2792.31	502.20	117.57	384.38	3
2792.37	558.00	118.25	439.67	3
2791.50	106.61	106.61	0.00	Overtopping

Table 5 - Culvert Summary Table: CP-2 Sta 947+08

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2785.11	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
55.80	55.80	2788.70	3.590	0.0*	1-S2n	1.993	2.239	1.998	0.650	8.894	4.113
111.60	108.34	2791.62	6.512	6.208	2-M2c	3.166	3.142	3.148	0.967	10.223	5.186
167.40	111.85	2791.88	6.767	6.320	2-M2c	3.287	3.194	3.195	1.214	10.395	5.905
223.20	113.43	2792.00	6.885	6.373	2-M2c	3.351	3.213	3.216	1.426	10.473	6.439
279.00	114.44	2792.07	6.961	6.406	2-M2c	3.392	3.223	3.230	1.618	10.519	6.840
334.80	115.32	2792.14	7.029	6.432	2-M2c	3.428	3.232	3.241	1.789	10.563	7.182
390.60	116.11	2792.20	7.089	6.461	2-M2c	3.460	3.240	3.251	1.944	10.632	7.482
446.40	116.87	2792.26	7.148	6.487	2-M2c	3.490	3.248	3.260	2.086	10.675	7.751
502.20	117.57	2792.31	7.203	6.509	2-M2c	3.518	3.256	3.269	2.218	10.715	7.995
558.00	118.25	2792.37	7.256	6.532	2-M2c	3.546	3.263	3.277	2.342	10.753	8.219

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2785.11 ft, Outlet Elevation (invert): 2783.66 ft
 Culvert Length: 70.02 ft, Culvert Slope: 0.0207

Site Data - CP-2 Sta 947+08

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2785.11 ft
 Outlet Station: 70.00 ft
 Outlet Elevation: 2783.66 ft
 Number of Barrels: 1

Culvert Data Summary - CP-2 Sta 947+08

Barrel Shape: Circular
Barrel Diameter: 4.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: NONE

Table 6 - Downstream Channel Rating Curve (Crossing: CP-2 Sta 947+08)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2783.30	0.00	0.00	0.00	0.00
55.80	2783.95	0.65	4.11	0.81	0.96
111.60	2784.27	0.97	5.19	1.21	1.01
167.40	2784.51	1.21	5.91	1.51	1.05
223.20	2784.73	1.43	6.44	1.78	1.07
279.00	2784.92	1.62	6.84	2.02	1.09
334.80	2785.09	1.79	7.18	2.23	1.10
390.60	2785.24	1.94	7.48	2.43	1.11
446.40	2785.39	2.09	7.75	2.60	1.12
502.20	2785.52	2.22	7.99	2.77	1.13
558.00	2785.64	2.34	8.22	2.92	1.14

Tailwater Channel Data - CP-2 Sta 947+08

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0200

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2792.66	0.0350
2	42.00	2791.66	0.0350
3	75.00	2790.66	0.0350
4	89.00	2789.66	0.0350
5	98.00	2788.66	0.0350
6	107.00	2787.66	0.0350
7	114.00	2786.66	0.0350
8	120.00	2785.66	0.0350
9	129.00	2784.66	0.0350
10	132.00	2783.30	0.0350
11	150.00	2783.30	0.0350
12	159.00	2784.66	0.0350
13	162.00	2785.66	0.0350
14	168.00	2786.66	0.0350
15	202.00	2786.66	0.0350
16	232.00	2787.66	0.0350
17	246.00	2788.66	0.0350
18	284.00	2789.66	0.0350
19	311.00	2790.66	0.0350
20	330.00	2791.66	0.0350
21	344.00	2792.66	0.0000

Roadway Data for Crossing: CP-2 Sta 947+08

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2792.00
1	150.00	2791.50
2	300.00	2792.00

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

CP-7 Sta 918+44

Table 7 - Summary of Culvert Flows at Crossing: CP-7 Sta 918+44

Headwater Elevation (ft)	Total Discharge (cfs)	CP-7 Sta 918+44 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2776.46	0.00	0.00	0.00	1
2779.65	47.00	47.00	0.00	1
2782.01	94.00	94.00	0.00	1
2783.35	141.00	113.60	26.94	16
2783.51	188.00	115.74	71.83	8
2783.61	235.00	116.98	117.24	5
2783.69	282.00	118.01	163.69	5
2783.76	329.00	118.88	209.57	4
2783.82	376.00	119.66	256.07	4
2783.87	423.00	120.35	301.79	3
2783.92	470.00	120.99	348.48	3
2783.00	108.88	108.88	0.00	Overtopping

Table 8 - Culvert Summary Table: CP-7 Sta 918+44

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2776.46	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
47.00	47.00	2779.65	3.186	0.0*	1-S2n	1.684	2.050	1.689	0.881	9.314	3.909
94.00	94.00	2782.01	5.552	0.0*	5-S2n	2.571	2.929	2.578	1.294	10.995	4.892
141.00	113.60	2783.35	6.886	0.0*	5-S2n	2.972	3.214	2.977	1.614	11.351	5.556
188.00	115.74	2783.51	7.050	0.0*	5-S2n	3.021	3.237	3.027	1.885	11.372	6.065
235.00	116.98	2783.61	7.146	0.173	5-S2n	3.048	3.250	3.049	2.123	11.408	6.483
282.00	118.01	2783.69	7.226	0.388	5-S2n	3.072	3.260	3.079	2.338	11.391	6.840
329.00	118.88	2783.76	7.295	0.586	5-S2n	3.091	3.269	3.098	2.536	11.402	7.152
376.00	119.66	2783.82	7.357	0.768	5-S2n	3.109	3.277	3.116	2.718	11.408	7.431
423.00	120.35	2783.87	7.413	0.940	5-S2n	3.124	3.285	3.129	2.890	11.428	7.684
470.00	120.99	2783.92	7.464	0.0*	5-S2n	3.139	3.291	3.140	3.430	11.445	6.330

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2776.46 ft, Outlet Elevation (invert): 2774.51 ft
 Culvert Length: 74.03 ft, Culvert Slope: 0.0264

Site Data - CP-7 Sta 918+44

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2776.46 ft
 Outlet Station: 74.00 ft
 Outlet Elevation: 2774.51 ft
 Number of Barrels: 1

Culvert Data Summary - CP-7 Sta 918+44

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: NONE

Table 9 - Downstream Channel Rating Curve (Crossing: CP-7 Sta 918+44)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2774.51	0.00	0.00	0.00	0.00
47.00	2775.39	0.88	3.91	0.71	0.80
94.00	2775.80	1.29	4.89	1.05	0.85
141.00	2776.12	1.61	5.56	1.31	0.87
188.00	2776.39	1.88	6.07	1.53	0.89
235.00	2776.63	2.12	6.48	1.72	0.90
282.00	2776.85	2.34	6.84	1.90	0.91
329.00	2777.05	2.54	7.15	2.06	0.92
376.00	2777.23	2.72	7.43	2.21	0.93
423.00	2777.40	2.89	7.68	2.34	0.94
470.00	2777.94	3.43	6.33	2.78	0.90

Tailwater Channel Data - CP-7 Sta 918+44

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0130

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2785.51	0.0350
2	32.00	2784.51	0.0350
3	51.00	2783.51	0.0350
4	68.00	2782.51	0.0350
5	82.00	2781.51	0.0350
6	88.00	2780.51	0.0350
7	96.00	2779.51	0.0350
8	105.00	2778.51	0.0350
9	121.00	2777.51	0.0350
10	124.00	2776.51	0.0350
11	127.00	2775.51	0.0350
12	130.00	2774.51	0.0350
13	141.00	2774.51	0.0350
14	144.00	2775.51	0.0350
15	146.00	2776.51	0.0350
16	148.00	2777.51	0.0350
17	182.00	2778.51	0.0350
18	206.00	2779.51	0.0350
19	216.00	2780.51	0.0350
20	226.00	2781.51	0.0350
21	246.00	2782.51	0.0350
22	260.00	2783.51	0.0000

Roadway Data for Crossing: CP-7 Sta 918+44

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2784.00
1	174.00	2783.50
2	356.00	2783.00

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

CP-8 Sta 913+54

Table 10 - Summary of Culvert Flows at Crossing: CP-8 Sta 913+54

Headwater Elevation (ft)	Total Discharge (cfs)	CP-8 Sta 913+54 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2776.50	0.00	0.00	0.00	1
2777.43	14.50	14.50	0.00	1
2777.85	29.00	29.00	0.00	1
2778.21	43.50	43.50	0.00	1
2778.55	58.00	58.00	0.00	1
2778.85	72.50	72.50	0.00	1
2779.13	87.00	87.00	0.00	1
2779.41	101.50	101.50	0.00	1
2779.71	116.00	116.00	0.00	1
2780.02	130.50	130.50	0.00	1
2780.36	145.00	145.00	0.00	1
2780.50	150.35	150.35	0.00	Overtopping

Table 11 - Culvert Summary Table: CP-8 Sta 913+54

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2776.50	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
14.50	14.50	2777.43	0.934	0.0*	1-S2n	0.568	0.676	0.575	0.435	5.065	1.758
29.00	29.00	2777.85	1.349	0.0*	1-S2n	0.803	0.975	0.805	0.592	6.286	2.102
43.50	43.50	2778.21	1.713	0.086	1-S2n	0.997	1.212	1.002	0.706	6.990	2.331
58.00	58.00	2778.55	2.049	0.179	1-S2n	1.168	1.403	1.172	0.799	7.547	2.507
72.50	72.50	2778.85	2.350	0.258	1-S2n	1.320	1.579	1.328	0.878	7.995	2.653
87.00	87.00	2779.13	2.633	0.327	1-S2n	1.468	1.739	1.472	0.947	8.400	2.778
101.50	101.50	2779.41	2.915	0.390	1-S2n	1.610	1.884	1.616	1.010	8.718	2.889
116.00	116.00	2779.71	3.208	0.447	5-S2n	1.750	2.019	1.758	1.067	8.988	2.990
130.50	130.50	2780.02	3.522	0.500	5-S2n	1.894	2.144	1.898	1.120	9.239	3.083
145.00	145.00	2780.36	3.865	0.550	5-S2n	2.040	2.255	2.045	1.170	9.427	3.167

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2776.50 ft, Outlet Elevation (invert): 2775.88 ft
 Culvert Length: 90.00 ft, Culvert Slope: 0.0069

Site Data - CP-8 Sta 913+54

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2776.50 ft
 Outlet Station: 90.00 ft
 Outlet Elevation: 2775.88 ft
 Number of Barrels: 3

Culvert Data Summary - CP-8 Sta 913+54

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: NONE

Table 12 - Downstream Channel Rating Curve (Crossing: CP-8 Sta 913+54)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2775.88	0.00	0.00	0.00	0.00
14.50	2776.31	0.43	1.76	0.27	0.60
29.00	2776.47	0.59	2.10	0.37	0.63
43.50	2776.59	0.71	2.33	0.44	0.64
58.00	2776.68	0.80	2.51	0.50	0.66
72.50	2776.76	0.88	2.65	0.55	0.66
87.00	2776.83	0.95	2.78	0.59	0.67
101.50	2776.89	1.01	2.89	0.63	0.68
116.00	2776.95	1.07	2.99	0.67	0.69
130.50	2777.00	1.12	3.08	0.70	0.69
145.00	2777.05	1.17	3.17	0.73	0.70

Tailwater Channel Data - CP-8 Sta 913+54

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0100

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2780.88	0.0350
2	24.00	2779.88	0.0350
3	37.00	2778.88	0.0350
4	54.00	2777.88	0.0350
5	91.00	2776.88	0.0350
6	134.00	2775.88	0.0350
7	141.00	2775.88	0.0350
8	153.00	2776.88	0.0350
9	169.00	2777.88	0.0350
10	189.00	2778.88	0.0350
11	207.00	2779.88	0.0350
12	242.00	2780.88	0.0000

Roadway Data for Crossing: CP-8 Sta 913+54

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2782.00
1	72.00	2781.50
2	151.00	2781.00
3	265.00	2780.50
4	327.00	2781.00
5	332.00	2782.00

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

CP-9 Sta 910+25

Table 13 - Summary of Culvert Flows at Crossing: CP-9 Sta 910+25

Headwater Elevation (ft)	Total Discharge (cfs)	CP-9 Sta 910+25 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2776.13	0.00	0.00	0.00	1
2776.90	13.50	13.50	0.00	1
2777.25	27.00	27.00	0.00	1
2777.54	40.50	40.50	0.00	1
2777.79	54.00	54.00	0.00	1
2778.01	67.50	67.50	0.00	1
2778.22	81.00	81.00	0.00	1
2778.42	94.50	94.50	0.00	1
2778.63	108.00	108.00	0.00	1
2778.83	121.50	121.50	0.00	1
2779.04	135.00	135.00	0.00	1
2780.00	183.17	183.17	0.00	Overtopping

Table 14 - Culvert Summary Table: CP-9 Sta 910+25

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2776.13	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
13.50	13.50	2776.90	0.716	0.770	2-M2c	0.555	0.534	0.541	0.344	3.548	2.175
27.00	27.00	2777.25	1.045	1.124	2-M2c	0.796	0.773	0.777	0.493	4.340	2.654
40.50	40.50	2777.54	1.309	1.410	2-M2c	0.993	0.964	0.964	0.604	4.910	2.969
54.00	54.00	2777.79	1.556	1.659	2-M2c	1.165	1.121	1.126	0.696	5.375	3.210
67.50	67.50	2778.01	1.783	1.881	2-M2c	1.319	1.264	1.264	0.775	5.756	3.408
81.00	81.00	2778.22	1.998	2.087	2-M2c	1.468	1.392	1.394	0.845	6.134	3.578
94.50	94.50	2778.42	2.207	2.295	2-M2c	1.626	1.511	1.514	0.909	6.492	3.727
108.00	108.00	2778.63	2.417	2.496	2-M2c	1.795	1.623	1.626	0.967	6.841	3.860
121.50	121.50	2778.83	2.631	2.696	2-M2c	1.998	1.728	1.731	1.022	7.185	3.977
135.00	135.00	2779.04	2.855	2.907	2-M2c	2.417	1.821	1.828	1.074	7.535	4.080

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2776.13 ft, Outlet Elevation (invert): 2775.90 ft
 Culvert Length: 86.00 ft, Culvert Slope: 0.0027

Site Data - CP-9 Sta 910+25

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2776.13 ft
 Outlet Station: 86.00 ft
 Outlet Elevation: 2775.90 ft
 Number of Barrels: 3

Culvert Data Summary - CP-9 Sta 910+25

Barrel Shape: Elliptical

Barrel Span: 45.00 in

Barrel Rise: 29.00 in

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Grooved Edge with Headwall

Inlet Depression: NONE

Table 15 - Downstream Channel Rating Curve (Crossing: CP-9 Sta 910+25)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2775.77	0.00	0.00	0.00	0.00
13.50	2776.11	0.34	2.18	0.34	0.75
27.00	2776.26	0.49	2.65	0.49	0.79
40.50	2776.37	0.60	2.97	0.60	0.82
54.00	2776.47	0.70	3.21	0.69	0.83
67.50	2776.54	0.77	3.41	0.77	0.84
81.00	2776.62	0.85	3.58	0.84	0.85
94.50	2776.68	0.91	3.73	0.91	0.86
108.00	2776.74	0.97	3.86	0.97	0.87
121.50	2776.79	1.02	3.98	1.02	0.88
135.00	2776.84	1.07	4.08	1.07	0.88

Tailwater Channel Data - CP-9 Sta 910+25

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0160

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2777.77	0.0350
2	29.00	2776.77	0.0350
3	53.00	2775.77	0.0350
4	65.00	2775.77	0.0350
5	76.00	2776.77	0.0350
6	86.00	2777.77	0.0000

Roadway Data for Crossing: CP-9 Sta 910+25

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2780.50
1	176.00	2780.00
2	240.00	2780.50
3	262.00	2781.00
4	291.00	2782.00
5	321.00	2783.00

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

CP-10 Sta 904+54

Table 16 - Summary of Culvert Flows at Crossing: CP-10 Sta 904+54

Headwater Elevation (ft)	Total Discharge (cfs)	CP-10 Sta 904+54 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2773.20	0.00	0.00	0.00	1
2774.26	12.30	12.30	0.00	1
2774.74	24.60	24.60	0.00	1
2775.19	36.90	36.90	0.00	1
2775.57	49.20	49.20	0.00	1
2775.93	61.50	61.50	0.00	1
2776.29	73.80	73.80	0.00	1
2776.69	86.10	86.10	0.00	1
2777.12	98.40	98.40	0.00	1
2777.60	110.70	110.22	0.39	14
2777.82	123.00	115.34	7.47	11
2777.50	107.85	107.85	0.00	Overtopping

Table 17 - Culvert Summary Table: CP-10 Sta 904+54

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2773.20	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
12.30	12.30	2774.26	1.056	0.0*	1-S2n	0.581	0.765	0.584	0.000	6.322	0.000
24.60	24.60	2774.74	1.537	0.0*	1-S2n	0.820	1.106	0.829	0.000	7.687	0.000
36.90	36.90	2775.19	1.986	0.0*	1-S2n	1.016	1.368	1.018	0.000	8.695	0.000
49.20	49.20	2775.57	2.370	0.0*	1-S2n	1.193	1.594	1.241	0.000	8.925	0.000
61.50	61.50	2775.93	2.729	0.0*	1-S2n	1.348	1.797	1.410	0.000	9.415	0.000
73.80	73.80	2776.29	3.093	0.0*	5-S2n	1.501	1.969	1.501	0.000	10.429	0.000
86.10	86.10	2776.69	3.486	0.0*	5-S2n	1.647	2.134	1.656	0.000	10.766	0.000
98.40	98.40	2777.12	3.925	0.0*	5-S2n	1.792	2.275	1.880	0.000	10.568	0.000
110.70	110.22	2777.60	4.400	0.0*	5-S2n	1.937	2.407	2.025	0.000	10.868	0.000
123.00	115.34	2777.82	4.623	0.0*	5-S2n	2.000	2.448	2.085	0.000	11.000	0.000

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2773.20 ft, Outlet Elevation (invert): 2772.35 ft
 Culvert Length: 82.00 ft, Culvert Slope: 0.0104

Site Data - CP-10 Sta 904+54

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2773.20 ft
 Outlet Station: 82.00 ft
 Outlet Elevation: 2772.35 ft
 Number of Barrels: 2

Culvert Data Summary - CP-10 Sta 904+54

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: NONE

Table 18 - Downstream Channel Rating Curve (Crossing: CP-10 Sta 904+54)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2772.30	0.00	0.00	0.00	0.00
12.30	2772.30	0.00	0.00	0.00	0.00
24.60	2772.30	0.00	0.00	0.00	0.00
36.90	2772.30	0.00	0.00	0.00	0.00
49.20	2772.30	0.00	0.00	0.00	0.00
61.50	2772.30	0.00	0.00	0.00	0.00
73.80	2772.30	0.00	0.00	0.00	0.00
86.10	2772.30	0.00	0.00	0.00	0.00
98.40	2772.30	0.00	0.00	0.00	0.00
110.70	2772.30	0.00	0.00	0.00	0.00
123.00	2772.30	0.00	0.00	0.00	0.00

Tailwater Channel Data - CP-10 Sta 904+54

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0000

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2776.30	0.0000
2	31.00	2775.30	0.0000
3	62.00	2774.30	0.0000
4	68.00	2773.30	0.0000
5	70.00	2772.30	0.0000
6	75.00	2772.30	0.0000
7	78.00	2773.30	0.0000
8	139.00	2774.30	0.0000
9	152.00	2775.30	0.0000
10	181.00	2776.30	0.0000

Roadway Data for Crossing: CP-10 Sta 904+54

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2779.00
1	63.80	2778.50
2	136.00	2778.00
3	168.00	2777.50
4	196.00	2778.00
5	203.00	2779.00
6	235.00	2780.00

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

CP-25 Sta 811+71

Table 19 - Summary of Culvert Flows at Crossing: CP-25 Sta 811+71

Headwater Elevation (ft)	Total Discharge (cfs)	CP-25 Sta 811+71 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2687.64	0.00	0.00	0.00	1
2688.86	33.90	33.90	0.00	1
2689.57	67.80	67.80	0.00	1
2690.14	101.70	101.70	0.00	1
2690.66	135.60	135.60	0.00	1
2691.13	169.50	168.80	0.57	7
2691.43	203.40	191.01	12.21	8
2691.63	237.30	205.42	31.55	7
2691.78	271.20	216.53	54.49	7
2691.91	305.10	225.61	79.30	6
2692.02	339.00	233.26	105.65	5
2691.00	159.61	159.61	0.00	Overtopping

Table 20 - Culvert Summary Table: CP-25 Sta 811+71

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2687.64	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
33.90	33.90	2688.86	1.217	0.0*	1-S2n	0.549	0.711	0.561	0.595	6.044	5.335
67.80	67.80	2689.57	1.926	0.0*	1-S2n	0.872	1.128	0.880	0.867	7.702	6.575
101.70	101.70	2690.14	2.502	0.0*	1-S2n	1.136	1.479	1.191	1.071	8.542	7.406
135.60	135.60	2690.66	3.018	0.0*	1-S2n	1.370	1.791	1.453	1.240	9.331	8.063
169.50	168.80	2691.13	3.488	0.0*	1-S2n	1.590	2.073	1.697	1.388	9.948	8.601
203.40	191.01	2691.43	3.793	0.0*	1-S2n	1.723	2.251	1.850	1.521	10.326	9.060
237.30	205.42	2691.63	3.990	0.003	1-S2n	1.809	2.363	1.950	1.643	10.536	9.462
271.20	216.53	2691.78	4.143	0.115	5-S2n	1.875	2.447	2.024	1.755	10.697	9.822
305.10	225.61	2691.91	4.268	0.219	5-S2n	1.929	2.515	2.085	1.859	10.820	10.148
339.00	233.26	2692.02	4.374	0.318	5-S2n	1.974	2.572	2.136	1.958	10.922	10.447

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2687.64 ft, Outlet Elevation (invert): 2687.19 ft
 Culvert Length: 79.00 ft, Culvert Slope: 0.0057

Site Data - CP-25 Sta 811+71

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2687.64 ft
 Outlet Station: 79.00 ft
 Outlet Elevation: 2687.19 ft
 Number of Barrels: 1

Culvert Data Summary - CP-25 Sta 811+71

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (90°) Headwall

Inlet Depression: NONE

Table 21 - Downstream Channel Rating Curve (Crossing: CP-25 Sta 811+71)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2686.00	0.00	0.00	0.00	0.00
33.90	2686.60	0.60	5.33	0.82	1.36
67.80	2686.87	0.87	6.57	1.19	1.43
101.70	2687.07	1.07	7.41	1.47	1.48
135.60	2687.24	1.24	8.06	1.70	1.51
169.50	2687.39	1.39	8.60	1.91	1.53
203.40	2687.52	1.52	9.06	2.09	1.55
237.30	2687.64	1.64	9.46	2.26	1.57
271.20	2687.75	1.75	9.82	2.41	1.58
305.10	2687.86	1.86	10.15	2.55	1.59
339.00	2687.96	1.96	10.45	2.69	1.60

Tailwater Channel Data - CP-25 Sta 811+71

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0220

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2688.00	0.0250
2	3.00	2687.00	0.0250
3	6.00	2686.00	0.0250
4	14.00	2686.00	0.0250
5	20.00	2687.00	0.0250
6	25.00	2688.00	0.0000

Roadway Data for Crossing: CP-25 Sta 811+71

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2693.50
1	40.50	2692.00
2	135.00	2691.00

Roadway Surface: Paved

Roadway Top Width: 72.00 ft

CP-26.1 Sta 809+00

Table 22 - Summary of Culvert Flows at Crossing: CP-26.1 Sta 809+00

Headwater Elevation (ft)	Total Discharge (cfs)	CP-26.1_1 Sta 809+00 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2686.50	0.00	0.00	0.00	1
2687.33	11.10	11.10	0.00	1
2687.83	22.20	22.20	0.00	1
2688.23	33.30	33.30	0.00	1
2688.60	44.40	44.40	0.00	1
2688.94	55.50	55.50	0.00	1
2689.27	66.60	66.60	0.00	1
2689.60	77.70	77.70	0.00	1
2689.94	88.80	88.80	0.00	1
2690.32	99.90	99.90	0.00	1
2690.76	111.00	111.00	0.00	1
2691.50	128.03	128.03	0.00	Overtopping

Table 23 - Culvert Summary Table: CP-26.1_1 Sta 809+00

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2686.50	0.000	0.300	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
11.10	11.10	2687.33	1.008	1.131	3-M2t	0.959	0.725	0.844	0.444	3.406	5.374
22.20	22.20	2687.83	1.460	1.627	2-M2c	1.402	1.046	1.056	0.567	4.997	6.646
33.30	33.30	2688.23	1.877	2.033	2-M2c	1.798	1.297	1.304	0.657	5.650	7.648
44.40	44.40	2688.60	2.239	2.396	2-M2c	2.221	1.514	1.515	0.735	6.200	8.429
55.50	55.50	2688.94	2.569	2.737	2-M2c	3.000	1.698	1.703	0.804	6.699	9.077
66.60	66.60	2689.27	2.892	3.069	2-M2c	3.000	1.869	1.873	0.867	7.173	9.634
77.70	77.70	2689.60	3.228	3.399	2-M2c	3.000	2.024	2.028	0.925	7.639	10.124
88.80	88.80	2689.94	3.592	3.736	2-M2c	3.000	2.165	2.171	0.979	8.107	10.564
99.90	99.90	2690.32	3.996	4.124	2-M2c	3.000	2.292	2.300	1.031	8.589	10.964
111.00	111.00	2690.76	4.447	4.557	7-M2c	3.000	2.413	2.417	1.079	9.094	11.331

 Inlet Elevation (invert): 2686.20 ft, Outlet Elevation (invert): 2686.10 ft
 Culvert Length: 85.00 ft, Culvert Slope: 0.0012

Site Data - CP-26.1_1 Sta 809+00

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2686.20 ft
 Outlet Station: 85.00 ft
 Outlet Elevation: 2686.10 ft
 Number of Barrels: 2

Culvert Data Summary - CP-26.1_1 Sta 809+00

Barrel Shape: Circular
 Barrel Diameter: 3.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Square Edge with Headwall
 Inlet Depression: NONE

Table 24 - Downstream Channel Rating Curve (Crossing: CP-26.1 Sta 809+00)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2686.50	0.00	0.00	0.00	0.00
11.10	2686.94	0.44	5.37	1.70	2.01
22.20	2687.07	0.57	6.65	2.17	2.12
33.30	2687.16	0.66	7.65	2.51	2.19
44.40	2687.23	0.73	8.43	2.81	2.24
55.50	2687.30	0.80	9.08	3.07	2.28
66.60	2687.37	0.87	9.63	3.32	2.32
77.70	2687.43	0.93	10.12	3.54	2.35
88.80	2687.48	0.98	10.56	3.75	2.37
99.90	2687.53	1.03	10.96	3.94	2.39
111.00	2687.58	1.08	11.33	4.13	2.41

Tailwater Channel Data - CP-26.1 Sta 809+00

Tailwater Channel Option: Irregular Channel
 Channel Slope: 0.0613
 User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2688.00	0.0250
2	4.00	2687.00	0.0250
3	11.00	2686.50	0.0250
4	14.50	2687.00	0.0250
5	17.00	2688.00	0.0250
6	27.00	2689.00	0.0250

Roadway Data for Crossing: CP-26.1 Sta 809+00

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2692.00
1	63.00	2691.50
2	265.00	2691.50
3	327.00	2692.00

Roadway Surface: Paved

Roadway Top Width: 60.00 ft

Table 25 - Summary of Culvert Flows at Crossing: CP-26.2 Sta 805+50

Headwater Elevation (ft)	Total Discharge (cfs)	CP-26.2 Sta 805+50 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2687.61	0.00	0.00	0.00	1
2687.99	0.70	0.70	0.00	1
2688.16	1.40	1.40	0.00	1
2688.29	2.10	2.10	0.00	1
2688.40	2.80	2.80	0.00	1
2688.51	3.50	3.50	0.00	1
2688.60	4.20	4.20	0.00	1
2688.70	4.90	4.90	0.00	1
2688.79	5.60	5.60	0.00	1
2688.88	6.30	6.30	0.00	1
2688.97	7.00	7.00	0.00	1
2690.00	16.16	16.16	0.00	Overtopping

CP-26.2 Sta 805+50

Table 25.1 - Summary of Culvert Flows at Crossing: CP-26.2 Sta 805+50

Headwater Elevation (ft)	Total Discharge (cfs)	CP-26.2 Sta 805+50 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2687.61	0.00	0.00	0.00	1
2687.99	0.70	0.70	0.00	1
2688.16	1.40	1.40	0.00	1
2688.29	2.10	2.10	0.00	1
2688.40	2.80	2.80	0.00	1
2688.51	3.50	3.50	0.00	1
2688.60	4.20	4.20	0.00	1
2688.70	4.90	4.90	0.00	1
2688.79	5.60	5.60	0.00	1
2688.88	6.30	6.30	0.00	1
2688.97	7.00	7.00	0.00	1
2690.00	16.16	16.16	0.00	Overtopping

Table 26 - Culvert Summary Table: CP-26.2 Sta 805+50

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2687.61	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
0.70	0.70	2687.99	0.381	0.0*	1-S2n	0.213	0.272	0.232	0.138	4.390	2.462
1.40	1.40	2688.16	0.554	0.0*	1-S2n	0.288	0.407	0.297	0.179	4.645	2.928
2.10	2.10	2688.29	0.680	0.0*	1-S2n	0.364	0.494	0.373	0.208	5.138	3.240
2.80	2.80	2688.40	0.794	0.0*	1-S2n	0.424	0.580	0.429	0.232	5.725	3.482
3.50	3.50	2688.51	0.899	0.0*	1-S2n	0.471	0.649	0.478	0.252	6.007	3.682
4.20	4.20	2688.60	0.986	0.0*	1-S2n	0.517	0.713	0.522	0.270	6.380	3.853
4.90	4.90	2688.70	1.086	0.0*	1-S2n	0.564	0.777	0.567	0.286	6.661	4.005
5.60	5.60	2688.79	1.182	0.0*	1-S2n	0.608	0.833	0.609	0.300	6.935	4.141
6.30	6.30	2688.88	1.272	0.0*	1-S2n	0.644	0.884	0.653	0.314	7.057	4.265
7.00	7.00	2688.97	1.358	0.0*	1-S2n	0.679	0.935	0.684	0.326	7.355	4.378

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2687.61 ft, Outlet Elevation (invert): 2686.38 ft
 Culvert Length: 96.01 ft, Culvert Slope: 0.0128

Site Data - CP-26.2 Sta 805+50

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2687.61 ft
 Outlet Station: 96.00 ft
 Outlet Elevation: 2686.38 ft
 Number of Barrels: 1

Culvert Data Summary - CP-26.2 Sta 805+50

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Inlet Type: Conventional
Inlet Edge Condition: Square Edge with Headwall
Inlet Depression: NONE

Table 27 - Downstream Channel Rating Curve (Crossing: CP-26.2 Sta 805+50)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2685.00	0.00	0.00	0.00	0.00
0.70	2685.14	0.14	2.46	0.52	1.65
1.40	2685.18	0.18	2.93	0.68	1.73
2.10	2685.21	0.21	3.24	0.79	1.77
2.80	2685.23	0.23	3.48	0.88	1.80
3.50	2685.25	0.25	3.68	0.96	1.83
4.20	2685.27	0.27	3.85	1.03	1.85
4.90	2685.29	0.29	4.00	1.09	1.87
5.60	2685.30	0.30	4.14	1.14	1.88
6.30	2685.31	0.31	4.26	1.19	1.90
7.00	2685.33	0.33	4.38	1.24	1.91

Tailwater Channel Data - CP-26.2 Sta 805+50

Tailwater Channel Option: Irregular Channel
Channel Slope: 0.0610
User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2687.00	0.0250
2	15.00	2686.00	0.0250
3	30.00	2685.00	0.0250
4	45.00	2686.00	0.0250
5	52.00	2687.00	0.0250
6	60.00	2688.00	0.0350

Roadway Data for Crossing: CP-26.2 Sta 805+50

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2692.00
1	134.00	2691.00
2	210.00	2690.00

Roadway Surface: Paved

Roadway Top Width: 70.00 ft

CP-27 Sta 801+50

Table 28 - Summary of Culvert Flows at Crossing: CP-27 Sta 801+50

Headwater Elevation (ft)	Total Discharge (cfs)	CP-27 Sta 801+50 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2680.13	0.00	0.00	0.00	1
2680.77	6.30	6.30	0.00	1
2681.04	12.60	12.60	0.00	1
2681.27	18.90	18.90	0.00	1
2681.47	25.20	25.20	0.00	1
2681.67	31.50	31.50	0.00	1
2681.86	37.80	37.80	0.00	1
2682.03	44.10	44.10	0.00	1
2682.20	50.40	50.40	0.00	1
2682.36	56.70	56.70	0.00	1
2682.52	63.00	63.00	0.00	1
2683.00	80.76	80.76	0.00	Overtopping

Table 29 - Culvert Summary Table: CP-27 Sta 801+50

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2680.13	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
6.30	6.30	2680.77	0.636	0.0*	1-S2n	0.329	0.465	0.355	0.284	4.754	2.021
12.60	12.60	2681.04	0.914	0.0*	1-S2n	0.487	0.664	0.488	0.398	6.193	2.438
18.90	18.90	2681.27	1.135	0.0*	1-S2n	0.589	0.824	0.597	0.482	6.939	2.715
25.20	25.20	2681.47	1.341	0.0*	1-S2n	0.686	0.961	0.693	0.551	7.523	2.927
31.50	31.50	2681.67	1.545	0.0*	1-S2n	0.775	1.078	0.800	0.609	7.799	3.101
37.80	37.80	2681.86	1.730	0.0*	1-S2n	0.850	1.187	0.856	0.662	8.445	3.251
44.10	44.10	2682.03	1.902	0.0*	1-S2n	0.924	1.289	0.931	0.709	8.807	3.382
50.40	50.40	2682.20	2.066	0.0*	1-S2n	0.999	1.380	1.002	0.752	9.139	3.500
56.70	56.70	2682.36	2.226	0.0*	1-S2n	1.063	1.472	1.107	0.792	8.998	3.607
63.00	63.00	2682.52	2.387	0.0*	1-S2n	1.128	1.553	1.178	0.829	9.228	3.706

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2680.13 ft, Outlet Elevation (invert): 2679.16 ft
 Culvert Length: 77.01 ft, Culvert Slope: 0.0126

Site Data - CP-27 Sta 801+50

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2680.13 ft
 Outlet Station: 77.00 ft
 Outlet Elevation: 2679.16 ft
 Number of Barrels: 3

Culvert Data Summary - CP-27 Sta 801+50

Barrel Shape: Circular
Barrel Diameter: 2.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Inlet Type: Conventional
Inlet Edge Condition: Square Edge with Headwall
Inlet Depression: NONE

Table 30 - Downstream Channel Rating Curve (Crossing: CP-27 Sta 801+50)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2679.25	0.00	0.00	0.00	0.00
6.30	2679.53	0.28	2.02	0.35	0.81
12.60	2679.65	0.40	2.44	0.50	0.84
18.90	2679.73	0.48	2.71	0.60	0.87
25.20	2679.80	0.55	2.93	0.69	0.88
31.50	2679.86	0.61	3.10	0.76	0.90
37.80	2679.91	0.66	3.25	0.83	0.91
44.10	2679.96	0.71	3.38	0.88	0.92
50.40	2680.00	0.75	3.50	0.94	0.92
56.70	2680.04	0.79	3.61	0.99	0.93
63.00	2680.08	0.83	3.71	1.03	0.94

Tailwater Channel Data - CP-27 Sta 801+50

Tailwater Channel Option: Irregular Channel
Channel Slope: 0.0200
User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2681.25	0.0350
2	21.00	2680.25	0.0350
3	38.00	2679.25	0.0350
4	44.00	2679.25	0.0350
5	62.00	2680.25	0.0350
6	96.00	2681.25	0.0000

Roadway Data for Crossing: CP-27 Sta 801+50

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2685.00
1	49.00	2684.00
2	100.00	2683.00

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

CP-28 Sta 794+30

Table 31 - Summary of Culvert Flows at Crossing: CP-28 Sta 794+30

Headwater Elevation (ft)	Total Discharge (cfs)	CP-28 Sta 794+30 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2671.30	0.00	0.00	0.00	1
2672.34	81.00	81.00	0.00	1
2672.92	162.00	162.00	0.00	1
2673.40	243.00	243.00	0.00	1
2673.84	324.00	324.00	0.00	1
2674.24	405.00	405.00	0.00	1
2674.61	486.00	486.00	0.00	1
2674.97	567.00	567.00	0.00	1
2675.31	648.00	648.00	0.00	1
2675.64	729.00	729.00	0.00	1
2675.96	810.00	810.00	0.00	1
2680.00	1747.27	1747.27	0.00	Overtopping

Table 32 - Culvert Summary Table: CP-28 Sta 794+30

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2671.30	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
81.00	81.00	2672.34	1.009	1.040	3-M2t	1.379	0.585	0.731	0.721	3.464	4.077
162.00	162.00	2672.92	1.597	1.620	3-M2t	2.222	0.929	1.096	1.086	4.618	4.649
243.00	243.00	2673.40	2.092	2.099	3-M2t	2.970	1.217	1.293	1.283	5.873	5.408
324.00	324.00	2673.84	2.526	2.535	2-M2c	3.666	1.474	1.472	1.454	6.877	6.011
405.00	405.00	2674.24	2.915	2.938	2-M2c	4.335	1.711	1.708	1.607	7.408	6.518
486.00	486.00	2674.61	3.279	3.315	2-M2c	5.000	1.932	1.929	1.747	7.873	6.960
567.00	567.00	2674.97	3.624	3.673	2-M2c	5.000	2.141	2.137	1.878	8.290	7.353
648.00	648.00	2675.31	3.954	4.013	2-M2c	5.000	2.340	2.337	2.006	8.663	7.685
729.00	729.00	2675.64	4.273	4.340	2-M2c	5.000	2.531	2.524	2.269	9.025	7.139
810.00	810.00	2675.96	4.586	4.655	2-M2c	5.000	2.716	2.709	2.425	9.344	7.030

 Inlet Elevation (invert): 2671.30 ft, Outlet Elevation (invert): 2671.29 ft
 Culvert Length: 48.00 ft, Culvert Slope: 0.0002

Site Data - CP-28 Sta 794+30

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2671.30 ft

Outlet Station: 48.00 ft

Outlet Elevation: 2671.29 ft

Number of Barrels: 4

Culvert Data Summary - CP-28 Sta 794+30

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (90°) Headwall

Inlet Depression: NONE

Table 33 - Downstream Channel Rating Curve (Crossing: CP-28 Sta 794+30)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2671.30	0.00	0.00	0.00	0.00
81.00	2672.02	0.72	4.08	0.90	0.96
162.00	2672.39	1.09	4.65	1.36	0.99
243.00	2672.58	1.28	5.41	1.60	1.03
324.00	2672.75	1.45	6.01	1.81	1.05
405.00	2672.91	1.61	6.52	2.01	1.07
486.00	2673.05	1.75	6.96	2.18	1.09
567.00	2673.18	1.88	7.35	2.34	1.11
648.00	2673.31	2.01	7.69	2.50	1.12
729.00	2673.57	2.27	7.14	2.83	1.10
810.00	2673.72	2.42	7.03	3.03	1.10

Tailwater Channel Data - CP-28 Sta 794+30

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0200

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2674.80	0.0350
2	63.00	2674.30	0.0350
3	67.00	2673.30	0.0350
4	70.00	2672.30	0.0350
5	74.00	2671.30	0.0350
6	90.00	2671.30	0.0350
7	100.00	2672.30	0.0350
8	109.00	2672.30	0.0350
9	114.00	2671.30	0.0350
10	118.00	2671.30	0.0350
11	120.00	2672.30	0.0350
12	124.00	2673.30	0.0350
13	161.00	2673.80	0.0000

Roadway Data for Crossing: CP-28 Sta 794+30

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 2680.00 ft

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

CP-33 Sta 769+08

Table 34 - Summary of Culvert Flows at Crossing: CP-33 Sta 769+08

Headwater Elevation (ft)	Total Discharge (cfs)	CP-33 Sta 769+08 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2649.99	0.00	0.00	0.00	1
2651.06	6.40	6.40	0.00	1
2651.56	12.80	12.80	0.00	1
2652.02	19.20	19.20	0.00	1
2652.41	25.60	25.60	0.00	1
2652.79	32.00	32.00	0.00	1
2653.17	38.40	38.38	0.02	6
2653.49	44.80	43.40	1.37	7
2653.73	51.20	46.73	4.43	8
2653.91	57.60	49.17	8.37	8
2654.05	64.00	51.01	12.95	7
2653.10	37.27	37.27	0.00	Overtopping

Table 35 - Culvert Summary Table: CP-33 Sta 769+08

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2649.99	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
6.40	6.40	2651.06	1.075	0.0*	1-S2n	0.536	0.782	0.542	0.387	7.248	3.227
12.80	12.80	2651.56	1.571	0.0*	1-S2n	0.764	1.131	0.775	0.546	8.775	3.902
19.20	19.20	2652.02	2.029	0.0*	1-S2n	0.952	1.398	0.957	0.664	9.862	4.348
25.60	25.60	2652.41	2.423	0.0*	1-S2n	1.108	1.627	1.117	0.760	10.656	4.690
32.00	32.00	2652.79	2.796	0.0*	1-S2n	1.255	1.832	1.261	0.843	11.335	4.972
38.40	38.38	2653.17	3.178	0.0*	5-S2n	1.390	2.010	1.437	0.916	11.464	5.213
44.80	43.40	2653.49	3.504	0.0*	5-S2n	1.496	2.142	1.550	0.983	11.786	5.425
51.20	46.73	2653.73	3.736	0.0*	5-S2n	1.563	2.218	1.567	1.054	12.515	5.509
57.60	49.17	2653.91	3.916	0.0*	5-S2n	1.611	2.274	1.618	1.120	12.651	5.570
64.00	51.01	2654.05	4.058	0.0*	5-S2n	1.648	2.316	1.655	1.178	12.764	5.642

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2649.99 ft, Outlet Elevation (invert): 2647.93 ft
 Culvert Length: 142.01 ft, Culvert Slope: 0.0145

Site Data - CP-33 Sta 769+08

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2649.99 ft
 Outlet Station: 142.00 ft
 Outlet Elevation: 2647.93 ft
 Number of Barrels: 1

Culvert Data Summary - CP-33 Sta 769+08

Barrel Shape: Circular
Barrel Diameter: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Inlet Type: Conventional
Inlet Edge Condition: Square Edge with Headwall
Inlet Depression: NONE

Table 36 - Downstream Channel Rating Curve (Crossing: CP-33 Sta 769+08)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2647.93	0.00	0.00	0.00	0.00
6.40	2648.32	0.39	3.23	0.80	1.09
12.80	2648.48	0.55	3.90	1.12	1.14
19.20	2648.59	0.66	4.35	1.37	1.17
25.60	2648.69	0.76	4.69	1.57	1.19
32.00	2648.77	0.84	4.97	1.74	1.21
38.40	2648.85	0.92	5.21	1.89	1.22
44.80	2648.91	0.98	5.42	2.02	1.24
51.20	2648.98	1.05	5.51	2.17	1.24
57.60	2649.05	1.12	5.57	2.31	1.25
64.00	2649.11	1.18	5.64	2.43	1.25

Tailwater Channel Data - CP-33 Sta 769+08

Tailwater Channel Option: Irregular Channel
Channel Slope: 0.0330
User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2649.93	0.0350
2	11.00	2648.93	0.0350
3	15.00	2647.93	0.0350
4	18.00	2647.93	0.0350
5	25.00	2648.93	0.0350
6	36.00	2649.93	0.0000

Roadway Data for Crossing: CP-33 Sta 769+08

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2656.00
1	90.00	2655.00
2	120.00	2654.00
3	126.00	2653.10
4	132.00	2654.00
5	142.00	2655.00
6	165.00	2656.00

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

CP-36 Camino de Oeste

Table 37 - Summary of Culvert Flows at Crossing: CP-36 Camino de Oeste

Headwater Elevation (ft)	Total Discharge (cfs)	CP-36 Camino de Oeste Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2627.81	0.00	0.00	0.00	1
2628.87	6.30	6.30	0.00	1
2629.36	12.60	12.60	0.00	1
2629.81	18.90	18.90	0.00	1
2630.20	25.20	25.20	0.00	1
2630.57	31.50	31.50	0.00	1
2630.94	37.80	37.80	0.00	1
2631.35	44.10	44.10	0.00	1
2631.81	50.40	50.40	0.00	1
2632.02	56.70	52.96	3.32	18
2632.03	63.00	53.15	9.50	4
2632.00	52.77	52.77	0.00	Overtopping

Table 38 - Culvert Summary Table: CP-36 Camino de Oeste

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2627.81	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
6.30	6.30	2628.87	1.060	0.0*	1-S2n	0.479	0.775	0.485	0.369	8.265	2.650
12.60	12.60	2629.36	1.546	0.0*	1-S2n	0.693	1.121	0.711	0.473	9.745	3.246
18.90	18.90	2629.81	2.000	0.0*	1-S2n	0.861	1.386	0.898	0.551	10.625	3.667
25.20	25.20	2630.20	2.391	0.0*	1-S2n	0.999	1.613	1.053	0.616	11.342	3.990
31.50	31.50	2630.57	2.758	0.0*	1-S2n	1.128	1.818	1.128	0.673	12.932	4.255
37.80	37.80	2630.94	3.133	0.0*	5-S2n	1.249	1.994	1.337	0.724	12.394	4.481
44.10	44.10	2631.35	3.542	0.0*	5-S2n	1.361	2.158	1.469	0.770	12.815	4.679
50.40	50.40	2631.81	4.001	0.0*	5-S2n	1.472	2.302	1.594	0.813	13.212	4.857
56.70	52.96	2632.02	4.205	0.0*	5-S2n	1.517	2.361	1.645	0.853	13.355	5.017
63.00	53.15	2632.03	4.221	0.0*	5-S2n	1.520	2.365	1.648	0.891	13.369	5.165

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2627.81 ft, Outlet Elevation (invert): 2625.77 ft
 Culvert Length: 99.02 ft, Culvert Slope: 0.0206

Site Data - CP-36 Camino de Oeste

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2627.81 ft
 Outlet Station: 99.00 ft
 Outlet Elevation: 2625.77 ft
 Number of Barrels: 1

Culvert Data Summary - CP-36 Camino de Oeste

Barrel Shape: Circular
 Barrel Diameter: 3.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Square Edge with Headwall
 Inlet Depression: NONE

Table 39 - Downstream Channel Rating Curve (Crossing: CP-36 Camino de Oeste)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2625.60	0.00	0.00	0.00	0.00
6.30	2625.97	0.37	2.65	0.44	1.09
12.60	2626.07	0.47	3.25	0.56	1.14
18.90	2626.15	0.55	3.67	0.65	1.18
25.20	2626.22	0.62	3.99	0.73	1.20
31.50	2626.27	0.67	4.26	0.80	1.22
37.80	2626.32	0.72	4.48	0.86	1.24
44.10	2626.37	0.77	4.68	0.91	1.25
50.40	2626.41	0.81	4.86	0.96	1.27
56.70	2626.45	0.85	5.02	1.01	1.28
63.00	2626.49	0.89	5.16	1.06	1.28

Tailwater Channel Data - CP-36 Camino de Oeste

Tailwater Channel Option: Irregular Channel
 Channel Slope: 0.0190
 User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2627.00	0.0250
2	11.00	2626.00	0.0250
3	19.00	2625.60	0.0250
4	25.00	2626.00	0.0250
5	35.00	2627.00	0.0000

Roadway Data for Crossing: CP-36 Camino de Oeste

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2634.00
1	205.00	2632.00
2	809.00	2632.00

Roadway Surface: Paved

Roadway Top Width: 49.00 ft

CP-37 Sta 750+53

Table 40 - Summary of Culvert Flows at Crossing: CP-37 Sta 750+53

Headwater Elevation (ft)	Total Discharge (cfs)	CP-37 Sta 750+53 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2620.91	0.00	0.00	0.00	1
2622.15	8.50	8.50	0.00	1
2622.76	17.00	17.00	0.00	1
2623.30	25.50	25.50	0.00	1
2623.80	34.00	34.00	0.00	1
2624.33	42.50	42.50	0.00	1
2624.94	51.00	51.00	0.00	1
2625.52	59.50	57.85	1.62	12
2625.71	68.00	59.93	7.96	9
2625.83	76.50	61.19	15.24	7
2625.92	85.00	62.12	22.73	5
2625.30	55.38	55.38	0.00	Overtopping

Table 41 - Culvert Summary Table: CP-37 Sta 750+53

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2620.91	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
8.50	8.50	2622.15	1.237	0.0*	1-S2n	0.500	0.917	0.507	0.209	10.505	2.045
17.00	17.00	2622.76	1.854	0.0*	1-S2n	0.719	1.311	0.721	0.314	12.880	2.649
25.50	25.50	2623.30	2.391	0.0*	1-S2n	0.900	1.623	0.954	0.399	13.152	3.072
34.00	34.00	2623.80	2.886	0.0*	1-S2n	1.039	1.888	1.128	0.472	13.961	3.406
42.50	42.50	2624.33	3.416	0.0*	5-S2n	1.177	2.121	1.291	0.538	14.596	3.687
51.00	51.00	2624.94	4.030	0.0*	5-S2n	1.300	2.316	1.445	0.598	15.134	3.929
59.50	57.85	2625.52	4.606	0.0*	5-S2n	1.397	2.451	1.564	0.654	15.530	4.145
68.00	59.93	2625.71	4.797	0.0*	5-S2n	1.427	2.484	1.598	0.707	15.658	4.339
76.50	61.19	2625.83	4.917	0.0*	5-S2n	1.444	2.505	1.620	0.756	15.727	4.516
85.00	62.12	2625.92	5.007	0.0*	5-S2n	1.458	2.520	1.636	0.803	15.774	4.679

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2620.91 ft, Outlet Elevation (invert): 2617.90 ft
 Culvert Length: 93.05 ft, Culvert Slope: 0.0324

Site Data - CP-37 Sta 750+53

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2620.91 ft
 Outlet Station: 93.00 ft
 Outlet Elevation: 2617.90 ft
 Number of Barrels: 1

Culvert Data Summary - CP-37 Sta 750+53

Barrel Shape: Circular
 Barrel Diameter: 3.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Square Edge with Headwall
 Inlet Depression: NONE

Table 42 - Downstream Channel Rating Curve (Crossing: CP-37 Sta 750+53)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2617.90	0.00	0.00	0.00	0.00
8.50	2618.11	0.21	2.04	0.26	0.81
17.00	2618.21	0.31	2.65	0.39	0.86
25.50	2618.30	0.40	3.07	0.50	0.89
34.00	2618.37	0.47	3.41	0.59	0.92
42.50	2618.44	0.54	3.69	0.67	0.93
51.00	2618.50	0.60	3.93	0.75	0.95
59.50	2618.55	0.65	4.14	0.82	0.96
68.00	2618.61	0.71	4.34	0.88	0.97
76.50	2618.66	0.76	4.52	0.94	0.98
85.00	2618.70	0.80	4.68	1.00	0.99

Tailwater Channel Data - CP-37 Sta 750+53

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0200

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2619.90	0.0350
2	4.00	2618.90	0.0350
3	8.00	2617.90	0.0350
4	27.00	2617.90	0.0350
5	32.00	2618.90	0.0350
6	37.00	2619.90	0.0000

Roadway Data for Crossing: CP-37 Sta 750+53

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2630.00
1	72.00	2626.30
2	120.00	2625.30
3	172.00	2627.50
4	314.00	2630.00

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

CP-39 Sta 745+70

Table 43 - Summary of Culvert Flows at Crossing: CP-39 Sta 745+70

Headwater Elevation (ft)	Total Discharge (cfs)	CP-39 Sta 745+70 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2616.42	0.00	0.00	0.00	1
2619.33	57.10	37.97	19.12	6
2619.87	114.20	47.78	66.38	6
2620.21	171.30	53.35	117.77	5
2620.47	228.40	57.33	170.95	6
2620.69	285.50	60.47	224.62	6
2620.89	342.60	63.09	279.18	6
2621.05	399.70	65.19	334.22	5
2621.18	456.80	66.83	389.57	4
2621.29	513.90	68.22	445.56	4
2621.39	571.00	69.42	501.32	3
2618.50	21.66	21.66	0.00	Overtopping

Table 44 - Culvert Summary Table: CP-39 Sta 745+70

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2616.42	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
57.10	37.97	2619.33	2.914	0.0*	1-S2n	1.102	1.999	1.113	0.790	15.868	5.044
114.20	47.78	2619.87	3.447	0.0*	5-S2n	1.254	2.242	1.367	1.124	15.225	6.125
171.30	53.35	2620.21	3.789	0.0*	5-S2n	1.332	2.370	1.462	1.372	15.598	6.839
228.40	57.33	2620.47	4.053	0.0*	5-S2n	1.389	2.443	1.530	1.575	15.826	7.385
285.50	60.47	2620.69	4.274	0.0*	5-S2n	1.433	2.493	1.582	1.751	16.003	7.834
342.60	63.09	2620.89	4.467	0.0*	5-S2n	1.470	2.535	1.625	1.906	16.148	8.219
399.70	65.19	2621.05	4.628	0.0*	5-S2n	1.499	2.569	1.659	2.046	16.267	8.562
456.80	66.83	2621.18	4.757	0.0*	5-S2n	1.521	2.595	1.685	2.174	16.356	8.878
513.90	68.22	2621.29	4.869	0.0*	5-S2n	1.540	2.618	1.708	2.293	16.429	9.165
571.00	69.42	2621.39	4.966	0.0*	5-S2n	1.556	2.637	1.727	2.404	16.489	9.428

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2616.42 ft, Outlet Elevation (invert): 2613.01 ft
 Culvert Length: 105.06 ft, Culvert Slope: 0.0325

Site Data - CP-39 Sta 745+70

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2616.42 ft
 Outlet Station: 105.00 ft
 Outlet Elevation: 2613.01 ft
 Number of Barrels: 1

Culvert Data Summary - CP-39 Sta 745+70

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Grooved End in Headwall

Inlet Depression: NONE

Table 45 - Downstream Channel Rating Curve (Crossing: CP-39 Sta 745+70)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2612.00	0.00	0.00	0.00	0.00
57.10	2612.79	0.79	5.04	1.46	1.17
114.20	2613.12	1.12	6.13	2.08	1.23
171.30	2613.37	1.37	6.84	2.54	1.26
228.40	2613.58	1.58	7.39	2.92	1.29
285.50	2613.75	1.75	7.83	3.24	1.31
342.60	2613.91	1.91	8.22	3.53	1.32
399.70	2614.05	2.05	8.56	3.79	1.34
456.80	2614.17	2.17	8.88	4.03	1.35
513.90	2614.29	2.29	9.16	4.25	1.36
571.00	2614.40	2.40	9.43	4.46	1.37

Tailwater Channel Data - CP-39 Sta 745+70

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0297

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2616.00	0.0350
2	32.00	2615.00	0.0350
3	53.00	2612.00	0.0350
4	62.00	2612.00	0.0350
5	75.00	2614.00	0.0350
6	86.00	2616.00	0.0250

Roadway Data for Crossing: CP-39 Sta 745+70

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2622.00
1	152.00	2621.00
2	173.00	2619.00
3	180.00	2618.50
4	187.00	2619.00
5	207.00	2620.00
6	232.00	2621.00
7	240.00	2621.40
8	249.00	2621.00
9	263.00	2620.80
10	270.00	2621.00
11	313.00	2622.00

Coefficient of Discharge: 2.7500

Roadway Top Width: 56.00 ft

CP-47 Sta 699+44

Table 46 - Summary of Culvert Flows at Crossing: CP-47 Sta 699+44

Headwater Elevation (ft)	Total Discharge (cfs)	CP-47 Sta 699+44 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2544.20	0.00	0.00	0.00	1
2544.70	5.00	5.00	0.00	1
2544.92	10.00	10.00	0.00	1
2545.09	15.00	15.00	0.00	1
2545.24	20.00	20.00	0.00	1
2545.38	25.00	25.00	0.00	1
2545.50	30.00	30.00	0.00	1
2545.61	35.00	35.00	0.00	1
2545.74	40.00	40.00	0.00	1
2545.85	45.00	45.00	0.00	1
2545.97	50.00	50.00	0.00	1
2548.00	141.78	141.78	0.00	Overtopping

Table 47 - Culvert Summary Table: CP-47 Sta 699+44

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2544.20	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
5.00	5.00	2544.70	0.498	0.0*	1-S2n	0.201	0.363	0.201	0.274	4.968	1.907
10.00	10.00	2544.92	0.719	0.0*	1-S2n	0.318	0.538	0.328	0.348	9.320	2.401
15.00	15.00	2545.09	0.890	0.0*	1-S2n	0.378	0.659	0.389	0.403	8.299	2.792
20.00	20.00	2545.24	1.039	0.0*	1-S2n	0.437	0.769	0.459	0.451	8.774	3.103
25.00	25.00	2545.38	1.177	0.0*	1-S2n	0.496	0.872	0.502	0.494	9.732	3.364
30.00	30.00	2545.50	1.297	0.0*	1-S2n	0.555	0.955	0.557	0.533	10.208	3.592
35.00	35.00	2545.61	1.413	0.0*	1-S2n	0.596	1.038	0.598	0.570	10.887	3.794
40.00	40.00	2545.74	1.536	0.0*	1-S2n	0.632	1.121	0.640	0.605	11.160	3.977
45.00	45.00	2545.85	1.653	0.0*	1-S2n	0.668	1.191	0.681	0.637	11.517	4.144
50.00	50.00	2545.97	1.766	0.0*	1-S2n	0.704	1.259	0.709	0.668	12.119	4.298

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2544.20 ft, Outlet Elevation (invert): 2539.15 ft
 Culvert Length: 200.06 ft, Culvert Slope: 0.0252

Site Data - CP-47 Sta 699+44

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2544.20 ft
 Outlet Station: 200.00 ft
 Outlet Elevation: 2539.15 ft
 Number of Barrels: 2

Culvert Data Summary - CP-47 Sta 699+44

Barrel Shape: Elliptical
Barrel Span: 53.00 in
Barrel Rise: 34.00 in
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Inlet Type: Conventional
Inlet Edge Condition: Square Edge with Headwall
Inlet Depression: NONE

Table 48 - Downstream Channel Rating Curve (Crossing: CP-47 Sta 699+44)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2537.70	0.00	0.00	0.00	0.00
5.00	2537.97	0.27	1.91	0.25	0.91
10.00	2538.05	0.35	2.40	0.32	0.96
15.00	2538.10	0.40	2.79	0.37	1.00
20.00	2538.15	0.45	3.10	0.41	1.03
25.00	2538.19	0.49	3.36	0.45	1.05
30.00	2538.23	0.53	3.59	0.49	1.06
35.00	2538.27	0.57	3.79	0.52	1.08
40.00	2538.30	0.60	3.98	0.55	1.09
45.00	2538.34	0.64	4.14	0.58	1.10
50.00	2538.37	0.67	4.30	0.61	1.11

Tailwater Channel Data - CP-47 Sta 699+44

Tailwater Channel Option: Irregular Channel
Channel Slope: 0.0146
User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2540.00	0.0250
2	8.00	2539.00	0.0250
3	14.00	2538.00	0.0250
4	23.00	2537.70	0.0250
5	35.00	2538.00	0.0250
6	40.00	2539.00	0.0250
7	44.00	2540.00	0.0000

Roadway Data for Crossing: CP-47 Sta 699+44

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2550.00
1	73.00	2549.00
2	132.00	2548.00
3	178.00	2548.37
4	221.00	2549.00
5	262.00	2550.00

Roadway Surface: Paved

Roadway Top Width: 147.50 ft

CP-64 Sta 556+73

Table 49 - Summary of Culvert Flows at Crossing: CP-64 Sta 556+73

Headwater Elevation (ft)	Total Discharge (cfs)	CP-64 Sta 556+73 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2186.50	0.00	0.00	0.00	1
2187.21	16.10	16.10	0.00	1
2187.85	32.20	32.20	0.00	1
2188.33	48.30	48.30	0.00	1
2188.76	64.40	64.40	0.00	1
2189.14	80.50	80.50	0.00	1
2189.50	96.60	96.60	0.00	1
2189.84	112.70	112.70	0.00	1
2190.17	128.80	128.80	0.00	1
2190.50	144.90	144.90	0.00	1
2190.81	161.00	161.00	0.00	1
2193.00	272.63	272.63	0.00	Overtopping

Table 50 - Culvert Summary Table: CP-64 Sta 556+73

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2186.50	0.000	0.740	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
16.10	16.10	2187.21	1.446	0.0*	1-S2n	0.894	0.952	0.942	0.165	5.023	2.765
32.20	32.20	2187.85	2.091	0.0*	1-S2n	1.308	1.427	1.317	0.245	6.353	3.502
48.30	48.30	2188.33	2.573	0.0*	1-S2n	1.598	1.732	1.622	0.308	7.083	4.000
64.40	64.40	2188.76	2.999	1.102	1-S2n	1.853	2.036	1.866	0.362	7.763	4.384
80.50	80.50	2189.14	3.380	1.149	1-S2n	2.106	2.277	2.106	0.409	8.260	4.701
96.60	96.60	2189.50	3.738	1.192	1-S2n	2.301	2.501	2.311	0.452	8.690	4.972
112.70	112.70	2189.84	4.081	1.231	1-S2n	2.497	2.725	2.515	0.491	9.034	5.210
128.80	128.80	2190.17	4.413	1.266	1-S2n	2.692	2.919	2.709	0.526	9.354	5.449
144.90	144.90	2190.50	4.736	1.298	1-S2n	2.876	3.098	2.888	0.558	9.668	5.675
161.00	161.00	2190.81	5.052	1.329	1-S2n	3.045	3.277	3.067	0.589	9.918	5.883

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2185.76 ft, Outlet Elevation (invert): 2185.01 ft
 Culvert Length: 54.01 ft, Culvert Slope: 0.0139

Site Data - CP-64 Sta 556+73

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2185.76 ft
 Outlet Station: 54.00 ft
 Outlet Elevation: 2185.01 ft
 Number of Barrels: 1

Culvert Data Summary - CP-64 Sta 556+73

Barrel Shape: Circular
Barrel Diameter: 7.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: NONE

Table 51 - Downstream Channel Rating Curve (Crossing: CP-64 Sta 556+73)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2186.50	0.00	0.00	0.00	0.00
16.10	2186.66	0.16	2.76	0.29	1.27
32.20	2186.75	0.25	3.50	0.43	1.35
48.30	2186.81	0.31	4.00	0.54	1.40
64.40	2186.86	0.36	4.38	0.63	1.43
80.50	2186.91	0.41	4.70	0.72	1.45
96.60	2186.95	0.45	4.97	0.79	1.47
112.70	2186.99	0.49	5.21	0.86	1.49
128.80	2187.03	0.53	5.45	0.92	1.51
144.90	2187.06	0.56	5.67	0.98	1.52
161.00	2187.09	0.59	5.88	1.03	1.54

Tailwater Channel Data - CP-64 Sta 556+73

Tailwater Channel Option: Irregular Channel
Channel Slope: 0.0280
User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2188.00	0.0250
2	25.50	2187.00	0.0250
3	40.00	2186.50	0.0250
4	71.00	2186.50	0.0250
5	83.00	2187.00	0.0250
6	87.00	2188.00	0.0000

Roadway Data for Crossing: CP-64 Sta 556+73

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2195.00
1	43.00	2194.00
2	77.00	2193.00

Roadway Surface: Paved

Roadway Top Width: 37.00 ft

CP-70 Sta 442+87

Table 52 - Summary of Culvert Flows at Crossing: CP-70 Sta 442+87

Headwater Elevation (ft)	Total Discharge (cfs)	CP-70 sta 442+87 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2038.43	0.00	0.00	0.00	1
2041.81	187.40	45.96	140.33	14
2042.01	374.80	48.17	324.72	7
2042.13	562.20	49.51	510.94	5
2042.24	749.60	50.62	698.33	5
2042.33	937.00	51.60	884.09	4
2042.42	1124.40	52.53	1071.28	4
2042.49	1311.80	52.96	1256.68	3
2042.57	1499.20	53.42	1444.76	3
2042.63	1686.60	53.76	1632.56	3
2042.70	1874.00	53.76	1818.52	2
2041.30	40.19	40.19	0.00	Overtopping

Table 53 - Culvert Summary Table: CP-70 sta 442+87

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2038.43	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
187.40	45.96	2041.81	3.065	3.380	7-M2c	2.000	1.693	1.705	1.261	8.055	1.122
374.80	48.17	2042.01	3.231	3.579	7-M2c	2.000	1.725	1.738	1.419	8.307	1.435
562.20	49.51	2042.13	3.337	3.703	7-M2c	2.000	1.745	1.757	1.545	8.466	1.649
749.60	50.62	2042.24	3.427	3.809	7-M2c	2.000	1.761	1.768	1.652	8.612	1.816
937.00	51.60	2042.33	3.508	3.902	7-M2c	2.000	1.776	1.779	1.747	8.739	1.954
1124.40	52.53	2042.42	3.587	3.986	7-M2t	2.000	1.790	1.804	1.834	8.806	2.073
1311.80	52.96	2042.49	3.624	4.063	7-M2t	2.000	1.796	1.884	1.914	8.631	2.177
1499.20	53.42	2042.57	3.663	4.135	7-M2t	2.000	1.803	1.954	1.984	8.552	2.284
1686.60	53.76	2042.63	3.693	4.203	4-FFf	2.000	1.808	2.000	2.047	8.556	2.393
1874.00	53.76	2042.70	3.693	4.263	4-FFf	2.000	1.808	2.000	2.106	8.557	2.495

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2038.43 ft, Outlet Elevation (invert): 2038.08 ft
 Culvert Length: 98.00 ft, Culvert Slope: 0.0036

Site Data - CP-70 sta 442+87

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2038.43 ft
 Outlet Station: 98.00 ft
 Outlet Elevation: 2038.08 ft
 Number of Barrels: 2

Culvert Data Summary - CP-70 sta 442+87

Barrel Shape: Circular
 Barrel Diameter: 2.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End Projecting
 Inlet Depression: NONE

Table 54 - Downstream Channel Rating Curve (Crossing: CP-70 Sta 442+87)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2038.05	0.00	0.00	0.00	0.00
187.40	2039.31	1.26	1.12	0.28	0.37
374.80	2039.47	1.42	1.44	0.32	0.39
562.20	2039.59	1.54	1.65	0.35	0.40
749.60	2039.70	1.65	1.82	0.37	0.41
937.00	2039.80	1.75	1.95	0.39	0.42
1124.40	2039.88	1.83	2.07	0.41	0.43
1311.80	2039.96	1.91	2.18	0.43	0.43
1499.20	2040.03	1.98	2.28	0.45	0.44
1686.60	2040.10	2.05	2.39	0.46	0.44
1874.00	2040.16	2.11	2.49	0.47	0.45

Tailwater Channel Data - CP-70 Sta 442+87

Tailwater Channel Option: Irregular Channel
 Channel Slope: 0.0036
 User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2043.00	0.0250
2	18.00	2041.00	0.0350
3	30.00	2040.00	0.0350
4	53.00	2039.00	0.0350
5	73.00	2038.05	0.0350
6	89.00	2039.00	0.0350
7	129.00	2039.15	0.0350
8	268.00	2039.00	0.0350
9	533.00	2039.00	0.0350
10	803.00	2040.00	0.0350
11	803.10	2043.00	0.0350

Roadway Data for Crossing: CP-70 Sta 442+87

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2043.50
1	100.00	2043.00
2	330.00	2042.00
3	500.00	2041.30
4	830.00	2042.00
5	1055.00	2043.00
6	1335.00	2044.00

Roadway Surface: Paved

Roadway Top Width: 40.00 ft

Trico RCBC

Table 55 - Summary of Culvert Flows at Crossing: Trico RCBC

Headwater Elevation (ft)	Total Discharge (cfs)	Trico Sta 487+50 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2056.07	0.00	0.00	0.00	1
2057.19	80.00	80.00	0.00	1
2057.85	160.00	160.00	0.00	1
2058.40	240.00	240.00	0.00	1
2058.90	320.00	320.00	0.00	1
2059.35	400.00	400.00	0.00	1
2059.77	480.00	480.00	0.00	1
2060.17	560.00	560.00	0.00	1
2060.55	640.00	640.00	0.00	1
2060.97	720.00	720.00	0.00	1
2061.43	800.00	800.00	0.00	1
2062.40	954.56	954.56	0.00	Overtopping

Table 56 - Culvert Summary Table: Trico Sta 487+50

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2056.07	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
80.00	80.00	2057.19	1.120	0.0*	1-S2n	0.701	0.703	0.702	0.922	4.749	3.000
160.00	160.00	2057.85	1.775	0.0*	1-S2n	1.110	1.116	1.115	1.399	5.980	3.891
240.00	240.00	2058.40	2.297	2.332	1-S1t	1.456	1.462	1.775	1.785	5.634	4.515
320.00	320.00	2058.90	2.757	2.825	3-M1t	1.772	1.771	2.111	2.121	6.315	5.008
400.00	400.00	2059.35	3.192	3.276	3-M1t	2.070	2.055	2.415	2.425	6.901	5.421
480.00	480.00	2059.77	3.614	3.698	3-M1t	2.352	2.321	2.695	2.705	7.421	5.779
560.00	560.00	2060.17	4.033	4.098	7-M1t	2.623	2.572	2.956	2.966	7.893	6.097
640.00	640.00	2060.55	4.459	4.478	7-M1t	2.887	2.812	3.203	3.213	8.327	6.383
720.00	720.00	2060.97	4.899	4.843	7-M1t	3.145	3.041	3.436	3.446	8.730	6.643
800.00	800.00	2061.43	5.359	5.195	7-M1t	3.396	3.263	3.660	3.670	9.108	6.884

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2056.07 ft, Outlet Elevation (invert): 2055.92 ft
 Culvert Length: 54.00 ft, Culvert Slope: 0.0028

Site Data - Trico Sta 487+50

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2056.07 ft
 Outlet Station: 54.00 ft
 Outlet Elevation: 2055.92 ft
 Number of Barrels: 3

Culvert Data Summary - Trico Sta 487+50

Barrel Shape: Concrete Box
Barrel Span: 8.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Inlet Type: Conventional
Inlet Edge Condition: 1:1 Bevel Headwall
Inlet Depression: NONE

Table 57 - Downstream Channel Rating Curve (Crossing: Trico RCBC)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2055.91	0.00	0.00	0.00	0.00
80.00	2056.83	0.92	3.00	0.35	0.56
160.00	2057.31	1.40	3.89	0.52	0.59
240.00	2057.69	1.78	4.51	0.67	0.61
320.00	2058.03	2.12	5.01	0.79	0.63
400.00	2058.34	2.43	5.42	0.91	0.64
480.00	2058.61	2.70	5.78	1.01	0.65
560.00	2058.88	2.97	6.10	1.11	0.65
640.00	2059.12	3.21	6.38	1.20	0.66
720.00	2059.36	3.45	6.64	1.29	0.66
800.00	2059.58	3.67	6.88	1.37	0.67

Tailwater Channel Data - Trico RCBC

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 28.00 ft
Side Slope (H:V): 1.00 (_:1)
Channel Slope: 0.0060
Channel Manning's n: 0.0350
Channel Invert Elevation: 2055.91 ft

Roadway Data for Crossing: Trico RCBC

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 40.00 ft
Crest Elevation: 2062.40 ft
Roadway Surface: Paved
Roadway Top Width: 30.00 ft

APPENDIX F

PROPOSED CONDITIONS CROSS CULVERT ANALYSIS

Includes

- Cross Drainage Structure Summary Table
- HY-8 Computations
- Grate Inlet Computations and Standard Grate Details
- StormCAD Computation for the Culvert at CP-47
- Reduced Size Culvert Plan and Profile Sheets (Provided by Psomas & Kittelson Associates, Inc.)

Proposed Cross Drainage Structures Summary Table

Roadway Station	Local Watershed		Culvert/Bridge Design Flow		Proposed Culvert Size	Culvert Length (ft)	Culvert Invert Elev.		Culvert Slope	Headwater Elevation	Min. Top of Training Berm Elevation	Culvert Outlet Depth (ft)	Culvert Outlet Velocity (fps)	Tailwater Depth (ft)	Drop Inlet	Min. Drop Inlet Lip Width (ft)	Lip Elev. (ft)	Drop Inlet Height (ft)	Drop Inlet Slope (ft/ft)
	Watershed	Q100 (cfs)	Contributing Watersheds	Q100 (cfs)			Upstream	Downstream											
962+13	La Canada Dr																		
955+50	1	422	1	422	2-10'x4' RCBC	148.0	2,784.0	2,780.0	2.7%	2,787.9	N/A	1.2	17.0	3.5	yes	35.0	2786.0	2.0	2:1
946+90	2	558	2	558	2-10'x5' RCBC	155.0	2,784.0	2,781.5	1.6%	2,788.5	N/A	1.8	15.7	1.9	yes	50.0	2786.0	2.0	2:1
941+55	3	59	Diverted to CP-4																
932+94	4	639	3+4	698	3-10'x4' RCBC	239.0	2,775.0	2,769.3	2.4%	2,779.0	N/A	1.3	17.8	1.8	no	-	-	-	-
931+13	5	278	5+6	304	2-6'x4' RCBC	128.0	2,773.0	2,769.3	2.9%	2,777.7	N/A	1.5	17.2	1.1	yes	23.0	2775.5	2.5	2:1
924+00	6	26	Diverted to CP-5																
918+72	7	470	7	470	3-8'x4' RCBC	143.0	2,778.2	2,774.0	2.9%	2,781.7	N/A	1.2	16.9	1.9	no	-	-	-	-
913+63	8	145	8	145	4-36" RCP	160.0	2,778.5	2,774.5	2.5%	2,781.3	N/A	1.2	14.3	1.1	yes	-	2780.0	1.5	2:1
910+44	9	135	9	135	4-45"x29" HERCP	149	2,778.5	2,775.0	2.3%	2,781.7	N/A	0.91	13.2	1.12	yes	-	2781	2.5	2:1
La Cholla Sta 534+93	8&9	280	8&9	280	6-42" RCP	191	2,763.9	2,760.8	1.6%	2,767.0	N/A		12.3	0.99	no	-			
909+28	La Cholla Blvd																		
904+62	10	123	10	123	3-36" RCP	162	2,774.5	2,771.5	1.9%	2,777.6	N/A	1.42	12.48	0.84	yes	-	2776.5	2.0	2:1
897+65	11	172	11	172	3-48" RCP	157	2,771.8	2,770.3	1.0%	2,775.1	N/A	1.78	10.6	1.38	yes	42.0	2774.2	2.4	2:1
894+33	12	60	Diverted to CP-13																
885+32	13	2,683	12+13	2,743	7-10'x6' RCBC	146	2,763.5	2,760.7	1.9%	2,768.7	2769.7	2.22	17.6	3.36	no	-	-	-	-
883+00	14	77	14	77	3-36" RCP	133	2,765.0	2,763.5	1.1%	2,767.3		1.25	9.2	1.26	no	-	-	-	-
878+25	15	40	15	40	1-42" RCP	157	2,760.5	2,757.9	1.7%	2,763.3	N/A	1.33	11.9	0.32	no				
874+87	16	153	16	153	2-48" RCP	140	2,758.2	2,754.1	2.9%	2,762.0	N/A	1.63	15.9	1.26	no	-	-	-	-
868+80	17	126	17	126	2-48" RCP	144	2,755.3	2,752.0	2.3%	2,758.7	2,759.4	1.54	14.1	1.26	no	-	-	-	-
860+00	18	28	Diverted to CP-19																
857+50	Shannon Rd																		
855+03	19	4,678	18+19	4,706	1-36"x9' Arch (embedded 8"), 2-32'x8' Arch w/ paved invert	181	2,730.0	2,727.5	1.4%	2,737.6	2,738.6	2.66	18.39	3.8	no	-	-	-	-
847+26	20	168	20	168	2-48" RCP	140	2,726.4	2,724.5	1.4%	2,730.5	N/A	2.09	12.65	1.32	yes	32.0	2728.4	2.0	2:1
835+80	21	316	21	316	2-8'x4' RCBC	125	2,719.4	2,717.0	1.9%	2,723.7	N/A	1.36	14.6	1.91	yes	38.0	2721.8	2.4	2:1
828+00	22	1,110	22	1,110	4-10'x6' RCBC	122	2,713.3	2,710.2	2.5%	2,717.5	2,718.5	1.62	17.2	2.2	no	-	-	-	-
825+31	23	12	23	12	1-24"	150	2,712.5	2,709.0	2.3%	2,714.3	N/A	0.80	10.6	0.4	no	-	-	-	-
818+42	24	157	24	157	2-48" RCP	170	2,699.4	2,696.2	1.9%	2,703.3	N/A	1.80	14.1	1.15	yes	45.0	2702.5	3.1	2:1
812+03	25	339	25	339	2-8'x4' RCBC	193	2,689.4	2,686.5	1.5%	2,693.2	N/A	1.46	14.49	1.75	yes	50.0	2692.8	3.4	0.1
809+20	26.1	111	26.1	111	2-42" RCP	148	2,687.3	2,685.5	1.2%	2,691.2	N/A	1.67	12.21	1.87	yes	37.0	2689.8	2.5	2:1
805+64	26.2	7	26.2	7	1-24" RCP	156	2,686.1	2,684.6	1.0%	2,689.5	N/A	0.76	6.7	0.47	n/a	-	-	-	Grate Inlet, EI 2688.8

Proposed Cross Drainage Structures Summary Table

Roadway Station	Local Watershed		Culvert/Bridge Design Flow		Proposed Culvert Size	Culvert Length (ft)	Culvert Invert Elev.		Culvert Slope	Headwater Elevation	Min. Top of Training Berm Elevation	Culvert Outlet Depth (ft)	Culvert Outlet Velocity (fps)	Tailwater Depth (ft)	Drop Inlet	Min. Drop Inlet Lip Width (ft)	Lip Elev. (ft)	Drop Inlet Height (ft)	Drop Inlet Slope (ft/ft)
	Watershed	Q100 (cfs)	Contributing Watersheds	Q100 (cfs)			Upstream	Downstream											
Thornycroft Sta 53+00	27 E	Est. 42	27 E	Est. 42	2-24" RCP	190	2688.80	2685.30	1.8%	2692.7	-	1.20	11.2	0.9	Yes	25	2692.0	3.2	1:1
804+64	Thornycroft Road																		
801+54	27	63	27	63	Extend Existing 3-30" RCP	154	2,680.7	2,679.0	1.1%	2,684.1	N/A	1.09	8.7	0.76	Yes	25	2683.47	2.8	2:1
794+30	28	810	28	810	4-8'x5' RCBC	121	2,672.9	2,671.1	1.5%	2,677.0	N/A	1.68	14.3	2.48	No	-	-	-	-
787+65	29	127	29	127	2-48" RCP	137	2,667.7	2,663.6	3.0%	2,671.1	N/A	1.42	15.88	1.75	No	40	2670.1	2.4	-
781+97	30	140	30	140	2-48" RCP	180	2,663.6	2,657.9	3.2%	2,667.2	N/A	1.44	17.2	1.1	No	-	-	-	-
774+67	Camino de Manana																		
777+54	31	31	31	31	1-36" RCP	158	2,663.5	2,658.8	3.0%	2,666.1	N/A	1.02	14.61	0.89	No	-	-	-	-
772+32	32	2,574	32	2,574	3-24'x7' Arch (embedded 8")	138	2,657.2	2,651.7	4.0%	2,662.9	2,663.9	1.64	21.8	3.74	Yes	-	-	-	-
768+72	33.1	26	33.1	26	1-36" RCP	232	2,653.4	2,647.4	2.6%	2,655.7	N/A	0.98	12.4	0.70	No	-	-	-	-
767+00	33.2	38	Delete culvert > 38 cfs conveyed west through roadside ditch to CP-35, 756+84 culvert																
763+50	34	20	Diverted to CP-35																
756+84	35	549	33.2+34+35	607	2-10'x5' RCBC	192	2,630.4	2,626.8	1.9%	2,635.1	2,636.1	1.76	17.3	2.97	Yes	49	2632.8	2.4	2:1
752+90	Camino De Oeste																		
Cmo de Oeste Sta. 29+05	36	66	36	66	2-36" RCP	91	2,628.5	2,627.2	1.5%	2,631.2	N/A	1.39	10.3	1.2	No	N/A	N/A	N/A	N/A
750+46	37	32	36+37	98	2-42" RCP	163	2,623.1	2,617.6	3.4%	2,626.2	2,627.2	1.2	16.4	1.2	No	-	-	-	-
747+00	38	25	Diverted to CP-39																
744+40	39	546	38+39	571	3-10'x4' RCBC	132	2,616.1	2,612.8	2.5%	2,620.7	2,621.7	1.20	15.9	2.69	Yes	-	2619.1	3.0	2:1
735+69	40	372	40	372	4-10'x6' RCBC	157	2,602.1	2,597.5	2.9%	2,604.5	2,605.5	0.64	14.6	1.14	No	-	-	-	-
730+92	41	80	41	80	2-42" RCP	186	2,593.1	2,587.9	2.8%	2,597.1	2,598.1	1.18	14.0	0.59	Yes	28	2596.11	3.0	2:1
726+38	42	399	Culvert removed > flow diverted to CP-44																
722+75	43	97	Diverted to CP-44																
716+38	44	689	43+44	1,185	4-10'x5' RCBC	135	2,562.0	2,557.0	3.7%	2,566.9	2,567.9	1.49	19.9	2.63	Yes	56	2564.62	2.6	2:1
711+44	45	172	45	172	2-48" RCP	149	2,554.3	2,552.1	1.5%	2,558.5	N/A	2.06	13.21	1.13	Yes	35	2557.1	2.8	2:1
706+73	46	435	46	435	2-10'x4' RCBC	160	2,548.9	2,545.2	2.3%	2,552.7	N/A	1.31	16.5	2.61	Yes	33	2550.3	1.4	2:1
700+00	Dove Mountain Blvd																		
699+44	47	50	47	50	Extend Existing 2-53"x34" HERCP	299	2,544.4	2,537.6	Varies	2,549.0	N/A	0.8	10.9	SEE Stormdrain Profile				Grate Inlet, EI 2548.2	
694+27	48	88	48	88	2-42" RCP	153	2,535.9	2,533.9	1.3%	2,538.8	2,539.8	1.50	11.1	0.94	Yes	24	2537.9	2.0	2:1
691+04	49.1	14	49	14	1-24" RCP	187	2,533.3	2,527.8	3.0%	2,535.3	2,536.3	0.8	12.06	0.6	No	-	-	-	-
689+34	49.2	80	Diverted to CP-52																
685+17	50	26	Diverted to CP-52																
678+50	51	77	Diverted to CP-52																
672+50	52.1	2,537	49.2+50+51+52	2,537	5-10'x4' RCBC	169	2,487.5	2,482.3	3.1%	2,492.1	2,493.1	1.46	19.80	3.50	-	-	-	-	-
661+84	52.2	4,059	49.2+50+51+52	4,059	1-104'x9' Bridge	N/A													
644+50	53	148	53	148	3-42" RCP	154	2,415.8	2,413.8	1.3%	2,419.4	2,420.4	1.60	11.5	0.83	Yes	28	2418.4	2.6	2:1

Proposed Cross Drainage Structures Summary Table

Roadway Station	Local Watershed		Culvert/Bridge Design Flow		Proposed Culvert Size	Culvert Length (ft)	Culvert Invert Elev.		Culvert Slope	Headwater Elevation	Min. Top of Training Berm Elevation	Culvert Outlet Depth (ft)	Culvert Outlet Velocity (fps)	Tailwater Depth (ft)	Drop Inlet	Min. Drop Inlet Lip Width (ft)	Lip Elev. (ft)	Drop Inlet Height (ft)	Drop Inlet Slope (ft/ft)
	Watershed	Q100 (cfs)	Contributing Watersheds	Q100 (cfs)			Upstream	Downstream											
635+38	54	124	54	124	2-42" RCP	162	2,390.3	2,387.4	1.8%	2,394.5	2,395.5	1.71	13.2	0.71	Yes	33	2393.4	3.1	2:1
627+84	55	157	55	157	2-48" RCP	138	2,369.0	2,367.6	1.0%	2,372.9	2,373.9	2.11	11.7	1.06	Yes	30	2371	2.0	2:1
630+71 LT Driveway Culvert	55.1	21	55.1	21	2-24" RCP	50	2,375.7	2,375.2	1.0%	2,377.4	-	0.55	7.5	0.7	No	-	-	-	-
613+05	56	232	56	232	4-10'x6' RCBC	156	2,327.6	2,324.7	1.9%	2,331.8	2,332.8	0.53	10.3	1.03	Yes	35	2331.0	3.4	10:1
605+00	57	50	Diverted to CP-58																
596+45	58	41	57+58	91	2-42" RCP	170	2,285.6	2,282.8	1.6%	2,288.9	2,289.9	1.45	12.1	0.59	Yes	25	2287.9	2.3	2:1
592+82	59	161	59	161	2-48" RCP	171	2,277.5	2,274.9	1.5%	2,281.5	2,282.5	1.96	13.1	1.06	Yes	20	2279.8	2.3	2:1
588+63	60	312	60	312	2-8'x4' RCBC	151	2,268.4	2,265.0	2.2%	2,272.4	2,273.4	1.26	15.5	1.07	Yes	27	2270.5	2.1	2:1
579+09	61	73	61	73	2-36" RCP	186	2,247.2	2,240.7	3.5%	2,250.0	2,251.0	1.10	15.3	0.69	No	-	-	-	-
575+67	62.1	637	62 (90% of total CP62 discharge)	637	1-60'x9' Bridge	N/A													
570+97	62.2	71	62 (10% of total CP62 discharge)	71	2-36" RCP	163	2,226.4	2,222.8	2.2%	2,229.2	2,230.2	1.19	13.6	0.45	No	-	-	-	-
568+78 LT	62.3	15	62.3	15	1-24" RCP	56	2,220.8	2,219.7	2.0%	2,222.9	N/A	1.01	9.4	0.53	No	-	-	-	-
561+35	63	58	62.3+63	73	2-36" RCP	256	2,204.3	2,197.9	2.5%	2,207.1	2,208.1	1.22	13.6	0.6	Yes	20	2205.6	1.3	2:1
555+06	64	161	64	161	2-48" RCP	156	2,185.8	2,182.6	2.0%	2,189.8	2,190.8	1.83	14.4	1.29	No	-	-	-	-
544+94	65	60	65	60	2-36" RCP	262	2,164.5	2,159.0	2.1%	2,167.8	2,168.8	1.15	12.0	0.53	Yes	22	2167.0	2.5	2:1
528+60	Breakers Rd.																		
526+65	66	563	66	563	3-8'x4' RCBC	200	2,119.0	2,115.2	1.9%	2,123.0	2,124.0	1.46	16.1	1.33	Yes	65	2121.1	2.1	2:1
524+28 LT Driveway Culvert	67.1	156	67	156	4-30" RCP	52	2,112.5	2,112.0	1.0%	2,116.1	-	-	10.2	1.23	-	-	-	-	-
515+35	67	785	67	785	4-10'x4' RCBC	178	2,094.9	2,091.5	1.9%	2,098.5	2,099.5	1.27	15.4	2.04	No	-	-	-	-
496+00	68	Sheet Flow (See Appendix K)																	
460+00	69	Sheet Flow (See Appendix K)																	
442+87	70	1,404	70	1,404	4-24" RCP	134	2,038.4	2,036.2	1.6%	2,042.1	-	-	11.26	0.8	-	-	-	-	-
441+87	UPRR R/W (Sta 441+87)																		
FR 110+00	FR1	22	FR1 + 65	82	2-36" RCP	98	2,154.5	2,152.5	2.0%	2,157.6	2,158.6	1.41	12.6	1.24	No	-	-	-	-
541+06 RT	FR2	7	FR2	7	1-24" RCP	69	2,151.2	2,150.5	1.0%	2,152.5	-	0.73	6.7	0.6	No	-	-	-	-
FR 104+06	FR3	11	FR2 + FR3	18	2-24" RCP	64	2,143.7	2,143.0	1.0%	2,145.2	2,146.2	0.84	7.2	0.61	No	-	-	-	-
Sta 487+44 LT (Trico)	Regional WS	1,506	Regional WS	1,506	5-10'x4' RCBC	60	2,055.0	2,054.4	0.9%	2,059.9	-	-	12.4	1.43	No	-	-	-	-

HY-8 Culvert Analysis Report

Summary of Culvert Flows at Crossing: CP-1 Sta 955+51

Headwater Elevation (ft)	Total Discharge (cfs)	CP-1 Sta 955+51 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2784.00	0.00	0.00	0.00	1
2786.62	42.20	42.20	0.00	1
2786.83	84.40	84.40	0.00	1
2787.00	126.60	126.60	0.00	1
2787.16	168.80	168.80	0.00	1
2787.30	211.00	211.00	0.00	1
2787.44	253.20	253.20	0.00	1
2787.57	295.40	295.40	0.00	1
2787.69	337.60	337.60	0.00	1
2787.80	379.80	379.80	0.00	1
2787.92	422.00	422.00	0.00	1
2793.00	1077.77	1077.77	0.00	Overtopping

Culvert Summary Table: CP-1 Sta 955+51

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2784.00	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
42.20	42.20	2786.62	2.617	0.0*	1-S2n	0.201	0.518	0.261	1.112	8.078	4.320
84.40	84.40	2786.83	2.826	0.0*	1-S2n	0.401	0.823	0.402	1.602	10.508	5.265
126.60	126.60	2787.00	3.002	0.0*	1-S2n	0.499	1.078	0.508	1.969	12.463	5.886
168.80	168.80	2787.16	3.159	0.0*	1-S2n	0.598	1.306	0.636	2.272	13.275	6.361
211.00	211.00	2787.30	3.303	0.0*	1-S2n	0.697	1.515	0.743	2.534	14.195	6.751
253.20	253.20	2787.44	3.438	0.0*	1-S2n	0.796	1.711	0.847	2.767	14.947	7.084
295.40	295.40	2787.57	3.566	0.0*	1-S2n	0.872	1.896	0.947	2.978	15.592	7.376
337.60	337.60	2787.69	3.687	0.0*	1-S2n	0.948	2.073	1.046	3.173	16.141	7.638
379.80	379.80	2787.80	3.804	0.0*	1-S2n	1.023	2.242	1.142	3.353	16.627	7.875
422.00	422.00	2787.92	3.916	0.0*	1-S2n	1.098	2.405	1.240	3.522	17.012	8.093

* theoretical depth is impractical. Depth reported is corrected.

Inlet Elevation (invert): 2784.00 ft, Outlet Elevation (invert): 2780.00 ft

Culvert Length: 148.05 ft, Culvert Slope: 0.0270

Inlet Throat Elevation: 2784.00 ft, Inlet Crest Elevation: 2786.26 ft

Site Data - CP-1 Sta 955+51

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2786.00 ft

Outlet Station: 148.00 ft

Outlet Elevation: 2780.00 ft

Number of Barrels: 2

Culvert Data Summary - CP-1 Sta 955+51

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Inlet Type: Conventional
Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-1 Sta 955+51)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2780.00	0.00	0.00	0.00	0.00
42.20	2781.11	1.11	4.32	0.69	0.83
84.40	2781.60	1.60	5.27	1.00	0.87
126.60	2781.97	1.97	5.89	1.23	0.89
168.80	2782.27	2.27	6.36	1.42	0.91
211.00	2782.53	2.53	6.75	1.58	0.92
253.20	2782.77	2.77	7.08	1.73	0.93
295.40	2782.98	2.98	7.38	1.86	0.94
337.60	2783.17	3.17	7.64	1.98	0.95
379.80	2783.35	3.35	7.88	2.09	0.95
422.00	2783.52	3.52	8.09	2.20	0.96

Tailwater Channel Data - CP-1 Sta 955+51

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 6.00 ft
Side Slope (H:V): 2.50 (_:1)
Channel Slope: 0.0100
Channel Manning's n: 0.0300
Channel Invert Elevation: 2780.00 ft

Roadway Data for Crossing: CP-1 Sta 955+51

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 30.00 ft
Crest Elevation: 2793.00 ft
Roadway Surface: Paved
Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: DW Sta 953+58 Lt

Headwater Elevation (ft)	Total Discharge (cfs)	KAI Prvt Dwy 4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2790.50	0.00	0.00	0.00	1
2790.88	0.60	0.60	0.00	1
2791.05	1.20	1.20	0.00	1
2791.19	1.80	1.80	0.00	1
2791.31	2.40	2.40	0.00	1
2791.42	3.00	3.00	0.00	1
2791.52	3.60	3.60	0.00	1
2791.62	4.20	4.20	0.00	1
2791.70	4.80	4.80	0.00	1
2791.79	5.40	5.40	0.00	1
2791.87	6.00	6.00	0.00	1
2792.80	11.38	11.38	0.00	Overtopping

Culvert Summary Table: KAI Prvt Dwy 4

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2790.50	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
0.60	0.60	2790.88	0.384	0.0*	1-S2n	0.231	0.283	0.233	0.248	3.319	1.622
1.20	1.20	2791.05	0.552	0.0*	1-S2n	0.336	0.404	0.343	0.322	4.034	1.929
1.80	1.80	2791.19	0.686	0.0*	1-S2n	0.415	0.500	0.419	0.375	4.431	2.135
2.40	2.40	2791.31	0.807	0.018	1-S2n	0.483	0.585	0.484	0.418	4.905	2.294
3.00	3.00	2791.42	0.920	0.054	1-S2n	0.544	0.655	0.545	0.454	5.160	2.425
3.60	3.60	2791.52	1.022	0.086	1-S2n	0.604	0.722	0.604	0.486	5.401	2.539
4.20	4.20	2791.62	1.115	0.115	1-S2n	0.656	0.783	0.662	0.515	5.583	2.638
4.80	4.80	2791.70	1.204	0.142	1-S2n	0.708	0.839	0.709	0.542	5.837	2.728
5.40	5.40	2791.79	1.289	0.166	1-S2n	0.760	0.895	0.761	0.566	6.005	2.809
6.00	6.00	2791.87	1.373	0.189	1-S2n	0.810	0.943	0.812	0.589	6.145	2.884

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2790.50 ft, Outlet Elevation (invert): 2790.20 ft

Culvert Length: 35.00 ft, Culvert Slope: 0.0086

Site Data - KAI Prvt Dwy 4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2790.50 ft

Outlet Station: 35.00 ft

Outlet Elevation: 2790.20 ft

Number of Barrels: 1

Culvert Data Summary - KAI Prvt Dwy 4

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: DW Sta 953+58 Lt)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2790.10	0.00	0.00	0.00	0.00
0.60	2790.35	0.25	1.62	0.37	0.81
1.20	2790.42	0.32	1.93	0.48	0.85
1.80	2790.47	0.37	2.13	0.56	0.87
2.40	2790.52	0.42	2.29	0.63	0.88
3.00	2790.55	0.45	2.43	0.68	0.90
3.60	2790.59	0.49	2.54	0.73	0.91
4.20	2790.62	0.52	2.64	0.77	0.92
4.80	2790.64	0.54	2.73	0.81	0.92
5.40	2790.67	0.57	2.81	0.85	0.93
6.00	2790.69	0.59	2.88	0.88	0.94

Tailwater Channel Data - DW Sta 953+58 Lt

Tailwater Channel Option: Triangular Channel
 Side Slope (H:V): 6.00 (1:1)
 Channel Slope: 0.0240
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2790.10 ft

Roadway Data for Crossing: DW Sta 953+58 Lt

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 150.00 ft
 Crest Elevation: 2792.80 ft
 Roadway Surface: Gravel
 Roadway Top Width: 24.00 ft

Summary of Culvert Flows at Crossing: CP-2 Sta 946+90

Headwater Elevation (ft)	Total Discharge (cfs)	CP-2 Sta 946+90 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2784.00	0.00	0.00	0.00	1
2786.54	55.80	55.80	0.00	1
2786.74	111.60	111.60	0.00	1
2786.90	167.40	167.40	0.00	1
2787.05	223.20	223.20	0.00	1
2787.19	279.00	279.00	0.00	1
2787.32	334.80	334.80	0.00	1
2787.44	390.60	390.60	0.00	1
2787.78	446.40	446.40	0.00	1
2788.12	502.20	502.20	0.00	1
2788.45	558.00	558.00	0.00	1
2792.50	1183.42	1183.42	0.00	Overtopping

Culvert Summary Table: CP-2 Sta 946+90

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2784.00	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
55.80	55.80	2786.54	2.537	0.0*	1-S2n	0.299	0.624	0.354	0.547	7.875	3.710
111.60	111.60	2786.74	2.736	0.0*	1-S2n	0.550	0.991	0.551	0.804	10.127	4.620
167.40	167.40	2786.90	2.903	0.0*	1-S2n	0.700	1.299	0.723	1.001	11.577	5.223
223.20	223.20	2787.05	3.052	0.0*	1-S2n	0.850	1.573	0.906	1.166	12.317	5.684
279.00	279.00	2787.19	3.189	0.0*	1-S2n	1.000	1.825	1.063	1.311	13.118	6.063
334.80	334.80	2787.32	3.317	0.0*	1-S2n	1.116	2.061	1.214	1.440	13.785	6.386
390.60	390.60	2787.44	3.438	0.0*	1-S2n	1.231	2.284	1.360	1.558	14.356	6.669
446.40	446.40	2787.78	3.779	0.0*	1-S2n	1.347	2.497	1.505	1.667	14.829	6.923
502.20	502.20	2788.12	4.117	0.0*	1-S2n	1.463	2.701	1.644	1.769	15.273	7.153
558.00	558.00	2788.45	4.449	0.0*	1-S2n	1.568	2.898	1.781	1.864	15.668	7.364

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2784.00 ft, Outlet Elevation (invert): 2781.50 ft
 Culvert Length: 155.02 ft, Culvert Slope: 0.0161
 Inlet Throat Elevation: 2784.00 ft, Inlet Crest Elevation: 2786.20 ft

Site Data - CP-2 Sta 946+90

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2786.00 ft
 Outlet Station: 155.00 ft
 Outlet Elevation: 2781.50 ft
 Number of Barrels: 2

Culvert Data Summary - CP-2 Sta 946+90

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 5.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Inlet Type: Conventional
Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-2 Sta 946+90)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2781.49	0.00	0.00	0.00	0.00
55.80	2782.04	0.55	3.71	0.55	0.97
111.60	2782.29	0.80	4.62	0.80	1.02
167.40	2782.49	1.00	5.22	1.00	1.05
223.20	2782.66	1.17	5.68	1.16	1.08
279.00	2782.80	1.31	6.06	1.31	1.09
334.80	2782.93	1.44	6.39	1.44	1.11
390.60	2783.05	1.56	6.67	1.56	1.12
446.40	2783.16	1.67	6.92	1.66	1.13
502.20	2783.26	1.77	7.15	1.77	1.14
558.00	2783.35	1.86	7.36	1.86	1.15

Tailwater Channel Data - CP-2 Sta 946+90

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 22.00 ft
Side Slope (H:V): 10.00 (1:1)
Channel Slope: 0.0160
Channel Manning's n: 0.0300
Channel Invert Elevation: 2781.49 ft

Roadway Data for Crossing: CP-2 Sta 946+90

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 30.00 ft
Crest Elevation: 2792.50 ft
Roadway Surface: Paved
Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: DW Sta 940+28 Lt

Headwater Elevation (ft)	Total Discharge (cfs)	KAI Prvt Dwy 5 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2788.90	0.00	0.00	0.00	1
2789.56	6.60	6.60	0.00	1
2789.89	13.20	13.20	0.00	1
2790.15	19.80	19.80	0.00	1
2790.38	26.40	26.40	0.00	1
2790.61	33.00	33.00	0.00	1
2790.81	39.60	39.60	0.00	1
2790.99	46.20	46.20	0.00	1
2791.17	52.80	52.80	0.00	1
2791.32	59.00	59.00	0.00	1
2791.50	66.00	66.00	0.00	1
2792.10	89.18	89.18	0.00	Overtopping

Culvert Summary Table: KAI Prvt Dwy 5

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2788.90	0.000	0.100	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
6.60	6.60	2789.56	0.756	0.0*	1-S2n	0.411	0.557	0.447	0.431	4.853	2.892
13.20	13.20	2789.89	1.087	0.0*	1-S2n	0.610	0.796	0.615	0.629	6.363	3.564
19.80	19.80	2790.15	1.350	0.0*	1-S2n	0.736	0.987	0.737	0.780	7.276	4.006
26.40	26.40	2790.38	1.585	0.0*	1-S2n	0.863	1.150	0.869	0.905	7.745	4.344
33.00	33.00	2790.61	1.808	0.0*	1-S2n	0.968	1.291	1.036	1.014	7.596	4.622
39.60	39.60	2790.81	2.009	0.0*	1-S2n	1.065	1.422	1.149	1.111	7.937	4.858
46.20	46.20	2790.99	2.193	0.0*	1-S2n	1.162	1.544	1.256	1.200	8.229	5.066
52.80	52.80	2791.17	2.367	0.0*	1-S2n	1.251	1.653	1.352	1.282	8.534	5.252
59.00	59.00	2791.32	2.524	0.0*	1-S2n	1.330	1.756	1.444	1.353	8.763	5.410
66.00	66.00	2791.50	2.698	0.0*	1-S2n	1.419	1.860	1.543	1.429	9.008	5.575

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2788.80 ft, Outlet Elevation (invert): 2788.40 ft

Culvert Length: 40.00 ft, Culvert Slope: 0.0100

Site Data - KAI Prvt Dwy 5

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2788.80 ft

Outlet Station: 40.00 ft

Outlet Elevation: 2788.40 ft

Number of Barrels: 2

Culvert Data Summary - KAI Prvt Dwy 5

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: DW Sta 940+28 Lt)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2788.90	0.00	0.00	0.00	0.00
6.60	2789.33	0.43	2.89	0.27	0.87
13.20	2789.53	0.63	3.56	0.39	0.91
19.80	2789.68	0.78	4.01	0.49	0.94
26.40	2789.80	0.90	4.34	0.56	0.95
33.00	2789.91	1.01	4.62	0.63	0.97
39.60	2790.01	1.11	4.86	0.69	0.98
46.20	2790.10	1.20	5.07	0.75	0.99
52.80	2790.18	1.28	5.25	0.80	1.00
59.00	2790.25	1.35	5.41	0.84	1.01
66.00	2790.33	1.43	5.57	0.89	1.01

Tailwater Channel Data - DW Sta 940+28 Lt

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 4.00 ft
 Side Slope (H:V): 3.00 (1:1)
 Channel Slope: 0.0100
 Channel Manning's n: 0.0250
 Channel Invert Elevation: 2788.90 ft

Roadway Data for Crossing: DW Sta 940+28 Lt

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 84.00 ft
 Crest Elevation: 2792.10 ft
 Roadway Surface: Paved
 Roadway Top Width: 20.00 ft

Summary of Culvert Flows at Crossing: CP-4 Sta 932+94

Headwater Elevation (ft)	Total Discharge (cfs)	CP-4 Sta 932+94 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2775.00	0.00	0.00	0.00	1
2775.81	69.80	69.80	0.00	1
2776.28	139.60	139.60	0.00	1
2776.68	209.40	209.40	0.00	1
2777.04	279.20	279.20	0.00	1
2777.39	349.00	349.00	0.00	1
2777.73	418.80	418.80	0.00	1
2778.05	488.60	488.60	0.00	1
2778.36	558.40	558.40	0.00	1
2778.67	628.20	628.20	0.00	1
2778.98	698.00	698.00	0.00	1
2782.00	1307.25	1307.25	0.00	Overtopping

Culvert Summary Table: CP-4 Sta 932+94

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2775.00	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
69.80	69.80	2775.81	0.806	0.0*	1-S2n	0.236	0.553	0.243	0.497	9.571	3.517
139.60	139.60	2776.28	1.280	0.0*	1-S2n	0.435	0.878	0.438	0.740	10.624	4.452
209.40	209.40	2776.68	1.678	0.0*	1-S2n	0.552	1.150	0.560	0.930	12.454	5.084
279.20	279.20	2777.04	2.036	0.0*	1-S2n	0.668	1.394	0.684	1.091	13.612	5.572
349.00	349.00	2777.39	2.392	0.0*	1-S2n	0.785	1.617	0.786	1.234	14.796	5.973
418.80	418.80	2777.73	2.729	0.0*	1-S2n	0.877	1.826	0.885	1.363	15.769	6.317
488.60	488.60	2778.05	3.051	0.0*	1-S2n	0.965	2.024	0.977	1.482	16.678	6.619
558.40	558.40	2778.36	3.365	0.0*	1-S2n	1.054	2.212	1.061	1.592	17.537	6.889
628.20	628.20	2778.67	3.673	0.0*	1-S2n	1.142	2.393	1.208	1.695	17.333	7.133
698.00	698.00	2778.98	3.979	0.0*	1-S2n	1.226	2.567	1.304	1.792	17.839	7.358

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2775.00 ft, Outlet Elevation (invert): 2769.30 ft
 Culvert Length: 240.07 ft, Culvert Slope: 0.0237

Site Data - CP-4 Sta 932+94

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2775.00 ft
 Outlet Station: 240.00 ft
 Outlet Elevation: 2769.30 ft
 Number of Barrels: 3

Culvert Data Summary - CP-4 Sta 932+94

Barrel Shape: Concrete Box
 Barrel Span: 10.00 ft
 Barrel Rise: 4.00 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-4 Sta 932+94)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2769.30	0.00	0.00	0.00	0.00
69.80	2769.80	0.50	3.52	0.46	0.93
139.60	2770.04	0.74	4.45	0.69	0.99
209.40	2770.23	0.93	5.08	0.87	1.02
279.20	2770.39	1.09	5.57	1.02	1.05
349.00	2770.53	1.23	5.97	1.16	1.06
418.80	2770.66	1.36	6.32	1.28	1.08
488.60	2770.78	1.48	6.62	1.39	1.09
558.40	2770.89	1.59	6.89	1.49	1.10
628.20	2771.00	1.70	7.13	1.59	1.11
698.00	2771.09	1.79	7.36	1.68	1.12

Tailwater Channel Data - CP-4 Sta 932+94

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 35.00 ft
 Side Slope (H:V): 10.00 (1:1)
 Channel Slope: 0.0150
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 2769.30 ft

Roadway Data for Crossing: CP-4 Sta 932+94

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2782.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-5 Sta 930+96

Headwater Elevation (ft)	Total Discharge (cfs)	CP-5 Sta 930+96 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2773.00	0.00	0.00	0.00	1
2776.33	30.40	30.40	0.00	1
2776.55	60.80	60.80	0.00	1
2776.74	91.20	91.20	0.00	1
2776.90	121.60	121.60	0.00	1
2777.06	152.00	152.00	0.00	1
2777.20	182.40	182.40	0.00	1
2777.33	212.80	212.80	0.00	1
2777.46	243.20	243.20	0.00	1
2777.59	273.60	273.60	0.00	1
2777.71	304.00	304.00	0.00	1
2782.00	646.84	646.84	0.00	Overtopping

Culvert Summary Table: CP-5 Sta 930+96

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2773.00	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
30.40	30.40	2776.33	3.326	0.0*	1-S2n	0.240	0.585	0.275	0.306	9.199	2.613
60.80	60.80	2776.55	3.549	0.0*	1-S2n	0.442	0.929	0.448	0.458	11.304	3.350
91.20	91.20	2776.74	3.736	0.0*	1-S2n	0.565	1.218	0.582	0.580	13.066	3.857
121.60	121.60	2776.90	3.903	0.0*	1-S2n	0.688	1.475	0.695	0.684	14.579	4.252
152.00	152.00	2777.06	4.056	0.0*	5-S2n	0.809	1.712	0.866	0.776	14.632	4.580
182.40	182.40	2777.20	4.199	0.0*	5-S2n	0.907	1.933	0.993	0.860	15.309	4.862
212.80	212.80	2777.33	4.335	0.0*	5-S2n	1.004	2.142	1.117	0.938	15.875	5.110
243.20	243.20	2777.46	4.464	0.0*	5-S2n	1.101	2.342	1.238	1.011	16.377	5.333
273.60	273.60	2777.59	4.588	0.0*	5-S2n	1.198	2.533	1.359	1.079	16.780	5.536
304.00	304.00	2777.71	4.707	0.0*	5-S2n	1.284	2.717	1.475	1.144	17.174	5.722

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2773.00 ft, Outlet Elevation (invert): 2769.30 ft
 Culvert Length: 128.05 ft, Culvert Slope: 0.0289
 Inlet Throat Elevation: 2773.00 ft, Inlet Crest Elevation: 2775.95 ft

Site Data - CP-5 Sta 930+96

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2775.50 ft
 Outlet Station: 128.00 ft
 Outlet Elevation: 2769.30 ft
 Number of Barrels: 2

Culvert Data Summary - CP-5 Sta 930+96

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 4.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Inlet Type: Conventional
Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-5 Sta 930+96)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2769.30	0.00	0.00	0.00	0.00
30.40	2769.61	0.31	2.61	0.29	0.87
60.80	2769.76	0.46	3.35	0.43	0.92
91.20	2769.88	0.58	3.86	0.54	0.95
121.60	2769.98	0.68	4.25	0.64	0.98
152.00	2770.08	0.78	4.58	0.73	1.00
182.40	2770.16	0.86	4.86	0.81	1.01
212.80	2770.24	0.94	5.11	0.88	1.02
243.20	2770.31	1.01	5.33	0.95	1.03
273.60	2770.38	1.08	5.54	1.01	1.04
304.00	2770.44	1.14	5.72	1.07	1.05

Tailwater Channel Data - CP-5 Sta 930+96

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 35.00 ft
Side Slope (H:V): 10.00 (_:1)
Channel Slope: 0.0150
Channel Manning's n: 0.0300
Channel Invert Elevation: 2769.30 ft

Roadway Data for Crossing: CP-5 Sta 930+96

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 30.00 ft
Crest Elevation: 2782.00 ft
Roadway Surface: Paved
Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-7 Sta 918+72

Headwater Elevation (ft)	Total Discharge (cfs)	CP-7 Sta 918+72 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2778.20	0.00	0.00	0.00	1
2778.91	47.00	47.00	0.00	1
2779.34	94.00	94.00	0.00	1
2779.69	141.00	141.00	0.00	1
2780.00	188.00	188.00	0.00	1
2780.30	235.00	235.00	0.00	1
2780.60	282.00	282.00	0.00	1
2780.88	329.00	329.00	0.00	1
2781.16	376.00	376.00	0.00	1
2781.42	423.00	423.00	0.00	1
2781.68	470.00	470.00	0.00	1
2785.00	1019.83	1019.83	0.00	Overtopping

Culvert Summary Table: CP-7 Sta 918+72

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2778.20	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
47.00	47.00	2778.91	0.715	0.0*	1-S2n	0.181	0.493	0.233	0.509	8.403	3.129
94.00	94.00	2779.34	1.136	0.0*	1-S2n	0.362	0.783	0.373	0.762	10.509	4.003
141.00	141.00	2779.69	1.488	0.0*	1-S2n	0.471	1.026	0.476	0.963	12.353	4.600
188.00	188.00	2780.00	1.803	0.0*	1-S2n	0.562	1.242	0.572	1.136	13.684	5.066
235.00	235.00	2780.30	2.101	0.0*	1-S2n	0.652	1.442	0.662	1.289	14.797	5.453
282.00	282.00	2780.60	2.398	0.0*	1-S2n	0.743	1.628	0.753	1.428	15.609	5.783
329.00	329.00	2780.88	2.682	0.0*	1-S2n	0.826	1.804	0.828	1.557	16.551	6.075
376.00	376.00	2781.16	2.955	0.0*	1-S2n	0.896	1.972	0.979	1.677	15.999	6.337
423.00	423.00	2781.42	3.221	0.0*	1-S2n	0.966	2.133	1.070	1.790	16.466	6.575
470.00	470.00	2781.68	3.482	0.0*	1-S2n	1.036	2.289	1.159	1.896	16.903	6.793

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2778.20 ft, Outlet Elevation (invert): 2774.00 ft
 Culvert Length: 143.06 ft, Culvert Slope: 0.0294

Site Data - CP-7 Sta 918+72

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2778.20 ft
 Outlet Station: 143.00 ft
 Outlet Elevation: 2774.00 ft
 Number of Barrels: 3

Culvert Data Summary - CP-7 Sta 918+72

Barrel Shape: Concrete Box
 Barrel Span: 8.00 ft
 Barrel Rise: 4.00 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-7 Sta 918+72)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2774.00	0.00	0.00	0.00	0.00
47.00	2774.51	0.51	3.13	0.48	0.81
94.00	2774.76	0.76	4.00	0.71	0.86
141.00	2774.96	0.96	4.60	0.90	0.89
188.00	2775.14	1.14	5.07	1.06	0.91
235.00	2775.29	1.29	5.45	1.21	0.92
282.00	2775.43	1.43	5.78	1.34	0.94
329.00	2775.56	1.56	6.08	1.46	0.95
376.00	2775.68	1.68	6.34	1.57	0.96
423.00	2775.79	1.79	6.57	1.68	0.97
470.00	2775.90	1.90	6.79	1.78	0.98

Tailwater Channel Data - CP-7 Sta 918+72

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 27.00 ft
 Side Slope (H:V): 5.00 (1:1)
 Channel Slope: 0.0150
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2774.00 ft

Roadway Data for Crossing: CP-7 Sta 918+72

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2785.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-8 Sta 913+63

Headwater Elevation (ft)	Total Discharge (cfs)	CP-8 Sta 913+63 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2778.50	0.00	0.00	0.00	1
2780.29	14.50	14.50	0.00	1
2780.36	29.00	29.00	0.00	1
2780.42	43.50	43.50	0.00	1
2780.47	58.00	58.00	0.00	1
2780.52	72.50	72.50	0.00	1
2780.60	87.00	87.00	0.00	1
2780.79	101.50	101.50	0.00	1
2780.98	116.00	116.00	0.00	1
2781.16	130.50	130.50	0.00	1
2781.34	145.00	145.00	0.00	1
2785.00	344.20	344.20	0.00	Overtopping

Culvert Summary Table: CP-8 Sta 913+63

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2778.50	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
14.50	14.50	2780.29	1.786	0.0*	1-S2n	0.349	0.592	0.382	0.296	6.682	2.130
29.00	29.00	2780.36	1.857	0.0*	1-S2n	0.491	0.839	0.499	0.441	9.153	2.694
43.50	43.50	2780.42	1.918	0.0*	1-S2n	0.621	1.035	0.625	0.554	10.261	3.074
58.00	58.00	2780.47	1.971	0.0*	1-S2n	0.708	1.212	0.711	0.650	11.208	3.367
72.50	72.50	2780.52	2.021	0.0*	1-S2n	0.796	1.356	0.805	0.735	11.797	3.608
87.00	87.00	2780.60	2.097	0.0*	1-S2n	0.884	1.499	0.888	0.811	12.406	3.814
101.50	101.50	2780.79	2.291	0.0*	1-S2n	0.955	1.619	0.959	0.882	12.995	3.996
116.00	116.00	2780.98	2.476	0.0*	1-S2n	1.022	1.739	1.053	0.947	13.059	4.157
130.50	130.50	2781.16	2.657	0.0*	1-S2n	1.089	1.850	1.090	1.008	14.029	4.304
145.00	145.00	2781.34	2.838	0.0*	1-S2n	1.157	1.951	1.163	1.066	14.299	4.439

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2778.50 ft, Outlet Elevation (invert): 2774.50 ft
 Culvert Length: 160.05 ft, Culvert Slope: 0.0250
 Inlet Throat Elevation: 2778.50 ft, Inlet Crest Elevation: 2780.16 ft

Site Data - CP-8 Sta 913+63

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2780.00 ft

Outlet Station: 160.00 ft

Outlet Elevation: 2774.50 ft

Number of Barrels: 4

Culvert Data Summary - CP-8 Sta 913+63

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Grooved End in Headwall

Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-8 Sta 913+63)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2774.49	0.00	0.00	0.00	0.00
14.50	2774.79	0.30	2.13	0.28	0.73
29.00	2774.93	0.44	2.69	0.41	0.78
43.50	2775.04	0.55	3.07	0.52	0.80
58.00	2775.14	0.65	3.37	0.61	0.82
72.50	2775.22	0.73	3.61	0.69	0.84
87.00	2775.30	0.81	3.81	0.76	0.85
101.50	2775.37	0.88	4.00	0.83	0.86
116.00	2775.44	0.95	4.16	0.89	0.87
130.50	2775.50	1.01	4.30	0.94	0.87
145.00	2775.56	1.07	4.44	1.00	0.88

Tailwater Channel Data - CP-8 Sta 913+63

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 20.00 ft

Side Slope (H:V): 10.00 (1:1)

Channel Slope: 0.0150

Channel Manning's n: 0.0350

Channel Invert Elevation: 2774.49 ft

Roadway Data for Crossing: CP-8 Sta 913+63

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 30.00 ft

Crest Elevation: 2785.00 ft

Roadway Surface: Paved

Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-8 & 9 La Cholla Sta 534+93

Headwater Elevation (ft)	Total Discharge (cfs)	CP-8 & 9 La Cholla Sta 534+93 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2763.90	0.00	0.00	0.00	1
2764.76	28.00	28.00	0.00	1
2765.14	56.00	56.00	0.00	1
2765.44	84.00	84.00	0.00	1
2765.70	112.00	112.00	0.00	1
2765.96	140.00	140.00	0.00	1
2766.19	168.00	168.00	0.00	1
2766.41	196.00	196.00	0.00	1
2766.61	224.00	224.00	0.00	1
2766.80	252.00	252.00	0.00	1
2766.98	280.00	280.00	0.00	1
2770.00	625.74	625.74	0.00	Overtopping

Culvert Summary Table: CP-8 & 9 La Cholla Sta 534+93

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2763.90	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
28.00	28.00	2764.76	0.859	0.0*	1-S2n	0.431	0.633	0.432	0.266	6.616	2.289
56.00	56.00	2765.14	1.236	0.0*	1-S2n	0.622	0.908	0.628	0.398	7.831	2.929
84.00	84.00	2765.44	1.537	0.0*	1-S2n	0.769	1.129	0.769	0.503	8.864	3.368
112.00	112.00	2765.70	1.799	0.0*	1-S2n	0.887	1.313	0.903	0.593	9.411	3.710
140.00	140.00	2765.96	2.058	0.0*	1-S2n	1.004	1.477	1.010	0.673	10.110	3.993
168.00	168.00	2766.19	2.292	0.0*	1-S2n	1.105	1.624	1.114	0.746	10.602	4.236
196.00	196.00	2766.41	2.505	0.0*	1-S2n	1.195	1.767	1.197	0.813	11.192	4.449
224.00	224.00	2766.61	2.705	0.0*	1-S2n	1.285	1.890	1.307	0.875	11.373	4.642
252.00	252.00	2766.80	2.896	0.0*	1-S2n	1.375	2.012	1.381	0.934	11.893	4.816
280.00	280.00	2766.98	3.082	0.0*	1-S2n	1.457	2.129	1.462	0.990	12.248	4.976

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2763.90 ft, Outlet Elevation (invert): 2760.80 ft
 Culvert Length: 191.03 ft, Culvert Slope: 0.0162

Site Data - CP-8 & 9 La Cholla Sta 534+93

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2763.90 ft
 Outlet Station: 191.00 ft
 Outlet Elevation: 2760.80 ft
 Number of Barrels: 6

Culvert Data Summary - CP-8 & 9 La Cholla Sta 534+93

Barrel Shape: Circular
 Barrel Diameter: 3.50 ft
 Barrel Material: Concrete

Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End Projecting
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-8 & 9 La Cholla Sta 534+93)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2760.80	0.00	0.00	0.00	0.00
28.00	2761.07	0.27	2.29	0.32	0.82
56.00	2761.20	0.40	2.93	0.47	0.87
84.00	2761.30	0.50	3.37	0.60	0.90
112.00	2761.39	0.59	3.71	0.70	0.92
140.00	2761.47	0.67	3.99	0.80	0.94
168.00	2761.55	0.75	4.24	0.88	0.95
196.00	2761.61	0.81	4.45	0.96	0.96
224.00	2761.68	0.88	4.64	1.04	0.97
252.00	2761.73	0.93	4.82	1.11	0.98
280.00	2761.79	0.99	4.98	1.17	0.99

Tailwater Channel Data - CP-8 & 9 La Cholla Sta 534+93

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 42.00 ft
 Side Slope (H:V): 15.00 (1:1)
 Channel Slope: 0.0190
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2760.80 ft

Roadway Data for Crossing: CP-8 & 9 La Cholla Sta 534+93

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2770.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 80.00 ft

Summary of Culvert Flows at Crossing: CP-9 Sta 910+44

Headwater Elevation (ft)	Total Discharge (cfs)	CP-9 Sta 910+44 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2778.50	0.00	0.00	0.00	1
2781.36	13.50	13.50	0.00	1
2781.42	27.00	27.00	0.00	1
2781.46	40.50	40.50	0.00	1
2781.50	54.00	54.00	0.00	1
2781.54	67.50	67.50	0.00	1
2781.58	81.00	81.00	0.00	1
2781.61	94.50	94.50	0.00	1
2781.64	108.00	108.00	0.00	1
2781.67	121.50	121.50	0.00	1
2781.70	135.00	135.00	0.00	1
2782.00	228.30	228.30	0.00	Overtopping

Culvert Summary Table: CP-9 Sta 910+44

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2778.50	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
13.50	13.50	2781.36	2.863	0.0*	5-S2n	0.277	0.462	0.282	0.320	8.637	2.195
27.00	27.00	2781.42	2.917	0.0*	5-S2n	0.387	0.661	0.391	0.473	8.203	2.751
40.50	40.50	2781.46	2.963	0.0*	5-S2n	0.492	0.821	0.494	0.592	9.105	3.121
54.00	54.00	2781.50	3.004	0.0*	5-S2n	0.558	0.964	0.563	0.692	10.002	3.406
67.50	67.50	2781.54	3.042	0.0*	5-S2n	0.625	1.082	0.631	0.779	10.718	3.640
81.00	81.00	2781.58	3.077	0.0*	5-S2n	0.692	1.199	0.698	0.858	11.264	3.839
94.50	94.50	2781.61	3.110	0.0*	5-S2n	0.750	1.296	0.755	0.930	11.875	4.015
108.00	108.00	2781.64	3.142	0.0*	5-S2n	0.801	1.392	0.802	0.997	12.467	4.172
121.50	121.50	2781.67	3.172	0.0*	5-S2n	0.852	1.483	0.853	1.059	12.928	4.313
135.00	135.00	2781.70	3.202	0.0*	5-S2n	0.903	1.567	0.909	1.118	13.227	4.443

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2778.50 ft, Outlet Elevation (invert): 2775.00 ft
 Culvert Length: 149.04 ft, Culvert Slope: 0.0235
 Inlet Throat Elevation: 2778.50 ft, Inlet Crest Elevation: 2781.27 ft

Site Data - CP-9 Sta 910+44

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2781.00 ft

Outlet Station: 149.00 ft

Outlet Elevation: 2775.00 ft

Number of Barrels: 4

Culvert Data Summary - CP-9 Sta 910+44

Barrel Shape: Elliptical

Barrel Span: 45.00 in

Barrel Rise: 29.00 in
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved Edge with Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-9 Sta 910+44)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2775.00	0.00	0.00	0.00	0.00
13.50	2775.32	0.32	2.19	0.30	0.74
27.00	2775.47	0.47	2.75	0.44	0.78
40.50	2775.59	0.59	3.12	0.55	0.81
54.00	2775.69	0.69	3.41	0.65	0.82
67.50	2775.78	0.78	3.64	0.73	0.84
81.00	2775.86	0.86	3.84	0.80	0.85
94.50	2775.93	0.93	4.01	0.87	0.86
108.00	2776.00	1.00	4.17	0.93	0.87
121.50	2776.06	1.06	4.31	0.99	0.87
135.00	2776.12	1.12	4.44	1.05	0.88

Tailwater Channel Data - CP-9 Sta 910+44

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 16.00 ft
 Side Slope (H:V): 10.00 (1:1)
 Channel Slope: 0.0150
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2775.00 ft

Roadway Data for Crossing: CP-9 Sta 910+44

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2782.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 120.00 ft

Summary of Culvert Flows at Crossing: CP-10 Sta 904+62

Headwater Elevation (ft)	Total Discharge (cfs)	CP-10 Sta 904+62 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2774.50	0.00	0.00	0.00	1
2776.80	12.30	12.30	0.00	1
2776.87	24.60	24.60	0.00	1
2776.93	36.90	36.90	0.00	1
2776.99	49.20	49.20	0.00	1
2777.04	61.50	61.50	0.00	1
2777.08	73.80	73.80	0.00	1
2777.13	86.10	86.10	0.00	1
2777.18	98.40	98.40	0.00	1
2777.38	110.70	110.70	0.00	1
2777.59	123.00	123.00	0.00	1
2780.00	226.15	226.15	0.00	Overtopping

Culvert Summary Table: CP-10 Sta 904+62

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2774.50	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
12.30	12.30	2776.80	2.301	0.0*	1-S2n	0.409	0.627	0.417	0.250	6.644	2.772
24.60	24.60	2776.87	2.373	0.0*	1-S2n	0.607	0.902	0.611	0.366	7.955	3.445
36.90	36.90	2776.93	2.433	0.0*	1-S2n	0.732	1.106	0.736	0.456	9.057	3.889
49.20	49.20	2776.99	2.487	0.0*	1-S2n	0.857	1.287	0.857	0.530	9.805	4.229
61.50	61.50	2777.04	2.536	0.0*	1-S2n	0.963	1.450	0.969	0.595	10.354	4.509
73.80	73.80	2777.08	2.582	0.0*	1-S2n	1.059	1.594	1.063	0.653	10.943	4.747
86.10	86.10	2777.13	2.626	0.0*	1-S2n	1.154	1.729	1.158	0.706	11.385	4.957
98.40	98.40	2777.18	2.675	0.0*	1-S2n	1.244	1.855	1.245	0.755	11.850	5.144
110.70	110.70	2777.38	2.881	0.0*	1-S2n	1.327	1.969	1.332	0.801	12.160	5.314
123.00	123.00	2777.59	3.093	0.0*	5-S2n	1.409	2.084	1.416	0.844	12.485	5.469

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2774.50 ft, Outlet Elevation (invert): 2771.50 ft
 Culvert Length: 162.03 ft, Culvert Slope: 0.0185
 Inlet Throat Elevation: 2774.50 ft, Inlet Crest Elevation: 2776.68 ft

Site Data - CP-10 Sta 904+62

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2776.50 ft
 Outlet Station: 162.00 ft
 Outlet Elevation: 2771.50 ft
 Number of Barrels: 3

Culvert Data Summary - CP-10 Sta 904+62

Barrel Shape: Circular

Barrel Diameter: 3.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-10 Sta 904+62)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2771.50	0.00	0.00	0.00	0.00
12.30	2771.75	0.25	2.77	0.55	1.08
24.60	2771.87	0.37	3.44	0.80	1.14
36.90	2771.96	0.46	3.89	0.99	1.17
49.20	2772.03	0.53	4.23	1.16	1.19
61.50	2772.09	0.59	4.51	1.30	1.21
73.80	2772.15	0.65	4.75	1.43	1.23
86.10	2772.21	0.71	4.96	1.54	1.24
98.40	2772.26	0.76	5.14	1.65	1.25
110.70	2772.30	0.80	5.31	1.75	1.27
123.00	2772.34	0.84	5.47	1.84	1.27

Tailwater Channel Data - CP-10 Sta 904+62

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 14.00 ft
 Side Slope (H:V): 15.00 (1:1)
 Channel Slope: 0.0350
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2771.50 ft

Roadway Data for Crossing: CP-10 Sta 904+62

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2780.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-11 Sta 897+65

Headwater Elevation (ft)	Total Discharge (cfs)	CP-11 Sta 897+65 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2771.80	0.00	0.00	0.00	1
2774.50	17.20	17.20	0.00	1
2774.57	34.40	34.40	0.00	1
2774.64	51.60	51.60	0.00	1
2774.69	68.80	68.80	0.00	1
2774.74	86.00	86.00	0.00	1
2774.79	103.20	103.20	0.00	1
2774.83	120.40	120.40	0.00	1
2774.88	137.60	137.60	0.00	1
2774.92	154.80	154.80	0.00	1
2775.06	172.00	172.00	0.00	1
2775.30	194.02	194.02	0.00	Overtopping

Culvert Summary Table: CP-11 Sta 897+65

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2771.80	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
17.20	17.20	2774.50	2.702	0.0*	1-S2n	0.519	0.669	0.559	0.449	5.194	2.492
34.40	34.40	2774.57	2.775	0.0*	1-S2n	0.764	0.970	0.769	0.641	6.745	3.034
51.60	51.60	2774.64	2.836	0.0*	1-S2n	0.928	1.215	0.935	0.784	7.625	3.392
68.80	68.80	2774.69	2.891	0.0*	1-S2n	1.079	1.400	1.090	0.902	8.220	3.665
86.00	86.00	2774.74	2.942	0.0*	1-S2n	1.222	1.584	1.227	1.003	8.785	3.891
103.20	103.20	2774.79	2.989	0.0*	1-S2n	1.338	1.735	1.349	1.093	9.205	4.082
120.40	120.40	2774.83	3.033	0.0*	1-S2n	1.453	1.883	1.473	1.175	9.534	4.252
137.60	137.60	2774.88	3.076	0.0*	1-S2n	1.569	2.025	1.574	1.250	9.979	4.403
154.80	154.80	2774.92	3.117	0.0*	1-S2n	1.673	2.148	1.678	1.320	10.308	4.540
172.00	172.00	2775.06	3.260	0.0*	1-S2n	1.773	2.272	1.783	1.385	10.576	4.667

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2771.80 ft, Outlet Elevation (invert): 2770.30 ft
 Culvert Length: 157.01 ft, Culvert Slope: 0.0096
 Inlet Throat Elevation: 2771.80 ft, Inlet Crest Elevation: 2774.38 ft

Site Data - CP-11 Sta 897+65

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2774.20 ft
 Outlet Station: 157.00 ft
 Outlet Elevation: 2770.30 ft
 Number of Barrels: 3

Culvert Data Summary - CP-11 Sta 897+65

Barrel Shape: Circular

Barrel Diameter: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-11 Sta 897+65)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2769.99	0.00	0.00	0.00	0.00
17.20	2770.44	0.45	2.49	0.42	0.76
34.40	2770.63	0.64	3.03	0.60	0.80
51.60	2770.77	0.78	3.39	0.73	0.82
68.80	2770.89	0.90	3.67	0.84	0.84
86.00	2770.99	1.00	3.89	0.94	0.85
103.20	2771.08	1.09	4.08	1.02	0.86
120.40	2771.16	1.17	4.25	1.10	0.87
137.60	2771.24	1.25	4.40	1.17	0.88
154.80	2771.31	1.32	4.54	1.24	0.88
172.00	2771.37	1.38	4.67	1.30	0.89

Tailwater Channel Data - CP-11 Sta 897+65

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 10.00 ft
 Side Slope (H:V): 12.00 (1:1)
 Channel Slope: 0.0150
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2769.99 ft

Roadway Data for Crossing: CP-11 Sta 897+65

Roadway Profile Shape: Irregular Roadway Shape (coordinates)
 Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2778.00
1	30.00	2777.00
2	68.00	2776.00
3	85.00	2775.30
4	133.00	2776.00
5	160.00	2777.00
6	180.00	2778.30
7	225.00	2778.50
8	325.00	2779.00

Roadway Surface: Paved
 Roadway Top Width: 40.00 ft

Summary of Culvert Flows at Crossing: DW Sta 893+83 Lt

Headwater Elevation (ft)	Total Discharge (cfs)	KAI Prvt Dwy 3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2770.60	0.00	0.00	0.00	1
2771.47	4.20	4.20	0.00	1
2771.84	8.40	8.40	0.00	1
2772.14	12.60	12.60	0.00	1
2772.43	16.80	16.80	0.00	1
2772.68	21.00	21.00	0.00	1
2772.90	25.20	25.20	0.00	1
2773.12	29.40	29.40	0.00	1
2773.33	33.60	33.60	0.00	1
2773.54	37.80	37.80	0.00	1
2773.76	42.00	42.00	0.00	1
2774.90	60.39	60.39	0.00	Overtopping

Culvert Summary Table: KAI Prvt Dwy 3

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2770.60	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
4.20	4.20	2771.47	0.865	0.0*	1-S2n	0.456	0.634	0.464	0.335	5.862	2.506
8.40	8.40	2771.84	1.239	0.0*	1-S2n	0.665	0.912	0.671	0.493	7.052	3.114
12.60	12.60	2772.14	1.540	0.0*	1-S2n	0.819	1.121	0.860	0.614	7.504	3.515
16.80	16.80	2772.43	1.826	0.015	1-S2n	0.956	1.303	0.962	0.715	8.568	3.822
21.00	21.00	2772.68	2.076	0.104	1-S2n	1.074	1.470	1.085	0.804	9.081	4.074
25.20	25.20	2772.90	2.303	0.184	1-S2n	1.192	1.613	1.271	0.884	8.832	4.289
29.40	29.40	2773.12	2.517	0.256	1-S2n	1.295	1.752	1.391	0.956	9.159	4.477
33.60	33.60	2773.33	2.726	0.323	1-S2n	1.398	1.877	1.505	1.023	9.467	4.645
37.80	37.80	2773.54	2.938	0.386	1-S2n	1.500	1.994	1.615	1.086	9.747	4.797
42.00	42.00	2773.76	3.157	0.444	5-S2n	1.597	2.110	1.723	1.144	10.005	4.937

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2770.60 ft, Outlet Elevation (invert): 2770.00 ft

Culvert Length: 55.00 ft, Culvert Slope: 0.0109

Site Data - KAI Prvt Dwy 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2770.60 ft

Outlet Station: 55.00 ft

Outlet Elevation: 2770.00 ft

Number of Barrels: 1

Culvert Data Summary - KAI Prvt Dwy 3

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Grooved End in Headwall

Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: DW Sta 893+83 Lt)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2769.90	0.00	0.00	0.00	0.00
4.20	2770.23	0.33	2.51	0.21	0.84
8.40	2770.39	0.49	3.11	0.31	0.88
12.60	2770.51	0.61	3.52	0.38	0.91
16.80	2770.62	0.72	3.82	0.45	0.93
21.00	2770.70	0.80	4.07	0.50	0.94
25.20	2770.78	0.88	4.29	0.55	0.95
29.40	2770.86	0.96	4.48	0.60	0.96
33.60	2770.92	1.02	4.65	0.64	0.97
37.80	2770.99	1.09	4.80	0.68	0.98
42.00	2771.04	1.14	4.94	0.71	0.98

Tailwater Channel Data - DW Sta 893+83 Lt

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 4.00 ft

Side Slope (H:V): 3.00 (1:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0250

Channel Invert Elevation: 2769.90 ft

Roadway Data for Crossing: DW Sta 893+83 Lt

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 132.00 ft

Crest Elevation: 2774.90 ft

Roadway Surface: Paved

Roadway Top Width: 20.00 ft

Table 10 - Summary of Culvert Flows at Crossing: CP-13 Sta 885+32

Headwater Elevation (ft)	Total Discharge (cfs)	CP-13 Sta 885+32 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2763.80	0.00	0.00	0.00	1
2764.85	274.30	274.30	0.00	1
2765.48	548.60	548.60	0.00	1
2766.00	822.90	822.90	0.00	1
2766.46	1097.20	1097.20	0.00	1
2766.88	1371.50	1371.50	0.00	1
2767.29	1645.80	1645.80	0.00	1
2767.69	1920.10	1920.10	0.00	1
2768.02	2194.40	2194.40	0.00	1
2768.35	2468.70	2468.70	0.00	1
2768.68	2743.00	2743.00	0.00	1
2775.00	6060.76	6060.76	0.00	Overtopping

Culvert Summary Table: CP-13 Sta 885+32

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2763.80	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
274.30	274.30	2764.85	1.049	0.0*	1-S2n	0.358	0.758	0.358	0.985	8.003	3.725
548.60	548.60	2765.48	1.673	0.0*	1-S2n	0.642	1.231	0.651	1.447	12.033	4.639
822.90	822.90	2766.00	2.193	0.0*	1-S2n	0.823	1.619	0.853	1.802	13.786	5.247
1097.20	1097.20	2766.46	2.656	0.0*	1-S2n	1.004	1.959	1.106	2.100	14.178	5.711
1371.50	1371.50	2766.88	3.078	0.0*	1-S2n	1.174	2.283	1.308	2.360	14.974	6.093
1645.80	1645.80	2767.29	3.489	0.0*	1-S2n	1.314	2.572	1.501	2.593	15.665	6.418
1920.10	1920.10	2767.69	3.891	0.0*	1-S2n	1.455	2.858	1.688	2.806	16.252	6.704
2194.40	2194.40	2768.02	4.220	0.0*	1-S2n	1.596	3.119	1.871	3.002	16.758	6.959
2468.70	2468.70	2768.35	4.550	0.0*	1-S2n	1.732	3.379	2.048	3.185	17.216	7.191
2743.00	2743.00	2768.68	4.879	0.0*	1-S2n	1.855	3.621	2.220	3.358	17.651	7.403

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2763.80 ft, Outlet Elevation (invert): 2761.00 ft
 Culvert Length: 146.03 ft, Culvert Slope: 0.0192

Site Data - CP-13 Sta 885+32

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2763.47 ft

Outlet Station: 146.00 ft

Outlet Elevation: 2760.67 ft

Number of Barrels: 7

Culvert Data Summary - CP-13 Sta 885+32

Barrel Shape: Concrete Box
 Barrel Span: 10.00 ft
 Barrel Rise: 6.00 ft
 Barrel Material: Concrete
 Embedment: 4.00 in
 Barrel Manning's n: 0.0120 (top and sides)
 Manning's n: 0.0120 (bottom)
 Inlet Type: Conventional
 Inlet Edge Condition: Square Edge (30-75° flare) Wingwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-13 Sta 885+32)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2761.00	0.00	0.00	0.00	0.00
274.30	2761.98	0.98	3.72	0.61	0.72
548.60	2762.45	1.45	4.64	0.90	0.76
822.90	2762.80	1.80	5.25	1.12	0.79
1097.20	2763.10	2.10	5.71	1.31	0.81
1371.50	2763.36	2.36	6.09	1.47	0.82
1645.80	2763.59	2.59	6.42	1.62	0.83
1920.10	2763.81	2.81	6.70	1.75	0.84
2194.40	2764.00	3.00	6.96	1.87	0.85
2468.70	2764.19	3.19	7.19	1.99	0.85
2743.00	2764.36	3.36	7.40	2.10	0.86

Tailwater Channel Data - CP-13 Sta 885+32

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 60.00 ft
 Side Slope (H:V): 15.00 (1:1)
 Channel Slope: 0.0100
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2761.00 ft

Roadway Data for Crossing: CP-13 Sta 885+32

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2775.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-14 Sta 883+00

Headwater Elevation (ft)	Total Discharge (cfs)	CP-14 Sta 883+00 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2765.00	0.00	0.00	0.00	1
2765.66	7.70	7.70	0.00	1
2765.95	15.40	15.40	0.00	1
2766.18	23.10	23.10	0.00	1
2766.37	30.80	30.80	0.00	1
2766.56	38.50	38.50	0.00	1
2766.73	46.20	46.20	0.00	1
2766.90	53.90	53.90	0.00	1
2767.05	61.60	61.60	0.00	1
2767.19	69.30	69.30	0.00	1
2767.33	77.00	77.00	0.00	1
2770.00	208.31	208.31	0.00	Overtopping

Culvert Summary Table: CP-14 Sta 883+00

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2765.00	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
7.70	7.70	2765.66	0.658	0.0*	1-S2n	0.369	0.477	0.376	0.530	4.851	2.495
15.40	15.40	2765.95	0.951	0.0*	1-S2n	0.531	0.697	0.537	0.687	5.889	2.967
23.10	23.10	2766.18	1.180	0.0*	1-S2n	0.658	0.870	0.660	0.800	6.633	3.284
30.80	30.80	2766.37	1.375	0.0*	1-S2n	0.758	1.005	0.769	0.891	7.110	3.528
38.50	38.50	2766.56	1.556	0.0*	1-S2n	0.858	1.132	0.861	0.969	7.625	3.731
46.20	46.20	2766.73	1.734	0.0*	1-S2n	0.945	1.248	0.947	1.037	8.088	3.905
53.90	53.90	2766.90	1.898	0.0*	1-S2n	1.022	1.349	1.028	1.099	8.357	4.058
61.60	61.60	2767.05	2.049	0.0*	1-S2n	1.099	1.451	1.105	1.155	8.667	4.196
69.30	69.30	2767.19	2.191	0.0*	1-S2n	1.176	1.544	1.178	1.207	8.962	4.321
77.00	77.00	2767.33	2.327	0.0*	1-S2n	1.245	1.629	1.250	1.256	9.201	4.437

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2765.00 ft, Outlet Elevation (invert): 2763.50 ft
 Culvert Length: 133.01 ft, Culvert Slope: 0.0113

Site Data - CP-14 Sta 883+00

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2765.00 ft
 Outlet Station: 133.00 ft
 Outlet Elevation: 2763.50 ft
 Number of Barrels: 3

Culvert Data Summary - CP-14 Sta 883+00

Barrel Shape: Circular
 Barrel Diameter: 3.00 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-14 Sta 883+00)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2763.50	0.00	0.00	0.00	0.00
7.70	2764.03	0.53	2.50	0.50	0.85
15.40	2764.19	0.69	2.97	0.64	0.89
23.10	2764.30	0.80	3.28	0.75	0.92
30.80	2764.39	0.89	3.53	0.83	0.93
38.50	2764.47	0.97	3.73	0.91	0.94
46.20	2764.54	1.04	3.90	0.97	0.96
53.90	2764.60	1.10	4.06	1.03	0.96
61.60	2764.66	1.16	4.20	1.08	0.97
69.30	2764.71	1.21	4.32	1.13	0.98
77.00	2764.76	1.26	4.44	1.18	0.99

Tailwater Channel Data - CP-14 Sta 883+00

Tailwater Channel Option: Triangular Channel
 Side Slope (H:V): 11.00 (1:1)
 Channel Slope: 0.0150
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 2763.50 ft

Roadway Data for Crossing: CP-14 Sta 883+00

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2770.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-15 Sta 878+25

Headwater Elevation (ft)	Total Discharge (cfs)	CP-15 Sta 878+25 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2760.50	0.00	0.00	0.00	1
2761.29	4.00	4.00	0.00	1
2761.64	8.00	8.00	0.00	1
2761.92	12.00	12.00	0.00	1
2762.15	16.00	16.00	0.00	1
2762.37	20.00	20.00	0.00	1
2762.58	24.00	24.00	0.00	1
2762.78	28.00	28.00	0.00	1
2762.96	32.00	32.00	0.00	1
2763.13	36.00	36.00	0.00	1
2763.30	40.00	40.00	0.00	1
2770.00	148.97	148.97	0.00	Overtopping

Culvert Summary Table: CP-15 Sta 878+25

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2760.50	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
4.00	4.00	2761.29	0.788	0.0*	1-S2n	0.402	0.576	0.406	0.083	6.257	1.604
8.00	8.00	2761.64	1.138	0.0*	1-S2n	0.564	0.837	0.577	0.126	7.515	2.091
12.00	12.00	2761.92	1.416	0.0*	1-S2n	0.716	1.051	0.720	0.160	8.459	2.438
16.00	16.00	2762.15	1.647	0.0*	1-S2n	0.816	1.208	0.818	0.190	9.266	2.711
20.00	20.00	2762.37	1.871	0.0*	1-S2n	0.915	1.366	0.916	0.216	9.895	2.944
24.00	24.00	2762.58	2.085	0.0*	1-S2n	1.015	1.498	1.020	0.241	10.265	3.147
28.00	28.00	2762.78	2.280	0.0*	1-S2n	1.100	1.624	1.103	0.264	10.751	3.327
32.00	32.00	2762.96	2.462	0.0*	1-S2n	1.176	1.750	1.180	0.285	11.187	3.492
36.00	36.00	2763.13	2.634	0.0*	1-S2n	1.252	1.855	1.282	0.305	11.244	3.642
40.00	40.00	2763.30	2.798	0.0*	1-S2n	1.329	1.960	1.330	0.325	11.905	3.780

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2760.50 ft, Outlet Elevation (invert): 2757.90 ft
 Culvert Length: 157.02 ft, Culvert Slope: 0.0166

Site Data - CP-15 Sta 878+25

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2760.50 ft
 Outlet Station: 157.00 ft
 Outlet Elevation: 2757.90 ft
 Number of Barrels: 1

Culvert Data Summary - CP-15 Sta 878+25

Barrel Shape: Circular
 Barrel Diameter: 3.50 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-15 Sta 878+25)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2757.90	0.00	0.00	0.00	0.00
4.00	2757.98	0.08	1.60	0.16	0.99
8.00	2758.03	0.13	2.09	0.24	1.06
12.00	2758.06	0.16	2.44	0.30	1.10
16.00	2758.09	0.19	2.71	0.36	1.13
20.00	2758.12	0.22	2.94	0.41	1.16
24.00	2758.14	0.24	3.15	0.45	1.18
28.00	2758.16	0.26	3.33	0.49	1.19
32.00	2758.19	0.29	3.49	0.53	1.21
36.00	2758.21	0.31	3.64	0.57	1.22
40.00	2758.22	0.32	3.78	0.61	1.23

Tailwater Channel Data - CP-15 Sta 878+25

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 29.00 ft
 Side Slope (H:V): 11.00 (1:1)
 Channel Slope: 0.0300
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 2757.90 ft

Roadway Data for Crossing: CP-15 Sta 878+25

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2770.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-16 Sta 874+87

Headwater Elevation (ft)	Total Discharge (cfs)	CP-16 Sta 874+87 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2758.20	0.00	0.00	0.00	1
2759.26	15.30	15.30	0.00	1
2759.72	30.60	30.60	0.00	1
2760.09	45.90	45.90	0.00	1
2760.43	61.20	61.20	0.00	1
2760.75	76.50	76.50	0.00	1
2761.03	91.80	91.80	0.00	1
2761.30	107.10	107.10	0.00	1
2761.55	122.40	122.40	0.00	1
2761.79	137.70	137.70	0.00	1
2762.04	153.00	153.00	0.00	1
2765.00	291.33	291.33	0.00	Overtopping

Culvert Summary Table: CP-16 Sta 874+87

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2758.20	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
15.30	15.30	2759.26	1.062	0.0*	1-S2n	0.461	0.803	0.493	0.368	8.345	3.063
30.60	30.60	2759.72	1.522	0.0*	1-S2n	0.647	1.137	0.657	0.542	11.053	3.820
45.90	45.90	2760.09	1.888	0.0*	1-S2n	0.821	1.400	0.829	0.675	12.258	4.323
61.20	61.20	2760.43	2.232	0.0*	1-S2n	0.935	1.637	0.969	0.787	12.899	4.708
76.50	76.50	2760.75	2.548	0.0*	1-S2n	1.050	1.834	1.054	0.885	14.339	5.024
91.80	91.80	2761.03	2.832	0.0*	1-S2n	1.165	2.026	1.171	0.973	14.946	5.294
107.10	107.10	2761.30	3.096	0.0*	1-S2n	1.261	2.190	1.322	1.054	14.725	5.529
122.40	122.40	2761.55	3.347	0.0*	1-S2n	1.349	2.355	1.426	1.128	15.187	5.742
137.70	137.70	2761.79	3.595	0.0*	1-S2n	1.437	2.500	1.529	1.197	15.558	5.933
153.00	153.00	2762.04	3.844	0.0*	1-S2n	1.525	2.639	1.627	1.263	15.944	6.109

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2758.20 ft, Outlet Elevation (invert): 2754.10 ft
 Culvert Length: 140.06 ft, Culvert Slope: 0.0293

Site Data - CP-16 Sta 874+87

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2758.20 ft
 Outlet Station: 140.00 ft
 Outlet Elevation: 2754.10 ft
 Number of Barrels: 2

Culvert Data Summary - CP-16 Sta 874+87

Barrel Shape: Circular
 Barrel Diameter: 4.00 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-16 Sta 874+87)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2754.10	0.00	0.00	0.00	0.00
15.30	2754.47	0.37	3.06	0.57	0.97
30.60	2754.64	0.54	3.82	0.84	1.03
45.90	2754.78	0.68	4.32	1.05	1.06
61.20	2754.89	0.79	4.71	1.23	1.08
76.50	2754.99	0.89	5.02	1.38	1.10
91.80	2755.07	0.97	5.29	1.52	1.11
107.10	2755.15	1.05	5.53	1.64	1.12
122.40	2755.23	1.13	5.74	1.76	1.13
137.70	2755.30	1.20	5.93	1.87	1.14
153.00	2755.36	1.26	6.11	1.97	1.15

Tailwater Channel Data - CP-16 Sta 874+87

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 11.00 ft
 Side Slope (H:V): 7.00 (1:1)
 Channel Slope: 0.0250
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2754.10 ft

Roadway Data for Crossing: CP-16 Sta 874+87

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2765.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-17 Sta 868+80

Headwater Elevation (ft)	Total Discharge (cfs)	CP-17 Sta 868+80 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2755.30	0.00	0.00	0.00	1
2756.26	12.60	12.60	0.00	1
2756.68	25.20	25.20	0.00	1
2757.01	37.80	37.80	0.00	1
2757.30	50.40	50.40	0.00	1
2757.58	63.00	63.00	0.00	1
2757.84	75.60	75.60	0.00	1
2758.08	88.20	88.20	0.00	1
2758.30	100.80	100.80	0.00	1
2758.51	113.40	113.40	0.00	1
2758.72	126.00	126.00	0.00	1
2765.00	383.97	383.97	0.00	Overtopping

Culvert Summary Table: CP-17 Sta 868+80

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2755.30	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
12.60	12.60	2756.26	0.957	0.0*	1-S2n	0.448	0.709	0.499	0.368	6.746	2.524
25.20	25.20	2756.68	1.378	0.0*	1-S2n	0.622	1.019	0.639	0.541	9.454	3.149
37.80	37.80	2757.01	1.713	0.0*	1-S2n	0.795	1.270	0.796	0.675	10.634	3.563
50.40	50.40	2757.30	1.997	0.0*	1-S2n	0.904	1.473	0.916	0.787	11.512	3.880
63.00	63.00	2757.58	2.284	0.0*	1-S2n	1.011	1.661	1.021	0.885	12.349	4.142
75.60	75.60	2757.84	2.543	0.0*	1-S2n	1.117	1.823	1.155	0.973	12.540	4.363
88.20	88.20	2758.08	2.780	0.0*	1-S2n	1.219	1.985	1.224	1.053	13.555	4.559
100.80	100.80	2758.30	3.002	0.0*	1-S2n	1.301	2.123	1.356	1.127	13.391	4.732
113.40	113.40	2758.51	3.213	0.0*	1-S2n	1.382	2.258	1.388	1.197	14.589	4.891
126.00	126.00	2758.72	3.418	0.0*	1-S2n	1.464	2.393	1.541	1.262	14.093	5.035

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2755.30 ft, Outlet Elevation (invert): 2752.00 ft
 Culvert Length: 144.04 ft, Culvert Slope: 0.0229

Site Data - CP-17 Sta 868+80

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2755.30 ft
 Outlet Station: 144.00 ft
 Outlet Elevation: 2752.00 ft
 Number of Barrels: 2

Culvert Data Summary - CP-17 Sta 868+80

Barrel Shape: Circular
 Barrel Diameter: 4.00 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-17 Sta 868+80)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2752.00	0.00	0.00	0.00	0.00
12.60	2752.37	0.37	2.52	0.39	0.80
25.20	2752.54	0.54	3.15	0.57	0.85
37.80	2752.67	0.67	3.56	0.72	0.87
50.40	2752.79	0.79	3.88	0.83	0.89
63.00	2752.88	0.88	4.14	0.94	0.90
75.60	2752.97	0.97	4.36	1.03	0.92
88.20	2753.05	1.05	4.56	1.12	0.93
100.80	2753.13	1.13	4.73	1.20	0.94
113.40	2753.20	1.20	4.89	1.27	0.94
126.00	2753.26	1.26	5.04	1.34	0.95

Tailwater Channel Data - CP-17 Sta 868+80

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 11.00 ft
 Side Slope (H:V): 7.00 (1:1)
 Channel Slope: 0.0170
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2752.00 ft

Roadway Data for Crossing: CP-17 Sta 868+80

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2765.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 110.00 ft

Summary of Culvert Flows at Crossing: CP-19Sta 855+03

Headwater Elevation (ft)	Total Discharge (cfs)	1-36'x9' Discharge (cfs)	2-32'x8' Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2730.00	0.00	0.00	0.00	0.00	0
2731.58	470.60	175.37	295.30	0.00	5
2732.52	941.20	350.42	590.74	0.00	3
2733.30	1411.80	523.42	888.27	0.00	3
2734.01	1882.40	697.61	1184.78	0.00	4
2734.62	2353.00	845.58	1507.36	0.00	2
2735.24	2823.60	993.52	1830.05	0.00	2
2735.85	3294.20	1141.44	2152.67	0.00	2
2736.45	3764.80	1288.96	2475.84	0.00	3
2737.03	4235.40	1442.92	2792.40	0.00	2
2737.61	4706.00	1596.99	3109.20	0.00	2
2740.00	6334.53	2220.46	4114.07	0.00	Overtopping

Culvert Summary Table: 1-36'x9'

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2730.00	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
470.60	175.37	2731.58	1.583	0.0*	1-S2n	0.399	0.886	0.406	0.993	8.034	4.991
941.20	350.42	2732.52	2.521	0.0*	1-S2n	0.797	1.408	0.850	1.496	12.198	6.456
1411.80	523.42	2733.30	3.303	0.0*	1-S2n	0.992	1.853	1.093	1.898	13.346	7.477
1882.40	697.61	2734.01	4.010	0.0*	1-S2n	1.186	2.257	1.341	2.245	14.521	8.283
2353.00	845.58	2734.62	4.622	0.0*	1-S2n	1.351	2.569	1.544	2.556	15.308	8.956
2823.60	993.52	2735.24	5.235	0.0*	1-S2n	1.517	2.858	1.743	2.841	15.977	9.539
3294.20	1141.44	2735.85	5.848	0.0*	1-S2n	1.663	3.147	1.937	3.105	16.563	10.055
3764.80	1288.96	2736.45	6.454	0.0*	1-S2n	1.789	3.407	2.126	3.352	17.084	10.520
4235.40	1442.92	2737.03	7.033	0.0*	1-S2n	1.920	3.671	2.315	3.586	17.596	10.944
4706.00	1596.99	2737.61	7.614	0.0*	1-S2n	2.052	3.935	2.503	3.808	18.057	11.334

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2730.00 ft, Outlet Elevation (invert): 2727.50 ft
 Culvert Length: 181.02 ft, Culvert Slope: 0.0138

Site Data - 1-36'x9'

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2729.00 ft

Outlet Station: 181.00 ft

Outlet Elevation: 2726.50 ft

Number of Barrels: 1

Culvert Data Summary - 1-36'x9'

Barrel Shape: Arch-Box, Concrete
 Barrel Span: 36.00 ft
 Barrel Rise: 9.00 ft
 Barrel Material: Concrete
 Embedment: 12.00 in
 Barrel Manning's n: 0.0120 (top and sides)
 Manning's n: 0.0120 (bottom)
 Inlet Type: Conventional
 Inlet Edge Condition: Mitered to Conform to Slope
 Inlet Depression: NONE

Culvert Summary Table: 2-32'x8'

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2730.00	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
470.60	295.30	2731.58	1.583	0.0*	1-S2n	0.378	0.858	0.388	0.993	7.828	4.991
941.20	590.74	2732.52	2.521	0.0*	1-S2n	0.757	1.353	0.757	1.496	11.541	6.456
1411.80	888.27	2733.30	3.303	0.0*	1-S2n	0.963	1.792	1.053	1.898	13.148	7.477
1882.40	1184.78	2734.01	4.010	0.0*	1-S2n	1.147	2.173	1.293	2.245	14.288	8.283
2353.00	1507.36	2734.62	4.622	0.0*	1-S2n	1.346	2.559	1.539	2.556	15.273	8.956
2823.60	1830.05	2735.24	5.235	0.0*	1-S2n	1.546	2.912	1.781	2.841	16.059	9.539
3294.20	2152.67	2735.85	5.848	0.0*	1-S2n	1.711	3.256	2.013	3.105	16.744	10.055
3764.80	2475.84	2736.45	6.454	0.0*	1-S2n	1.864	3.563	2.233	3.352	17.381	10.520
4235.40	2792.40	2737.03	7.033	0.0*	1-S2n	2.014	3.865	2.449	3.586	17.901	10.944
4706.00	3109.20	2737.61	7.614	0.0*	1-S2n	2.163	4.148	2.663	3.808	18.390	11.334

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2730.00 ft, Outlet Elevation (invert): 2727.50 ft
 Culvert Length: 181.02 ft, Culvert Slope: 0.0138

Site Data - 2-32'x8'

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2730.00 ft
 Outlet Station: 181.00 ft
 Outlet Elevation: 2727.50 ft
 Number of Barrels: 2

Culvert Data Summary - 2-32'x8'

Barrel Shape: Arch-Box, Concrete
Barrel Span: 32.00 ft
Barrel Rise: 8.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120 (top and sides)
Manning's n: 0.0120 (bottom)
Inlet Type: Conventional
Inlet Edge Condition: Mitered to Conform to Slope
Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-19Sta 855+03)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2727.49	0.00	0.00	0.00	0.00
470.60	2728.48	0.99	4.99	0.68	0.91
941.20	2728.99	1.50	6.46	1.03	0.97
1411.80	2729.39	1.90	7.48	1.30	1.00
1882.40	2729.74	2.25	8.28	1.54	1.03
2353.00	2730.05	2.56	8.96	1.75	1.05
2823.60	2730.33	2.84	9.54	1.95	1.06
3294.20	2730.59	3.10	10.06	2.13	1.08
3764.80	2730.84	3.35	10.52	2.30	1.09
4235.40	2731.08	3.59	10.94	2.46	1.10
4706.00	2731.30	3.81	11.33	2.61	1.11

Tailwater Channel Data - CP-19Sta 855+03

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 90.00 ft
Side Slope (H:V): 5.00 (1:1)
Channel Slope: 0.0110
Channel Manning's n: 0.0300
Channel Invert Elevation: 2727.49 ft

Roadway Data for Crossing: CP-19Sta 855+03

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 30.00 ft
Crest Elevation: 2740.00 ft
Roadway Surface: Paved
Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-20 Sta 847+26

Headwater Elevation (ft)	Total Discharge (cfs)	CP-20 Sta 847+26 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2726.40	0.00	0.00	0.00	1
2728.78	16.80	16.80	0.00	1
2728.90	33.60	33.60	0.00	1
2729.00	50.40	50.40	0.00	1
2729.09	67.20	67.20	0.00	1
2729.17	84.00	84.00	0.00	1
2729.42	100.80	100.80	0.00	1
2729.70	117.60	117.60	0.00	1
2729.97	134.40	134.40	0.00	1
2730.25	151.20	151.20	0.00	1
2730.53	168.00	168.00	0.00	1
2733.00	282.77	282.77	0.00	Overtopping

Culvert Summary Table: CP-20 Sta 847+26

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2726.40	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
16.80	16.80	2728.78	2.380	0.0*	1-S2n	0.575	0.835	0.595	0.408	6.951	3.015
33.60	33.60	2728.90	2.501	0.0*	1-S2n	0.847	1.202	0.851	0.591	8.546	3.709
50.40	50.40	2729.00	2.602	0.0*	1-S2n	1.032	1.473	1.033	0.730	9.718	4.168
67.20	67.20	2729.09	2.692	0.0*	1-S2n	1.213	1.715	1.241	0.845	10.148	4.518
84.00	84.00	2729.17	2.775	0.0*	1-S2n	1.355	1.931	1.366	0.945	11.043	4.805
100.80	100.80	2729.42	3.020	0.0*	1-S2n	1.497	2.123	1.546	1.034	11.232	5.051
117.60	117.60	2729.70	3.300	0.0*	1-S2n	1.634	2.303	1.636	1.115	12.167	5.266
134.40	134.40	2729.97	3.573	0.0*	1-S2n	1.757	2.471	1.826	1.189	12.021	5.459
151.20	151.20	2730.25	3.846	0.0*	1-S2n	1.879	2.623	1.958	1.258	12.360	5.634
168.00	168.00	2730.53	4.128	0.0*	5-S2n	2.002	2.775	2.089	1.323	12.653	5.794

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2726.40 ft, Outlet Elevation (invert): 2724.50 ft
 Culvert Length: 140.01 ft, Culvert Slope: 0.0136
 Inlet Throat Elevation: 2726.40 ft, Inlet Crest Elevation: 2728.58 ft

Site Data - CP-20 Sta 847+26

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2728.40 ft
 Outlet Station: 140.00 ft
 Outlet Elevation: 2724.50 ft
 Number of Barrels: 2

Culvert Data Summary - CP-20 Sta 847+26

Barrel Shape: Circular

Barrel Diameter: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-20 Sta 847+26)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2724.50	0.00	0.00	0.00	0.00
16.80	2724.91	0.41	3.02	0.59	0.94
33.60	2725.09	0.59	3.71	0.85	0.99
50.40	2725.23	0.73	4.17	1.05	1.02
67.20	2725.34	0.84	4.52	1.21	1.04
84.00	2725.44	0.94	4.81	1.36	1.05
100.80	2725.53	1.03	5.05	1.48	1.07
117.60	2725.61	1.11	5.27	1.60	1.08
134.40	2725.69	1.19	5.46	1.71	1.09
151.20	2725.76	1.26	5.63	1.81	1.10
168.00	2725.82	1.32	5.79	1.90	1.10

Tailwater Channel Data - CP-20 Sta 847+26

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 10.00 ft
 Side Slope (H:V): 9.00 (1:1)
 Channel Slope: 0.0230
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2724.50 ft

Roadway Data for Crossing: CP-20 Sta 847+26

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2733.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-21 Sta 835+80

Headwater Elevation (ft)	Total Discharge (cfs)	CP-21 Sta 835+80 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2719.40	0.00	0.00	0.00	1
2722.60	31.60	31.60	0.00	1
2722.78	63.20	63.20	0.00	1
2722.92	94.80	94.80	0.00	1
2723.05	126.40	126.40	0.00	1
2723.17	158.00	158.00	0.00	1
2723.28	189.60	189.60	0.00	1
2723.39	221.20	221.20	0.00	1
2723.49	252.80	252.80	0.00	1
2723.58	284.40	284.40	0.00	1
2723.68	316.00	316.00	0.00	1
2725.00	558.31	558.31	0.00	Overtopping

Culvert Summary Table: CP-21 Sta 835+80

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2719.40	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
31.60	31.60	2722.60	3.204	0.0*	1-S2n	0.225	0.496	0.286	0.631	6.909	3.070
63.20	63.20	2722.78	3.377	0.0*	1-S2n	0.426	0.787	0.432	0.895	9.154	3.724
94.80	94.80	2722.92	3.522	0.0*	1-S2n	0.538	1.031	0.557	1.091	10.645	4.156
126.40	126.40	2723.05	3.651	0.0*	1-S2n	0.651	1.249	0.659	1.251	11.979	4.487
158.00	158.00	2723.17	3.770	0.0*	1-S2n	0.764	1.450	0.772	1.390	12.788	4.758
189.60	189.60	2723.28	3.881	0.0*	1-S2n	0.860	1.637	0.868	1.512	13.648	4.991
221.20	221.20	2723.39	3.986	0.0*	1-S2n	0.947	1.814	1.037	1.623	13.325	5.196
252.80	252.80	2723.49	4.087	0.0*	5-S2n	1.034	1.983	1.145	1.725	13.794	5.379
284.40	284.40	2723.58	4.183	0.0*	5-S2n	1.121	2.145	1.253	1.819	14.181	5.546
316.00	316.00	2723.68	4.275	0.0*	5-S2n	1.207	2.302	1.358	1.907	14.548	5.698

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2719.40 ft, Outlet Elevation (invert): 2717.00 ft
 Culvert Length: 125.02 ft, Culvert Slope: 0.0192
 Inlet Throat Elevation: 2719.40 ft, Inlet Crest Elevation: 2722.31 ft

Site Data - CP-21 Sta 835+80

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2722.00 ft
 Outlet Station: 125.00 ft
 Outlet Elevation: 2717.00 ft
 Number of Barrels: 2

Culvert Data Summary - CP-21 Sta 835+80

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft
 Barrel Rise: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-21 Sta 835+80)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2717.00	0.00	0.00	0.00	0.00
31.60	2717.63	0.63	3.07	0.59	0.80
63.20	2717.90	0.90	3.72	0.84	0.84
94.80	2718.09	1.09	4.16	1.02	0.86
126.40	2718.25	1.25	4.49	1.17	0.88
158.00	2718.39	1.39	4.76	1.30	0.89
189.60	2718.51	1.51	4.99	1.42	0.91
221.20	2718.62	1.62	5.20	1.52	0.91
252.80	2718.72	1.72	5.38	1.61	0.92
284.40	2718.82	1.82	5.55	1.70	0.93
316.00	2718.91	1.91	5.70	1.79	0.94

Tailwater Channel Data - CP-21 Sta 835+80

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 10.00 ft
 Side Slope (H:V): 10.00 (1:1)
 Channel Slope: 0.0150
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2717.00 ft

Roadway Data for Crossing: CP-21 Sta 835+80

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2725.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 110.00 ft

Summary of Culvert Flows at Crossing: CP-22 Sta 828+00

Headwater Elevation (ft)	Total Discharge (cfs)	CP-22 Sta 828+00 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2713.60	0.00	0.00	0.00	1
2714.48	111.00	111.00	0.00	1
2714.93	222.00	222.00	0.00	1
2715.34	333.00	333.00	0.00	1
2715.71	444.00	444.00	0.00	1
2716.05	555.00	555.00	0.00	1
2716.37	666.00	666.00	0.00	1
2716.66	777.00	777.00	0.00	1
2716.95	888.00	888.00	0.00	1
2717.25	999.00	999.00	0.00	1
2717.52	1110.00	1110.00	0.00	1
2720.00	2115.86	2115.86	0.00	Overtopping

Culvert Summary Table: CP-22 Sta 828+00

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2713.60	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
111.00	111.00	2714.48	0.877	0.0*	1-S2n	0.220	0.612	0.232	0.649	7.519	3.071
222.00	222.00	2714.93	1.326	0.0*	1-S2n	0.440	0.967	0.440	0.952	10.308	3.815
333.00	333.00	2715.34	1.741	0.0*	1-S2n	0.614	1.280	0.620	1.183	13.438	4.309
444.00	444.00	2715.71	2.110	0.0*	1-S2n	0.725	1.554	0.805	1.377	13.791	4.687
555.00	555.00	2716.05	2.450	0.0*	1-S2n	0.837	1.808	0.948	1.546	14.631	4.997
666.00	666.00	2716.37	2.766	0.0*	1-S2n	0.948	2.040	1.088	1.698	15.303	5.261
777.00	777.00	2716.66	3.060	0.0*	1-S2n	1.059	2.271	1.224	1.836	15.869	5.493
888.00	888.00	2716.95	3.351	0.0*	1-S2n	1.163	2.475	1.357	1.963	16.355	5.701
999.00	999.00	2717.25	3.643	0.0*	1-S2n	1.249	2.680	1.488	2.082	16.788	5.889
1110.00	1110.00	2717.52	3.918	0.0*	1-S2n	1.336	2.879	1.615	2.194	17.182	6.061

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2713.60 ft, Outlet Elevation (invert): 2710.50 ft
 Culvert Length: 122.04 ft, Culvert Slope: 0.0254

Site Data - CP-22 Sta 828+00

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2713.27 ft

Outlet Station: 122.00 ft

Outlet Elevation: 2710.17 ft

Number of Barrels: 4

Culvert Data Summary - CP-22 Sta 828+00

Barrel Shape: Concrete Box
 Barrel Span: 10.00 ft
 Barrel Rise: 6.00 ft
 Barrel Material: Concrete
 Embedment: 4.00 in
 Barrel Manning's n: 0.0120 (top and sides)
 Manning's n: 0.0120 (bottom)
 Inlet Type: Conventional
 Inlet Edge Condition: Square Edge (30-75° flare) Wingwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-22 Sta 828+00)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2710.50	0.00	0.00	0.00	0.00
111.00	2711.15	0.65	3.07	0.49	0.74
222.00	2711.45	0.95	3.82	0.71	0.78
333.00	2711.68	1.18	4.31	0.89	0.80
444.00	2711.88	1.38	4.69	1.03	0.82
555.00	2712.05	1.55	5.00	1.16	0.83
666.00	2712.20	1.70	5.26	1.27	0.84
777.00	2712.34	1.84	5.49	1.37	0.85
888.00	2712.46	1.96	5.70	1.47	0.86
999.00	2712.58	2.08	5.89	1.56	0.87
1110.00	2712.69	2.19	6.06	1.64	0.88

Tailwater Channel Data - CP-22 Sta 828+00

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 44.00 ft
 Side Slope (H:V): 18.00 (1:1)
 Channel Slope: 0.0120
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2710.50 ft

Roadway Data for Crossing: CP-22 Sta 828+00

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2720.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-23 Sta 825+31

Headwater Elevation (ft)	Total Discharge (cfs)	CP-23 Sta 825+31 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2712.50	0.00	0.00	0.00	1
2713.00	1.20	1.20	0.00	1
2713.22	2.40	2.40	0.00	1
2713.39	3.60	3.60	0.00	1
2713.54	4.80	4.80	0.00	1
2713.69	6.00	6.00	0.00	1
2713.83	7.20	7.20	0.00	1
2713.95	8.40	8.40	0.00	1
2714.07	9.60	9.60	0.00	1
2714.18	10.80	10.80	0.00	1
2714.29	12.00	12.00	0.00	1
2720.00	44.99	44.99	0.00	Overtopping

Culvert Summary Table: CP-23 Sta 825+31

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2712.50	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
1.20	1.20	2713.00	0.499	0.0*	1-S2n	0.233	0.372	0.262	0.111	4.783	1.175
2.40	2.40	2713.22	0.717	0.0*	1-S2n	0.329	0.531	0.330	0.165	6.899	1.485
3.60	3.60	2713.39	0.890	0.0*	1-S2n	0.416	0.659	0.418	0.207	7.625	1.693
4.80	4.80	2713.54	1.044	0.0*	1-S2n	0.475	0.768	0.482	0.243	8.150	1.854
6.00	6.00	2713.69	1.193	0.0*	1-S2n	0.534	0.862	0.541	0.274	8.693	1.986
7.20	7.20	2713.83	1.327	0.0*	1-S2n	0.593	0.949	0.593	0.303	9.222	2.099
8.40	8.40	2713.95	1.451	0.0*	1-S2n	0.640	1.030	0.645	0.329	9.651	2.199
9.60	9.60	2714.07	1.566	0.0*	1-S2n	0.685	1.103	0.693	0.353	9.894	2.287
10.80	10.80	2714.18	1.678	0.0*	1-S2n	0.730	1.176	0.735	0.376	10.285	2.368
12.00	12.00	2714.29	1.788	0.0*	1-S2n	0.776	1.241	0.780	0.397	10.561	2.442

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2712.50 ft, Outlet Elevation (invert): 2709.00 ft
 Culvert Length: 150.04 ft, Culvert Slope: 0.0233

Site Data - CP-23 Sta 825+31

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2712.50 ft
 Outlet Station: 150.00 ft
 Outlet Elevation: 2709.00 ft
 Number of Barrels: 1

Culvert Data Summary - CP-23 Sta 825+31

Barrel Shape: Circular
 Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Grooved End in Headwall

Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-23 Sta 825+31)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2709.00	0.00	0.00	0.00	0.00
1.20	2709.11	0.11	1.17	0.12	0.66
2.40	2709.16	0.16	1.48	0.17	0.70
3.60	2709.21	0.21	1.69	0.22	0.72
4.80	2709.24	0.24	1.85	0.26	0.74
6.00	2709.27	0.27	1.99	0.29	0.75
7.20	2709.30	0.30	2.10	0.32	0.76
8.40	2709.33	0.33	2.20	0.35	0.77
9.60	2709.35	0.35	2.29	0.37	0.78
10.80	2709.38	0.38	2.37	0.40	0.79
12.00	2709.40	0.40	2.44	0.42	0.79

Tailwater Channel Data - CP-23 Sta 825+31

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0170

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2710.00	0.0350
2	12.00	2709.00	0.0350
3	20.00	2709.00	0.0350
4	30.00	2710.00	0.0000

Roadway Data for Crossing: CP-23 Sta 825+31

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 150.00 ft

Crest Elevation: 2720.00 ft

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

Summary of Culvert Flows at Crossing: CP-24 Sta 818+42

Headwater Elevation (ft)	Total Discharge (cfs)	CP-24 Sta 818+42 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2699.40	0.00	0.00	0.00	1
2702.75	15.70	15.70	0.00	1
2702.85	31.40	31.40	0.00	1
2702.92	47.10	47.10	0.00	1
2702.99	62.80	62.80	0.00	1
2703.06	78.50	78.50	0.00	1
2703.11	94.20	94.20	0.00	1
2703.17	109.90	109.90	0.00	1
2703.22	125.60	125.60	0.00	1
2703.27	141.30	141.30	0.00	1
2703.33	157.00	157.00	0.00	1
2705.00	242.84	242.84	0.00	Overtopping

Culvert Summary Table: CP-24 Sta 818+42

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2699.40	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
15.70	15.70	2702.75	3.355	0.0*	1-S2n	0.513	0.811	0.531	0.325	7.646	2.168
31.40	31.40	2702.85	3.446	0.0*	1-S2n	0.752	1.155	0.754	0.483	9.469	2.730
47.10	47.10	2702.92	3.523	0.0*	1-S2n	0.917	1.420	0.919	0.605	10.710	3.108
62.80	62.80	2702.99	3.592	0.0*	1-S2n	1.064	1.658	1.068	0.709	11.567	3.397
78.50	78.50	2703.06	3.655	0.0*	1-S2n	1.208	1.860	1.209	0.800	12.258	3.635
94.20	94.20	2703.11	3.714	0.0*	1-S2n	1.321	2.052	1.322	0.882	12.958	3.839
109.90	109.90	2703.17	3.770	0.0*	1-S2n	1.434	2.220	1.445	0.957	13.388	4.018
125.60	125.60	2703.22	3.823	0.0*	1-S2n	1.546	2.389	1.600	1.027	13.379	4.178
141.30	141.30	2703.27	3.874	0.0*	1-S2n	1.651	2.533	1.658	1.092	14.343	4.322
157.00	157.00	2703.33	3.931	0.0*	1-S2n	1.749	2.676	1.823	1.154	14.072	4.455

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2699.40 ft, Outlet Elevation (invert): 2696.20 ft
 Culvert Length: 170.03 ft, Culvert Slope: 0.0188
 Inlet Throat Elevation: 2699.40 ft, Inlet Crest Elevation: 2702.60 ft

Site Data - CP-24 Sta 818+42

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2702.30 ft
 Outlet Station: 170.00 ft
 Outlet Elevation: 2696.20 ft
 Number of Barrels: 2

Culvert Data Summary - CP-24 Sta 818+42

Barrel Shape: Circular

Barrel Diameter: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-24 Sta 818+42)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2696.20	0.00	0.00	0.00	0.00
15.70	2696.53	0.33	2.17	0.28	0.72
31.40	2696.68	0.48	2.73	0.42	0.76
47.10	2696.81	0.61	3.11	0.53	0.78
62.80	2696.91	0.71	3.40	0.62	0.80
78.50	2697.00	0.80	3.64	0.70	0.82
94.20	2697.08	0.88	3.84	0.77	0.83
109.90	2697.16	0.96	4.02	0.84	0.84
125.60	2697.23	1.03	4.18	0.90	0.84
141.30	2697.29	1.09	4.32	0.95	0.85
157.00	2697.35	1.15	4.45	1.01	0.86

Tailwater Channel Data - CP-24 Sta 818+42

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 19.00 ft
 Side Slope (H:V): 10.00 (1:1)
 Channel Slope: 0.0140
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2696.20 ft

Roadway Data for Crossing: CP-24 Sta 818+42

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2705.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-25 Sta 812+03

Headwater Elevation (ft)	Total Discharge (cfs)	CP-25 Sta 812+03 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2689.40	0.00	0.00	0.00	1
2692.16	33.90	33.90	0.00	1
2692.32	67.80	67.80	0.00	1
2692.45	101.70	101.70	0.00	1
2692.57	135.60	135.60	0.00	1
2692.68	169.50	169.50	0.00	1
2692.79	203.40	203.40	0.00	1
2692.89	237.30	237.30	0.00	1
2692.98	271.20	271.20	0.00	1
2693.07	305.10	305.10	0.00	1
2693.15	339.00	339.00	0.00	1
2700.00	973.23	973.23	0.00	Overtopping

Culvert Summary Table: CP-25 Sta 812+03

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2689.40	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
33.90	33.90	2692.16	2.759	0.0*	1-S2n	0.273	0.520	0.310	0.466	6.843	4.178
67.80	67.80	2692.32	2.920	0.0*	1-S2n	0.474	0.825	0.475	0.700	8.924	5.349
101.70	101.70	2692.45	3.054	0.0*	1-S2n	0.611	1.081	0.621	0.886	10.237	6.152
135.60	135.60	2692.57	3.174	0.0*	1-S2n	0.748	1.309	0.749	1.045	11.309	6.778
169.50	169.50	2692.68	3.285	0.0*	1-S2n	0.865	1.519	0.872	1.188	12.147	7.296
203.40	203.40	2692.79	3.388	0.0*	1-S2n	0.971	1.716	0.976	1.317	13.028	7.741
237.30	237.30	2692.89	3.485	0.0*	1-S2n	1.077	1.901	1.128	1.437	13.142	8.133
271.20	271.20	2692.98	3.578	0.0*	1-S2n	1.182	2.079	1.188	1.548	14.273	8.484
305.10	305.10	2693.07	3.668	0.0*	1-S2n	1.276	2.248	1.354	1.653	14.080	8.804
339.00	339.00	2693.15	3.754	0.0*	1-S2n	1.367	2.412	1.462	1.753	14.493	9.097

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2689.40 ft, Outlet Elevation (invert): 2686.50 ft
 Culvert Length: 193.02 ft, Culvert Slope: 0.0150
 Inlet Throat Elevation: 2689.40 ft, Inlet Crest Elevation: 2691.89 ft

Site Data - CP-25 Sta 812+03

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2691.70 ft
 Outlet Station: 193.00 ft
 Outlet Elevation: 2686.50 ft
 Number of Barrels: 2

Culvert Data Summary - CP-25 Sta 812+03

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft
 Barrel Rise: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-25 Sta 812+03)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2686.49	0.00	0.00	0.00	0.00
33.90	2686.96	0.47	4.18	0.87	1.12
67.80	2687.19	0.70	5.35	1.31	1.19
101.70	2687.38	0.89	6.15	1.66	1.23
135.60	2687.54	1.05	6.78	1.96	1.26
169.50	2687.68	1.19	7.30	2.22	1.28
203.40	2687.81	1.32	7.74	2.47	1.30
237.30	2687.93	1.44	8.13	2.69	1.32
271.20	2688.04	1.55	8.48	2.90	1.33
305.10	2688.14	1.65	8.80	3.10	1.34
339.00	2688.24	1.75	9.10	3.28	1.35

Tailwater Channel Data - CP-25 Sta 812+03

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 16.00 ft
 Side Slope (H:V): 3.00 (1:1)
 Channel Slope: 0.0300
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2686.49 ft

Roadway Data for Crossing: CP-25 Sta 812+03

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2700.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-26_2 Sta 805+64

Headwater Elevation (ft)	Total Discharge (cfs)	CP-26_2 Sta 805+64 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2686.10	0.00	0.00	0.00	1
2686.49	0.73	0.73	0.00	1
2686.66	1.46	1.46	0.00	1
2686.79	2.19	2.19	0.00	1
2686.91	2.92	2.92	0.00	1
2687.01	3.65	3.65	0.00	1
2687.10	4.38	4.38	0.00	1
2687.20	5.11	5.11	0.00	1
2687.29	5.84	5.84	0.00	1
2687.37	6.57	6.57	0.00	1
2687.45	7.30	7.30	0.00	1
2692.00	34.75	34.75	0.00	Overtopping

Culvert Summary Table: CP-26_2 Sta 805+64

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2686.10	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
0.73	0.73	2686.49	0.387	0.0*	1-S2n	0.228	0.278	0.250	0.135	4.757	1.223
1.46	1.46	2686.66	0.564	0.0*	1-S2n	0.319	0.415	0.325	0.203	4.290	1.561
2.19	2.19	2686.79	0.691	0.0*	1-S2n	0.406	0.505	0.408	0.256	4.771	1.791
2.92	2.92	2686.91	0.807	0.0*	1-S2n	0.462	0.595	0.464	0.302	5.230	1.970
3.65	3.65	2687.01	0.908	0.0*	1-S2n	0.518	0.663	0.522	0.343	5.546	2.118
4.38	4.38	2687.10	1.002	0.0*	1-S2n	0.574	0.730	0.579	0.380	5.796	2.244
5.11	5.11	2687.20	1.098	0.0*	1-S2n	0.623	0.796	0.625	0.414	6.113	2.356
5.84	5.84	2687.29	1.188	0.0*	1-S2n	0.666	0.850	0.669	0.446	6.320	2.454
6.57	6.57	2687.37	1.272	0.0*	1-S2n	0.709	0.903	0.712	0.476	6.529	2.546
7.30	7.30	2687.45	1.352	0.0*	1-S2n	0.752	0.956	0.755	0.504	6.707	2.629

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2686.10 ft, Outlet Elevation (invert): 2684.60 ft
 Culvert Length: 156.01 ft, Culvert Slope: 0.0096

Site Data - CP-26_2 Sta 805+64

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2686.10 ft
 Outlet Station: 156.00 ft
 Outlet Elevation: 2684.60 ft
 Number of Barrels: 1

Culvert Data Summary - CP-26_2 Sta 805+64

Barrel Shape: Circular
 Barrel Diameter: 2.00 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-26_2 Sta 805+64)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2684.59	0.00	0.00	0.00	0.00
0.73	2684.73	0.14	1.22	0.08	0.61
1.46	2684.79	0.20	1.56	0.13	0.65
2.19	2684.85	0.26	1.79	0.16	0.67
2.92	2684.89	0.30	1.97	0.19	0.69
3.65	2684.93	0.34	2.12	0.21	0.70
4.38	2684.97	0.38	2.24	0.24	0.71
5.11	2685.00	0.41	2.36	0.26	0.72
5.84	2685.04	0.45	2.45	0.28	0.72
6.57	2685.07	0.48	2.55	0.30	0.73
7.30	2685.09	0.50	2.63	0.31	0.74

Tailwater Channel Data - CP-26_2 Sta 805+64

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 4.00 ft
 Side Slope (H:V): 3.00 (1:1)
 Channel Slope: 0.0100
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 2684.59 ft

Roadway Data for Crossing: CP-26_2 Sta 805+64

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2692.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 110.00 ft

Summary of Culvert Flows at Crossing: CP-26.1 Sta 809+20

Headwater Elevation (ft)	Total Discharge (cfs)	CP-26.1 Sta 809+20 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2687.30	0.00	0.00	0.00	1
2690.71	11.10	11.10	0.00	1
2690.79	22.20	22.20	0.00	1
2690.86	33.30	33.30	0.00	1
2690.92	44.40	44.40	0.00	1
2690.98	55.50	55.50	0.00	1
2691.03	66.60	66.60	0.00	1
2691.08	77.70	77.70	0.00	1
2691.13	88.80	88.80	0.00	1
2691.18	99.90	99.90	0.00	1
2691.22	111.00	111.00	0.00	1
2695.00	255.39	255.39	0.00	Overtopping

Culvert Summary Table: CP-26.1 Sta 809+20

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2687.30	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
11.10	11.10	2690.71	3.408	0.0*	1-S2n	0.482	0.706	0.496	0.530	6.428	3.452
22.20	22.20	2690.79	3.491	0.0*	1-S2n	0.715	1.003	0.722	0.785	7.795	4.301
33.30	33.30	2690.86	3.561	0.0*	5-S2n	0.864	1.234	0.877	0.983	8.746	4.863
44.40	44.40	2690.92	3.623	0.0*	5-S2n	1.013	1.442	1.021	1.150	9.492	5.292
55.50	55.50	2690.98	3.680	0.0*	5-S2n	1.136	1.616	1.136	1.296	10.222	5.643
66.60	66.60	2691.03	3.733	0.0*	5-S2n	1.250	1.784	1.254	1.427	10.716	5.943
77.70	77.70	2691.08	3.784	0.0*	5-S2n	1.364	1.930	1.369	1.547	11.134	6.205
88.80	88.80	2691.13	3.832	0.0*	5-S2n	1.468	2.075	1.516	1.658	11.106	6.440
99.90	99.90	2691.18	3.878	0.0*	5-S2n	1.567	2.202	1.625	1.762	11.414	6.652
111.00	111.00	2691.22	3.922	0.0*	5-S2n	1.666	2.325	1.674	1.859	12.206	6.847

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2687.30 ft, Outlet Elevation (invert): 2685.50 ft
 Culvert Length: 148.01 ft, Culvert Slope: 0.0122
 Inlet Throat Elevation: 2687.30 ft, Inlet Crest Elevation: 2690.57 ft

Site Data - CP-26.1 Sta 809+20

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2690.30 ft
 Outlet Station: 148.00 ft
 Outlet Elevation: 2685.50 ft
 Number of Barrels: 2

Culvert Data Summary - CP-26.1 Sta 809+20

Barrel Shape: Circular

Barrel Diameter: 3.50 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-26.1 Sta 809+20)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2685.49	0.00	0.00	0.00	0.00
11.10	2686.02	0.53	3.45	0.66	0.91
22.20	2686.28	0.79	4.30	0.98	0.95
33.30	2686.47	0.98	4.86	1.23	0.98
44.40	2686.64	1.15	5.29	1.43	1.00
55.50	2686.79	1.30	5.64	1.62	1.01
66.60	2686.92	1.43	5.94	1.78	1.02
77.70	2687.04	1.55	6.21	1.93	1.03
88.80	2687.15	1.66	6.44	2.07	1.04
99.90	2687.25	1.76	6.65	2.20	1.05
111.00	2687.35	1.86	6.85	2.32	1.06

Tailwater Channel Data - CP-26.1 Sta 809+20

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 5.00 ft
 Side Slope (H:V): 2.00 (2:1)
 Channel Slope: 0.0200
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2685.49 ft

Roadway Data for Crossing: CP-26.1 Sta 809+20

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2695.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: Thornydale Sta 53+00

Headwater Elevation (ft)	Total Discharge (cfs)	Thornydale Sta 53+00 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2688.80	0.00	0.00	0.00	1
2692.38	4.20	4.20	0.00	1
2692.43	8.40	8.40	0.00	1
2692.48	12.60	12.60	0.00	1
2692.52	16.80	16.80	0.00	1
2692.56	21.00	21.00	0.00	1
2692.60	25.20	25.20	0.00	1
2692.63	29.40	29.40	0.00	1
2692.66	33.60	33.60	0.00	1
2692.69	37.80	37.80	0.00	1
2692.72	42.00	42.00	0.00	1
2694.00	71.33	71.33	0.00	Overtopping

Culvert Summary Table: Thornydale Sta 53+00

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2688.80	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
4.20	4.20	2692.38	3.575	0.0*	5-S2n	0.326	0.494	0.333	0.221	5.967	1.498
8.40	8.40	2692.43	3.632	0.0*	5-S2n	0.471	0.713	0.473	0.334	7.321	1.935
12.60	12.60	2692.48	3.679	0.0*	5-S2n	0.587	0.884	0.589	0.424	8.151	2.240
16.80	16.80	2692.52	3.721	0.0*	5-S2n	0.680	1.030	0.684	0.502	8.811	2.480
21.00	21.00	2692.56	3.760	0.0*	5-S2n	0.769	1.158	0.771	0.571	9.390	2.681
25.20	25.20	2692.60	3.796	0.0*	5-S2n	0.850	1.272	0.851	0.635	9.880	2.854
29.40	29.40	2692.63	3.830	0.0*	5-S2n	0.928	1.380	0.929	0.694	10.281	3.008
33.60	33.60	2692.66	3.863	0.0*	5-S2n	1.005	1.472	1.005	0.749	10.627	3.146
37.80	37.80	2692.69	3.894	0.0*	5-S2n	1.078	1.560	1.079	0.802	10.934	3.272
42.00	42.00	2692.72	3.924	0.0*	5-S2n	1.151	1.634	1.153	0.852	11.199	3.388

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2688.80 ft, Outlet Elevation (invert): 2685.30 ft
 Culvert Length: 190.03 ft, Culvert Slope: 0.0184
 Inlet Throat Elevation: 2688.80 ft, Inlet Crest Elevation: 2692.28 ft

Site Data - Thornydale Sta 53+00

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2692.00 ft

Outlet Station: 190.00 ft

Outlet Elevation: 2685.30 ft

Number of Barrels: 2

Culvert Data Summary - Thornydale Sta 53+00

Barrel Shape: Circular

Barrel Diameter: 2.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: Thornydale Sta 53+00)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2685.20	0.00	0.00	0.00	0.00
4.20	2685.42	0.22	1.50	0.14	0.58
8.40	2685.53	0.33	1.94	0.21	0.61
12.60	2685.62	0.42	2.24	0.26	0.63
16.80	2685.70	0.50	2.48	0.31	0.65
21.00	2685.77	0.57	2.68	0.36	0.66
25.20	2685.83	0.63	2.85	0.40	0.67
29.40	2685.89	0.69	3.01	0.43	0.68
33.60	2685.95	0.75	3.15	0.47	0.69
37.80	2686.00	0.80	3.27	0.50	0.70
42.00	2686.05	0.85	3.39	0.53	0.70

Tailwater Channel Data - Thornydale Sta 53+00

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 12.00 ft
 Side Slope (H:V): 3.00 (3:1)
 Channel Slope: 0.0100
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2685.20 ft

Roadway Data for Crossing: Thornydale Sta 53+00

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 100.00 ft
 Crest Elevation: 2694.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 40.00 ft

Summary of Culvert Flows at Crossing: CP-27 Sta 801+54

Headwater Elevation (ft)	Total Discharge (cfs)	CP-27 Sta 801+54 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2680.67	0.00	0.00	0.00	1
2683.78	6.30	6.30	0.00	1
2683.83	12.60	12.60	0.00	1
2683.88	18.90	18.90	0.00	1
2683.92	25.20	25.20	0.00	1
2683.96	31.50	31.50	0.00	1
2684.00	37.80	37.80	0.00	1
2684.03	44.10	44.10	0.00	1
2684.06	50.40	50.40	0.00	1
2684.10	56.70	56.70	0.00	1
2684.13	63.00	63.00	0.00	1
2686.00	155.74	155.74	0.00	Overtopping

Culvert Summary Table: CP-27 Sta 801+54

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2680.67	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
6.30	6.30	2683.78	3.106	0.0*	5-S2n	0.356	0.465	0.364	0.240	4.588	2.259
12.60	12.60	2683.83	3.162	0.0*	5-S2n	0.524	0.664	0.533	0.346	5.541	2.764
18.90	18.90	2683.88	3.210	0.0*	5-S2n	0.638	0.824	0.643	0.425	6.255	3.097
25.20	25.20	2683.92	3.252	0.0*	5-S2n	0.751	0.961	0.752	0.490	6.763	3.351
31.50	31.50	2683.96	3.291	0.0*	5-S2n	0.838	1.078	0.838	0.546	7.251	3.560
37.80	37.80	2684.00	3.327	0.0*	5-S2n	0.925	1.187	0.926	0.597	7.597	3.739
44.10	44.10	2684.03	3.361	0.0*	5-S2n	1.010	1.289	1.010	0.642	7.913	3.895
50.40	50.40	2684.06	3.394	0.0*	5-S2n	1.085	1.380	1.089	0.684	8.173	4.036
56.70	56.70	2684.10	3.425	0.0*	5-S2n	1.160	1.472	1.162	0.723	8.456	4.163
63.00	63.00	2684.13	3.455	0.0*	5-S2n	1.236	1.553	1.237	0.759	8.669	4.280

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2680.67 ft, Outlet Elevation (invert): 2679.00 ft
 Culvert Length: 154.01 ft, Culvert Slope: 0.0108
 Inlet Throat Elevation: 2680.67 ft, Inlet Crest Elevation: 2683.68 ft

Site Data - CP-27 Sta 801+54

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2683.47 ft
 Outlet Station: 154.00 ft
 Outlet Elevation: 2679.00 ft
 Number of Barrels: 3

Culvert Data Summary - CP-27 Sta 801+54

Barrel Shape: Circular

Barrel Diameter: 2.50 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-27 Sta 801+54)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2678.80	0.00	0.00	0.00	0.00
6.30	2679.04	0.24	2.26	0.30	0.93
12.60	2679.15	0.35	2.76	0.43	0.98
18.90	2679.22	0.42	3.10	0.53	1.01
25.20	2679.29	0.49	3.35	0.61	1.03
31.50	2679.35	0.55	3.56	0.68	1.04
37.80	2679.40	0.60	3.74	0.74	1.05
44.10	2679.44	0.64	3.90	0.80	1.07
50.40	2679.48	0.68	4.04	0.85	1.07
56.70	2679.52	0.72	4.16	0.90	1.08
63.00	2679.56	0.76	4.28	0.95	1.09

Tailwater Channel Data - CP-27 Sta 801+54

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 8.00 ft
 Side Slope (H:V): 15.00 (1:1)
 Channel Slope: 0.0200
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 2678.80 ft

Roadway Data for Crossing: CP-27 Sta 801+54

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2686.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: DW Sta 798+07 Lt

Headwater Elevation (ft)	Total Discharge (cfs)	KAI TC Prvt Dwy 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2679.60	0.00	0.00	0.00	1
2680.14	2.00	2.00	0.00	1
2680.29	4.00	4.00	0.00	1
2680.46	6.00	6.00	0.00	1
2680.60	8.00	8.00	0.00	1
2680.74	10.00	10.00	0.00	1
2681.02	12.00	12.00	0.00	1
2681.15	14.00	14.00	0.00	1
2681.27	16.00	16.00	0.00	1
2681.38	18.00	18.00	0.00	1
2681.49	20.00	20.00	0.00	1
2682.10	31.39	31.39	0.00	Overtopping

Culvert Summary Table: KAI TC Prvt Dwy 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2679.60	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
2.00	2.00	2680.14	0.481	0.540	2-M2c	0.332	0.332	0.344	0.047	2.773	0.840
4.00	4.00	2680.29	0.693	0.0*	1-S2n	0.478	0.481	0.480	0.072	3.412	1.107
6.00	6.00	2680.46	0.861	0.0*	1-S2n	0.597	0.604	0.598	0.091	3.803	1.301
8.00	8.00	2680.60	1.004	0.0*	1-S2n	0.690	0.695	0.694	0.108	4.117	1.456
10.00	10.00	2680.74	1.141	0.0*	1-S2n	0.782	0.786	0.785	0.124	4.367	1.589
12.00	12.00	2681.02	1.264	1.421	2-M2c	0.864	0.862	0.866	0.138	4.603	1.708
14.00	14.00	2681.15	1.379	1.549	2-M2c	0.943	0.935	0.939	0.152	4.833	1.814
16.00	16.00	2681.27	1.490	1.668	2-M2c	1.022	1.006	1.006	0.164	5.052	1.911
18.00	18.00	2681.38	1.599	1.782	2-M2c	1.097	1.067	1.070	0.176	5.258	2.001
20.00	20.00	2681.49	1.710	1.891	2-M2c	1.172	1.128	1.131	0.188	5.456	2.085

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2679.60 ft, Outlet Elevation (invert): 2678.70 ft
 Culvert Length: 57.01 ft, Culvert Slope: 0.0158

Site Data - KAI TC Prvt Dwy 1

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2679.60 ft
 Outlet Station: 57.00 ft
 Outlet Elevation: 2678.70 ft
 Number of Barrels: 2

Culvert Data Summary - KAI TC Prvt Dwy 1

Barrel Shape: Circular
 Barrel Diameter: 2.00 ft

Barrel Material: Corrugated Steel
 Embedment: 0.00 in
 Barrel Manning's n: 0.0240
 Inlet Type: Conventional
 Inlet Edge Condition: Mitered to Conform to Slope
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: DW Sta 798+07 Lt)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2678.60	0.00	0.00	0.00	0.00
2.00	2678.65	0.05	0.84	0.05	0.68
4.00	2678.67	0.07	1.11	0.08	0.73
6.00	2678.69	0.09	1.30	0.10	0.76
8.00	2678.71	0.11	1.46	0.12	0.78
10.00	2678.72	0.12	1.59	0.13	0.80
12.00	2678.74	0.14	1.71	0.15	0.82
14.00	2678.75	0.15	1.81	0.16	0.83
16.00	2678.76	0.16	1.91	0.17	0.84
18.00	2678.78	0.18	2.00	0.19	0.85
20.00	2678.79	0.19	2.09	0.20	0.86

Tailwater Channel Data - DW Sta 798+07 Lt

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 50.00 ft
 Side Slope (H:V): 6.00 (1:1)
 Channel Slope: 0.0170
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 2678.60 ft

Roadway Data for Crossing: DW Sta 798+07 Lt

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 200.00 ft
 Crest Elevation: 2682.10 ft
 Roadway Surface: Paved
 Roadway Top Width: 40.00 ft

Summary of Culvert Flows at Crossing: CP-28 Sta 794+30

Headwater Elevation (ft)	Total Discharge (cfs)	CP-28 Sta 794+30 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2672.90	0.00	0.00	0.00	1
2673.76	81.00	81.00	0.00	1
2674.27	162.00	162.00	0.00	1
2674.69	243.00	243.00	0.00	1
2675.07	324.00	324.00	0.00	1
2675.42	405.00	405.00	0.00	1
2675.77	486.00	486.00	0.00	1
2676.10	567.00	567.00	0.00	1
2676.43	648.00	648.00	0.00	1
2676.74	729.00	729.00	0.00	1
2677.04	810.00	810.00	0.00	1
2679.00	1334.17	1334.17	0.00	Overtopping

Culvert Summary Table: CP-28 Sta 794+30

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2672.90	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
81.00	81.00	2673.76	0.860	0.0*	1-S2n	0.287	0.585	0.375	0.673	6.749	3.609
162.00	162.00	2674.27	1.366	0.0*	1-S2n	0.538	0.929	0.539	1.006	9.397	4.597
243.00	243.00	2674.69	1.790	0.0*	1-S2n	0.685	1.217	0.732	1.269	10.379	5.269
324.00	324.00	2675.07	2.168	0.0*	1-S2n	0.831	1.474	0.896	1.494	11.297	5.790
405.00	405.00	2675.42	2.518	0.0*	1-S2n	0.978	1.711	1.053	1.693	12.022	6.220
486.00	486.00	2675.77	2.869	0.0*	1-S2n	1.097	1.932	1.204	1.874	12.616	6.588
567.00	567.00	2676.10	3.204	0.0*	1-S2n	1.212	2.141	1.352	2.040	13.106	6.913
648.00	648.00	2676.43	3.526	0.0*	1-S2n	1.327	2.340	1.494	2.195	13.552	7.203
729.00	729.00	2676.74	3.839	0.0*	1-S2n	1.442	2.531	1.631	2.341	13.964	7.467
810.00	810.00	2677.04	4.144	0.0*	1-S2n	1.550	2.716	1.770	2.479	14.304	7.709

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2672.90 ft, Outlet Elevation (invert): 2671.10 ft
 Culvert Length: 121.01 ft, Culvert Slope: 0.0149

Site Data - CP-28 Sta 794+30

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2672.90 ft
 Outlet Station: 121.00 ft
 Outlet Elevation: 2671.10 ft
 Number of Barrels: 4

Culvert Data Summary - CP-28 Sta 794+30

Barrel Shape: Concrete Box
 Barrel Span: 8.00 ft

Barrel Rise: 5.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-28 Sta 794+30)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2671.10	0.00	0.00	0.00	0.00
81.00	2671.77	0.67	3.61	0.59	0.81
162.00	2672.11	1.01	4.60	0.88	0.86
243.00	2672.37	1.27	5.27	1.11	0.89
324.00	2672.59	1.49	5.79	1.30	0.91
405.00	2672.79	1.69	6.22	1.48	0.93
486.00	2672.97	1.87	6.59	1.64	0.94
567.00	2673.14	2.04	6.91	1.78	0.95
648.00	2673.30	2.20	7.20	1.92	0.96
729.00	2673.44	2.34	7.47	2.04	0.97
810.00	2673.58	2.48	7.71	2.17	0.98

Tailwater Channel Data - CP-28 Sta 794+30

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 30.00 ft
 Side Slope (H:V): 5.00 (_:1)
 Channel Slope: 0.0140
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2671.10 ft

Roadway Data for Crossing: CP-28 Sta 794+30

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2679.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-29 Sta 787+65

Headwater Elevation (ft)	Total Discharge (cfs)	CP-29 Sta 787+65 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2667.70	0.00	0.00	0.00	1
2670.60	12.70	12.70	0.00	1
2670.68	25.40	25.40	0.00	1
2670.76	38.10	38.10	0.00	1
2670.82	50.80	50.80	0.00	1
2670.88	63.50	63.50	0.00	1
2670.93	76.20	76.20	0.00	1
2670.99	88.90	88.90	0.00	1
2671.04	101.60	101.60	0.00	1
2671.08	114.30	114.30	0.00	1
2671.13	127.00	127.00	0.00	1
2677.00	372.70	372.70	0.00	Overtopping

Culvert Summary Table: CP-29 Sta 787+65

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2667.70	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
12.70	12.70	2670.60	2.897	0.0*	1-S2n	0.416	0.712	0.432	0.513	9.773	3.280
25.40	25.40	2670.68	2.983	0.0*	1-S2n	0.557	1.024	0.574	0.755	11.077	4.072
38.10	38.10	2670.76	3.055	0.0*	1-S2n	0.698	1.275	0.705	0.940	12.544	4.595
50.80	50.80	2670.82	3.120	0.0*	1-S2n	0.824	1.479	0.832	1.095	13.504	4.995
63.50	63.50	2670.88	3.179	0.0*	1-S2n	0.911	1.667	0.917	1.231	14.477	5.322
76.20	76.20	2670.93	3.234	0.0*	1-S2n	0.998	1.830	1.055	1.352	14.262	5.603
88.90	88.90	2670.99	3.287	0.0*	1-S2n	1.085	1.994	1.152	1.463	14.794	5.848
101.60	101.60	2671.04	3.337	0.0*	1-S2n	1.172	2.131	1.250	1.566	15.194	6.067
114.30	114.30	2671.08	3.384	0.0*	1-S2n	1.245	2.268	1.332	1.661	15.564	6.265
127.00	127.00	2671.13	3.431	0.0*	1-S2n	1.312	2.403	1.417	1.751	15.881	6.448

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2667.70 ft, Outlet Elevation (invert): 2663.60 ft
 Culvert Length: 137.06 ft, Culvert Slope: 0.0299
 Inlet Throat Elevation: 2667.70 ft, Inlet Crest Elevation: 2670.45 ft

Site Data - CP-29 Sta 787+65

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2670.10 ft
 Outlet Station: 137.00 ft
 Outlet Elevation: 2663.60 ft
 Number of Barrels: 2

Culvert Data Summary - CP-29 Sta 787+65

Barrel Shape: Circular

Barrel Diameter: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-29 Sta 787+65)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2663.60	0.00	0.00	0.00	0.00
12.70	2664.11	0.51	3.28	0.45	0.89
25.40	2664.35	0.75	4.07	0.66	0.93
38.10	2664.54	0.94	4.59	0.82	0.96
50.80	2664.70	1.10	5.00	0.96	0.98
63.50	2664.83	1.23	5.32	1.08	0.99
76.20	2664.95	1.35	5.60	1.18	1.01
88.90	2665.06	1.46	5.85	1.28	1.02
101.60	2665.17	1.57	6.07	1.37	1.02
114.30	2665.26	1.66	6.27	1.45	1.03
127.00	2665.35	1.75	6.45	1.53	1.04

Tailwater Channel Data - CP-29 Sta 787+65

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 6.00 ft
 Side Slope (H:V): 3.00 (1:1)
 Channel Slope: 0.0140
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 2663.60 ft

Roadway Data for Crossing: CP-29 Sta 787+65

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2677.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-30 Sta 781+97

Headwater Elevation (ft)	Total Discharge (cfs)	CP-30 Sta 781+97 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2663.60	0.00	0.00	0.00	1
2664.61	14.00	14.00	0.00	1
2665.05	28.00	28.00	0.00	1
2665.40	42.00	42.00	0.00	1
2665.71	56.00	56.00	0.00	1
2666.01	70.00	70.00	0.00	1
2666.29	84.00	84.00	0.00	1
2666.54	98.00	98.00	0.00	1
2666.77	112.00	112.00	0.00	1
2667.00	126.00	126.00	0.00	1
2667.23	140.00	140.00	0.00	1
2670.94	310.64	310.64	0.00	Overtopping

Culvert Summary Table: CP-30 Sta 781+97

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2663.60	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
14.00	14.00	2664.61	1.007	0.0*	1-S2n	0.426	0.758	0.448	0.366	10.861	2.738
28.00	28.00	2665.05	1.446	0.0*	1-S2n	0.576	1.080	0.579	0.530	12.036	3.418
42.00	42.00	2665.40	1.796	0.0*	1-S2n	0.727	1.337	0.727	0.727	13.263	3.041
56.00	56.00	2665.71	2.111	0.0*	1-S2n	0.848	1.563	0.853	0.802	14.198	3.302
70.00	70.00	2666.01	2.413	0.0*	1-S2n	0.941	1.751	0.974	0.868	14.643	3.516
84.00	84.00	2666.29	2.685	0.0*	1-S2n	1.034	1.931	1.041	0.926	16.024	3.699
98.00	98.00	2666.54	2.936	0.0*	1-S2n	1.127	2.093	1.136	0.979	16.609	3.860
112.00	112.00	2666.77	3.172	0.0*	1-S2n	1.215	2.243	1.265	1.028	16.384	4.003
126.00	126.00	2667.00	3.400	0.0*	1-S2n	1.286	2.393	1.351	1.074	16.815	4.133
140.00	140.00	2667.23	3.627	0.0*	1-S2n	1.357	2.521	1.436	1.117	17.196	4.253

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2663.60 ft, Outlet Elevation (invert): 2657.86 ft
 Culvert Length: 180.09 ft, Culvert Slope: 0.0319

Site Data - CP-30 Sta 781+97

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2663.60 ft
 Outlet Station: 180.00 ft
 Outlet Elevation: 2657.86 ft
 Number of Barrels: 2

Culvert Data Summary - CP-30 Sta 781+97

Barrel Shape: Circular
 Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Grooved End in Headwall

Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-30 Sta 781+97)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2657.86	0.00	0.00	0.00	0.00
14.00	2658.23	0.37	2.74	0.36	0.89
28.00	2658.39	0.53	3.42	0.52	0.94
42.00	2658.59	0.73	3.04	0.71	0.91
56.00	2658.66	0.80	3.30	0.79	0.93
70.00	2658.73	0.87	3.52	0.85	0.95
84.00	2658.79	0.93	3.70	0.91	0.96
98.00	2658.84	0.98	3.86	0.96	0.97
112.00	2658.89	1.03	4.00	1.01	0.98
126.00	2658.93	1.07	4.13	1.05	0.99
140.00	2658.98	1.12	4.25	1.09	0.99

Tailwater Channel Data - CP-30 Sta 781+97

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0157

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2661.50	0.0300
2	0.87	2661.50	0.0300
3	0.89	2661.50	0.0300
4	2.18	2661.50	0.0300
5	2.54	2661.50	0.0300
6	4.02	2661.50	0.0300
7	13.70	2661.50	0.0300
8	13.84	2661.50	0.0300
9	15.28	2661.50	0.0300
10	20.33	2661.21	0.0300
11	26.27	2661.13	0.0300
12	37.20	2660.64	0.0300
13	37.34	2660.64	0.0300
14	37.83	2660.62	0.0300
15	38.53	2660.60	0.0300
16	39.33	2660.59	0.0300
17	42.59	2660.50	0.0300
18	42.68	2660.50	0.0300
19	43.72	2660.50	0.0300
20	44.51	2660.50	0.0300
21	49.76	2660.50	0.0300
22	64.15	2659.92	0.0300
23	73.67	2659.50	0.0300

24	74.82	2659.50	0.0300
25	75.14	2659.50	0.0300
26	75.60	2659.50	0.0300
27	81.07	2659.50	0.0300
28	83.04	2659.50	0.0300
29	83.39	2659.50	0.0300
30	97.51	2659.01	0.0300
31	115.65	2658.50	0.0300
32	117.87	2658.50	0.0300
33	123.83	2658.50	0.0300
34	125.47	2658.50	0.0300
35	127.38	2658.50	0.0300
36	128.18	2658.50	0.0300
37	130.19	2658.50	0.0300
38	131.95	2658.22	0.0300
39	133.29	2658.01	0.0300
40	136.35	2657.86	0.0300
41	139.95	2657.86	0.0300
42	142.50	2657.86	0.0300
43	144.81	2657.86	0.0300
44	146.77	2657.95	0.0300
45	149.37	2658.23	0.0300
46	150.02	2658.30	0.0300
47	151.88	2658.50	0.0300
48	159.76	2659.29	0.0300
49	161.81	2659.50	0.0300
50	162.10	2659.53	0.0300
51	162.33	2659.54	0.0300
52	167.11	2659.77	0.0300
53	169.37	2659.87	0.0300
54	172.83	2660.11	0.0300
55	174.48	2660.24	0.0300
56	175.46	2660.29	0.0300
57	178.94	2660.50	0.0000

Roadway Data for Crossing: CP-30 Sta 781+97

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 2670.94 ft
Roadway Surface: Paved
Roadway Top Width: 30.00 ft

Summary of Culvert Flows at Crossing: CP-31 Sta 777+54

Headwater Elevation (ft)	Total Discharge (cfs)	CP-31 Sta 777+54 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2663.50	0.00	0.00	0.00	1
2664.22	3.10	3.10	0.00	1
2664.53	6.20	6.20	0.00	1
2664.78	9.30	9.30	0.00	1
2665.00	12.40	12.40	0.00	1
2665.21	15.50	15.50	0.00	1
2665.41	18.60	18.60	0.00	1
2665.59	21.70	21.70	0.00	1
2665.75	24.80	24.80	0.00	1
2665.91	27.90	27.90	0.00	1
2666.07	31.00	31.00	0.00	1
2668.60	70.97	70.97	0.00	Overtopping

Culvert Summary Table: CP-31 Sta 777+54

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2663.50	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
3.10	3.10	2664.22	0.717	0.0*	1-S2n	0.317	0.535	0.325	0.220	8.485	1.589
6.20	6.20	2664.53	1.032	0.0*	1-S2n	0.428	0.769	0.459	0.289	8.790	1.965
9.30	9.30	2664.78	1.283	0.0*	1-S2n	0.540	0.957	0.547	0.341	10.408	2.235
12.40	12.40	2665.00	1.497	0.0*	1-S2n	0.631	1.111	0.640	0.385	11.366	2.442
15.50	15.50	2665.21	1.713	0.0*	1-S2n	0.700	1.252	0.702	0.424	12.210	2.613
18.60	18.60	2665.41	1.908	0.0*	1-S2n	0.768	1.374	0.773	0.459	12.778	2.759
21.70	21.70	2665.59	2.087	0.0*	1-S2n	0.837	1.497	0.837	0.491	13.386	2.887
24.80	24.80	2665.75	2.254	0.0*	1-S2n	0.904	1.600	0.904	0.520	13.820	3.001
27.90	27.90	2665.91	2.413	0.0*	1-S2n	0.957	1.703	0.962	0.548	14.236	3.105
31.00	31.00	2666.07	2.568	0.0*	1-S2n	1.009	1.804	1.018	0.574	14.613	3.200

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2663.50 ft, Outlet Elevation (invert): 2658.76 ft
 Culvert Length: 158.07 ft, Culvert Slope: 0.0300

Site Data - CP-31 Sta 777+54

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2663.50 ft
 Outlet Station: 158.00 ft
 Outlet Elevation: 2658.76 ft
 Number of Barrels: 1

Culvert Data Summary - CP-31 Sta 777+54

Barrel Shape: Circular
 Barrel Diameter: 3.00 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-31 Sta 777+54)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2658.76	0.00	0.00	0.00	0.00
3.10	2658.98	0.22	1.59	0.31	0.80
6.20	2659.05	0.29	1.96	0.41	0.84
9.30	2659.10	0.34	2.23	0.48	0.87
12.40	2659.15	0.39	2.44	0.55	0.89
15.50	2659.18	0.42	2.61	0.60	0.90
18.60	2659.22	0.46	2.76	0.65	0.91
21.70	2659.25	0.49	2.89	0.70	0.92
24.80	2659.28	0.52	3.00	0.74	0.93
27.90	2659.31	0.55	3.10	0.78	0.94
31.00	2659.33	0.57	3.20	0.81	0.95

Tailwater Channel Data - CP-31 Sta 777+54

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0227

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2661.00	0.0350
2	24.00	2660.00	0.0350
3	44.00	2659.00	0.0350
4	54.00	2658.76	0.0350
5	56.00	2658.76	0.0350
6	61.00	2659.00	0.0350
7	72.00	2660.00	0.0350
8	98.00	2661.00	0.0000

Roadway Data for Crossing: CP-31 Sta 777+54

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 150.00 ft

Crest Elevation: 2668.60 ft

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

Summary of Culvert Flows at Crossing: CP-32 Sta 772+32

Headwater Elevation (ft)	Total Discharge (cfs)	3-24'x7' Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2657.50	0.00	0.00	0.00	1
2658.64	257.40	257.40	0.00	1
2659.31	514.80	514.80	0.00	1
2659.87	772.20	772.20	0.00	1
2660.37	1029.60	1029.60	0.00	1
2660.83	1287.00	1287.00	0.00	1
2661.27	1544.40	1544.40	0.00	1
2661.72	1801.80	1801.80	0.00	1
2662.12	2059.20	2059.20	0.00	1
2662.50	2316.60	2316.60	0.00	1
2662.89	2574.00	2574.00	0.00	1
2665.54	3966.65	3966.65	0.00	Overtopping

Culvert Summary Table: 3-24'x7'

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2657.50	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
257.40	257.40	2658.64	1.140	0.0*	1-S2n	0.209	0.716	0.215	1.371	10.110	5.660
514.80	514.80	2659.31	1.806	0.0*	1-S2n	0.419	1.161	0.419	2.296	13.102	5.123
772.20	772.20	2659.87	2.369	0.0*	1-S2n	0.614	1.512	0.650	2.613	17.985	5.503
1029.60	1029.60	2660.37	2.868	0.0*	1-S2n	0.714	1.846	0.804	2.816	17.780	6.133
1287.00	1287.00	2660.83	3.326	0.0*	1-S2n	0.815	2.134	0.952	2.999	18.763	6.666
1544.40	1544.40	2661.27	3.775	0.0*	1-S2n	0.916	2.419	1.093	3.172	19.604	7.095
1801.80	1801.80	2661.72	4.224	0.0*	1-S2n	1.017	2.670	1.234	3.327	20.268	7.510
2059.20	2059.20	2662.12	4.621	0.0*	1-S2n	1.118	2.920	1.370	3.473	20.862	7.888
2316.60	2316.60	2662.50	5.003	0.0*	1-S2n	1.214	3.153	1.506	3.611	21.363	8.234
2574.00	2574.00	2662.89	5.386	0.0*	1-S2n	1.289	3.377	1.637	3.742	21.840	8.555

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2657.50 ft, Outlet Elevation (invert): 2652.00 ft
 Culvert Length: 138.11 ft, Culvert Slope: 0.0399

Site Data - 3-24'x7'

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2656.50 ft
 Outlet Station: 138.00 ft
 Outlet Elevation: 2651.00 ft
 Number of Barrels: 3

Culvert Data Summary - 3-24'x7'

Barrel Shape: Arch-Box, Concrete
 Barrel Span: 24.00 ft
 Barrel Rise: 7.00 ft

Barrel Material: Concrete
 Embedment: 12.00 in
 Barrel Manning's n: 0.0120 (top and sides)
 Manning's n: 0.0120 (bottom)
 Inlet Type: Conventional
 Inlet Edge Condition: Beveled Edge
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-32 Sta 772+32)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2652.00	0.00	0.00	0.00	0.00
257.40	2653.37	1.37	5.66	1.37	0.96
514.80	2654.30	2.30	5.12	2.29	0.93
772.20	2654.61	2.61	5.50	2.61	0.95
1029.60	2654.82	2.82	6.13	2.81	0.98
1287.00	2655.00	3.00	6.67	2.99	1.00
1544.40	2655.17	3.17	7.09	3.17	1.01
1801.80	2655.33	3.33	7.51	3.32	1.03
2059.20	2655.47	3.47	7.89	3.47	1.04
2316.60	2655.61	3.61	8.23	3.60	1.05
2574.00	2655.74	3.74	8.56	3.74	1.06

Tailwater Channel Data - CP-32 Sta 772+32

Tailwater Channel Option: Irregular Channel
 Channel Slope: 0.0160
 User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	2658.00	0.0350
2	6.34	2658.00	0.0350
3	6.45	2658.00	0.0350
4	10.15	2658.00	0.0350
5	17.54	2657.67	0.0350
6	36.03	2657.00	0.0350
7	36.24	2657.00	0.0350
8	37.21	2657.00	0.0350
9	39.38	2657.00	0.0350
10	43.02	2657.00	0.0350
11	43.40	2657.00	0.0350
12	43.54	2657.00	0.0350
13	47.60	2656.79	0.0350
14	48.26	2656.78	0.0350
15	48.53	2656.78	0.0350
16	67.16	2656.00	0.0350
17	70.08	2656.00	0.0350
18	76.08	2656.00	0.0350
19	76.57	2656.00	0.0350
20	77.60	2656.00	0.0350
21	85.12	2655.05	0.0350
22	85.47	2655.00	0.0350

23	85.99	2654.90	0.0350
24	89.34	2654.39	0.0350
25	91.46	2654.00	0.0350
26	95.05	2653.15	0.0350
27	95.33	2653.08	0.0350
28	95.48	2653.05	0.0350
29	95.77	2653.00	0.0350
30	100.69	2652.52	0.0350
31	102.98	2652.03	0.0350
32	103.11	2652.00	0.0350
33	103.52	2652.00	0.0350
34	115.86	2652.00	0.0350
35	124.40	2652.00	0.0350
36	125.68	2652.00	0.0350
37	126.49	2652.00	0.0350
38	127.88	2652.00	0.0350
39	132.78	2652.85	0.0350
40	133.87	2653.00	0.0350
41	136.02	2653.39	0.0350
42	139.57	2654.00	0.0350
43	139.77	2654.00	0.0350
44	140.73	2654.04	0.0350
45	175.93	2654.15	0.0350
46	182.78	2654.00	0.0350
47	183.03	2654.00	0.0350
48	185.39	2654.00	0.0350
49	191.65	2654.00	0.0350
50	192.07	2654.00	0.0350
51	193.56	2654.17	0.0350
52	194.18	2654.15	0.0350
53	194.34	2654.15	0.0350
54	199.19	2654.39	0.0350
55	201.11	2654.45	0.0350
56	202.34	2654.47	0.0350
57	203.26	2654.44	0.0350
58	205.90	2654.48	0.0350
59	207.21	2654.42	0.0350
60	208.47	2654.42	0.0350
61	215.26	2654.30	0.0350
62	221.97	2654.47	0.0350
63	222.29	2654.53	0.0350
64	224.33	2654.97	0.0350
65	224.59	2655.00	0.0350
66	225.17	2655.00	0.0350
67	226.47	2655.00	0.0350
68	235.00	2658.00	0.0000

Roadway Data for Crossing: CP-32 Sta 772+32

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 150.00 ft

Crest Elevation: 2665.54 ft

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

Summary of Culvert Flows at Crossing: CP-33.1 Sta 768+72

Headwater Elevation (ft)	Total Discharge (cfs)	CP-33.1 Sta 768+72 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2653.35	0.00	0.00	0.00	1
2654.00	2.60	2.60	0.00	1
2654.29	5.20	5.20	0.00	1
2654.52	7.80	7.80	0.00	1
2654.72	10.40	10.40	0.00	1
2654.90	13.00	13.00	0.00	1
2655.08	15.60	15.60	0.00	1
2655.24	18.20	18.20	0.00	1
2655.39	20.80	20.80	0.00	1
2655.54	23.40	23.40	0.00	1
2655.67	26.00	26.00	0.00	1
2661.00	97.03	97.03	0.00	Overtopping

Culvert Summary Table: CP-33.1 Sta 768+72

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2653.35	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
2.60	2.60	2654.00	0.654	0.0*	1-S2n	0.315	0.480	0.330	0.200	7.141	1.804
5.20	5.20	2654.29	0.945	0.0*	1-S2n	0.425	0.701	0.431	0.296	8.036	2.261
7.80	7.80	2654.52	1.174	0.0*	1-S2n	0.534	0.876	0.536	0.370	8.956	2.566
10.40	10.40	2654.72	1.367	0.0*	1-S2n	0.627	1.012	0.631	0.432	9.707	2.799
13.00	13.00	2654.90	1.547	0.0*	1-S2n	0.694	1.140	0.703	0.487	10.200	2.991
15.60	15.60	2655.08	1.726	0.0*	1-S2n	0.761	1.255	0.765	0.536	10.870	3.154
18.20	18.20	2655.24	1.890	0.0*	1-S2n	0.829	1.359	0.829	0.582	11.386	3.298
20.80	20.80	2655.39	2.043	0.0*	1-S2n	0.896	1.462	0.897	0.623	11.720	3.426
23.40	23.40	2655.54	2.186	0.0*	1-S2n	0.948	1.554	0.953	0.662	12.095	3.542
26.00	26.00	2655.67	2.323	0.0*	1-S2n	1.000	1.640	1.009	0.699	12.413	3.649

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2653.35 ft, Outlet Elevation (invert): 2647.40 ft
 Culvert Length: 232.08 ft, Culvert Slope: 0.0256

Site Data - CP-33.1 Sta 768+72

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2653.35 ft

Outlet Station: 232.00 ft

Outlet Elevation: 2647.40 ft

Number of Barrels: 1

Culvert Data Summary - CP-33.1 Sta 768+72

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-33.1 Sta 768+72)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2647.40	0.00	0.00	0.00	0.00
2.60	2647.60	0.20	1.80	0.17	0.77
5.20	2647.70	0.30	2.26	0.26	0.81
7.80	2647.77	0.37	2.57	0.32	0.84
10.40	2647.83	0.43	2.80	0.38	0.86
13.00	2647.89	0.49	2.99	0.43	0.87
15.60	2647.94	0.54	3.15	0.47	0.88
18.20	2647.98	0.58	3.30	0.51	0.89
20.80	2648.02	0.62	3.43	0.54	0.90
23.40	2648.06	0.66	3.54	0.58	0.91
26.00	2648.10	0.70	3.65	0.61	0.91

Tailwater Channel Data - CP-33.1 Sta 768+72

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 6.00 ft
 Side Slope (H:V): 6.00 (1:1)
 Channel Slope: 0.0140
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 2647.40 ft

Roadway Data for Crossing: CP-33.1 Sta 768+72

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2661.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-35 Sta 756+84

Headwater Elevation (ft)	Total Discharge (cfs)	CP-35 Sta 756+84 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2630.40	0.00	0.00	0.00	1
2633.40	60.70	60.70	0.00	1
2633.62	121.40	121.40	0.00	1
2633.80	182.10	182.10	0.00	1
2633.96	242.80	242.80	0.00	1
2634.10	303.50	303.50	0.00	1
2634.24	364.20	364.20	0.00	1
2634.37	424.90	424.90	0.00	1
2634.49	485.60	485.60	0.00	1
2634.77	546.30	546.30	0.00	1
2635.13	607.00	607.00	0.00	1
2640.00	1320.71	1320.71	0.00	Overtopping

Culvert Summary Table: CP-35 Sta 756+84

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2630.40	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
60.70	60.70	2633.40	3.005	0.0*	1-S2n	0.301	0.660	0.350	1.021	8.664	5.351
121.40	121.40	2633.62	3.218	0.0*	1-S2n	0.551	1.048	0.561	1.431	10.816	6.449
182.10	182.10	2633.80	3.397	0.0*	1-S2n	0.702	1.374	0.714	1.732	12.761	7.175
242.80	242.80	2633.96	3.557	0.0*	1-S2n	0.853	1.664	0.899	1.977	13.506	7.732
303.50	303.50	2634.10	3.704	0.0*	1-S2n	1.003	1.931	1.053	2.188	14.414	8.191
364.20	364.20	2634.24	3.841	0.0*	1-S2n	1.119	2.180	1.201	2.374	15.159	8.585
424.90	424.90	2634.37	3.971	0.0*	1-S2n	1.235	2.416	1.346	2.542	15.780	8.931
485.60	485.60	2634.49	4.095	0.0*	1-S2n	1.352	2.641	1.487	2.697	16.325	9.241
546.30	546.30	2634.77	4.373	0.0*	1-S2n	1.468	2.857	1.625	2.840	16.809	9.524
607.00	607.00	2635.13	4.731	0.0*	1-S2n	1.573	3.065	1.760	2.973	17.245	9.783

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2630.40 ft, Outlet Elevation (invert): 2626.77 ft
 Culvert Length: 192.03 ft, Culvert Slope: 0.0189
 Inlet Throat Elevation: 2630.40 ft, Inlet Crest Elevation: 2633.04 ft

Site Data - CP-35 Sta 756+84

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2632.80 ft
 Outlet Station: 192.00 ft
 Outlet Elevation: 2626.77 ft
 Number of Barrels: 2

Culvert Data Summary - CP-35 Sta 756+84

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft
 Barrel Rise: 5.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-35 Sta 756+84)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2626.77	0.00	0.00	0.00	0.00
60.70	2627.79	1.02	5.35	1.66	1.13
121.40	2628.20	1.43	6.45	2.32	1.18
182.10	2628.50	1.73	7.17	2.81	1.21
242.80	2628.75	1.98	7.73	3.21	1.23
303.50	2628.96	2.19	8.19	3.55	1.25
364.20	2629.14	2.37	8.59	3.85	1.27
424.90	2629.31	2.54	8.93	4.12	1.28
485.60	2629.47	2.70	9.24	4.38	1.29
546.30	2629.61	2.84	9.52	4.61	1.30
607.00	2629.74	2.97	9.78	4.82	1.31

Tailwater Channel Data - CP-35 Sta 756+84

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 6.00 ft
 Side Slope (H:V): 5.00 (1:1)
 Channel Slope: 0.0260
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2626.77 ft

Roadway Data for Crossing: CP-35 Sta 756+84

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2640.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-36 Camino De Oeste

Headwater Elevation (ft)	Total Discharge (cfs)	CP-36 Camino De Oeste Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2628.50	0.00	0.00	0.00	1
2629.25	6.60	6.60	0.00	1
2629.58	13.20	13.20	0.00	1
2629.84	19.80	19.80	0.00	1
2630.08	26.40	26.40	0.00	1
2630.30	33.00	33.00	0.00	1
2630.50	39.60	39.60	0.00	1
2630.69	46.20	46.20	0.00	1
2630.86	52.80	52.80	0.00	1
2631.03	59.40	59.40	0.00	1
2631.19	66.00	66.00	0.00	1
2632.00	96.43	96.43	0.00	Overtopping

Culvert Summary Table: CP-36 Camino De Oeste

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2628.50	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
6.60	6.60	2629.25	0.753	0.0*	1-S2n	0.389	0.557	0.397	0.351	5.754	2.240
13.20	13.20	2629.58	1.082	0.0*	1-S2n	0.572	0.796	0.575	0.519	6.932	2.805
19.80	19.80	2629.84	1.344	0.0*	1-S2n	0.696	0.987	0.697	0.649	7.876	3.182
26.40	26.40	2630.08	1.578	0.0*	1-S2n	0.808	1.150	0.810	0.758	8.508	3.469
33.00	33.00	2630.30	1.801	0.0*	1-S2n	0.916	1.291	0.920	0.855	8.988	3.707
39.60	39.60	2630.50	2.002	0.0*	1-S2n	1.003	1.422	1.022	0.941	9.287	3.909
46.20	46.20	2630.69	2.186	0.0*	1-S2n	1.089	1.544	1.097	1.020	9.843	4.086
52.80	52.80	2630.86	2.360	0.0*	1-S2n	1.176	1.653	1.178	1.094	10.241	4.244
59.40	59.40	2631.03	2.527	0.0*	1-S2n	1.254	1.762	1.302	1.162	10.086	4.388
66.00	66.00	2631.19	2.691	0.0*	1-S2n	1.329	1.860	1.385	1.227	10.339	4.519

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2628.50 ft, Outlet Elevation (invert): 2627.16 ft
 Culvert Length: 91.01 ft, Culvert Slope: 0.0147

Site Data - CP-36 Camino De Oeste

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2628.50 ft
 Outlet Station: 91.00 ft
 Outlet Elevation: 2627.16 ft
 Number of Barrels: 2

Culvert Data Summary - CP-36 Camino De Oeste

Barrel Shape: Circular
 Barrel Diameter: 3.00 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-36 Camino De Oeste)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2627.50	0.00	0.00	0.00	0.00
6.60	2627.85	0.35	2.24	0.31	0.72
13.20	2628.02	0.52	2.80	0.45	0.76
19.80	2628.15	0.65	3.18	0.57	0.78
26.40	2628.26	0.76	3.47	0.66	0.80
33.00	2628.35	0.85	3.71	0.75	0.81
39.60	2628.44	0.94	3.91	0.82	0.82
46.20	2628.52	1.02	4.09	0.89	0.83
52.80	2628.59	1.09	4.24	0.96	0.84
59.40	2628.66	1.16	4.39	1.02	0.85
66.00	2628.73	1.23	4.52	1.07	0.85

Tailwater Channel Data - CP-36 Camino De Oeste

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 7.00 ft
 Side Slope (H:V): 4.00 (1:1)
 Channel Slope: 0.0140
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2627.50 ft

Roadway Data for Crossing: CP-36 Camino De Oeste

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 100.00 ft
 Crest Elevation: 2632.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 50.00 ft

Summary of Culvert Flows at Crossing: CP-37 Sta 750+46

Headwater Elevation (ft)	Total Discharge (cfs)	CP-37 Sta 750+46 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2623.10	0.00	0.00	0.00	1
2623.97	9.80	9.80	0.00	1
2624.35	19.60	19.60	0.00	1
2624.65	29.40	29.40	0.00	1
2624.92	39.20	39.20	0.00	1
2625.18	49.00	49.00	0.00	1
2625.42	58.80	58.80	0.00	1
2625.63	68.60	68.60	0.00	1
2625.84	78.40	78.40	0.00	1
2626.03	88.20	88.20	0.00	1
2626.23	98.00	98.00	0.00	1
2630.00	235.65	235.65	0.00	Overtopping

Culvert Summary Table: CP-37 Sta 750+46

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2623.10	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
9.80	9.80	2623.97	0.869	0.0*	1-S2n	0.379	0.654	0.394	0.358	9.940	2.990
19.60	19.60	2624.35	1.248	0.0*	1-S2n	0.518	0.933	0.523	0.523	10.527	3.696
29.40	29.40	2624.65	1.550	0.0*	1-S2n	0.657	1.157	0.666	0.648	11.438	4.163
39.20	39.20	2624.92	1.818	0.0*	1-S2n	0.759	1.350	0.760	0.753	12.641	4.521
49.00	49.00	2625.18	2.080	0.0*	1-S2n	0.845	1.514	0.857	0.844	13.284	4.814
58.80	58.80	2625.42	2.315	0.0*	1-S2n	0.930	1.668	0.937	0.925	14.091	5.064
68.60	68.60	2625.63	2.532	0.0*	1-S2n	1.016	1.810	1.019	0.999	14.691	5.283
78.40	78.40	2625.84	2.735	0.0*	1-S2n	1.089	1.939	1.098	1.067	15.241	5.479
88.20	88.20	2626.03	2.932	0.0*	1-S2n	1.155	2.067	1.193	1.131	15.181	5.657
98.00	98.00	2626.23	3.125	0.0*	1-S2n	1.221	2.181	1.221	1.191	16.346	5.820

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2623.10 ft, Outlet Elevation (invert): 2617.60 ft
 Culvert Length: 163.09 ft, Culvert Slope: 0.0337

Site Data - CP-37 Sta 750+46

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2623.10 ft
 Outlet Station: 163.00 ft
 Outlet Elevation: 2617.60 ft
 Number of Barrels: 2

Culvert Data Summary - CP-37 Sta 750+46

Barrel Shape: Circular
 Barrel Diameter: 3.50 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-37 Sta 750+46)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2617.60	0.00	0.00	0.00	0.00
9.80	2617.96	0.36	2.99	0.58	0.98
19.60	2618.12	0.52	3.70	0.85	1.03
29.40	2618.25	0.65	4.16	1.05	1.06
39.20	2618.35	0.75	4.52	1.22	1.08
49.00	2618.44	0.84	4.81	1.37	1.10
58.80	2618.53	0.93	5.06	1.50	1.11
68.60	2618.60	1.00	5.28	1.62	1.13
78.40	2618.67	1.07	5.48	1.73	1.14
88.20	2618.73	1.13	5.66	1.83	1.15
98.00	2618.79	1.19	5.82	1.93	1.15

Tailwater Channel Data - CP-37 Sta 750+46

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 7.00 ft
 Side Slope (H:V): 6.00 (1:1)
 Channel Slope: 0.0260
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2617.60 ft

Roadway Data for Crossing: CP-37 Sta 750+46

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2630.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-39 Sta 744+40

Headwater Elevation (ft)	Total Discharge (cfs)	CP-39 Sta 744+40 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2616.05	0.00	0.00	0.00	1
2619.79	57.10	57.10	0.00	1
2619.94	114.20	114.20	0.00	1
2620.07	171.30	171.30	0.00	1
2620.19	228.40	228.40	0.00	1
2620.29	285.50	285.50	0.00	1
2620.39	342.60	342.60	0.00	1
2620.49	399.70	399.70	0.00	1
2620.58	456.80	456.80	0.00	1
2620.66	513.90	513.90	0.00	1
2620.74	571.00	571.00	0.00	1
2622.00	1117.71	1117.71	0.00	Overtopping

Culvert Summary Table: CP-39 Sta 744+40

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2616.05	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
57.10	57.10	2619.79	3.738	0.0*	1-S2n	0.188	0.484	0.274	0.897	6.952	4.756
114.20	114.20	2619.94	3.893	0.0*	1-S2n	0.376	0.768	0.378	1.270	10.072	5.759
171.30	171.30	2620.07	4.022	0.0*	5-S2n	0.481	1.006	0.496	1.545	11.505	6.421
228.40	228.40	2620.19	4.138	0.0*	5-S2n	0.574	1.219	0.609	1.770	12.500	6.928
285.50	285.50	2620.29	4.244	0.0*	5-S2n	0.667	1.415	0.675	1.964	14.107	7.345
342.60	342.60	2620.39	4.343	0.0*	5-S2n	0.759	1.597	0.816	2.136	13.988	7.703
399.70	399.70	2620.49	4.437	0.0*	5-S2n	0.840	1.770	0.913	2.292	14.588	8.017
456.80	456.80	2620.58	4.526	0.0*	5-S2n	0.910	1.935	1.008	2.435	15.104	8.299
513.90	513.90	2620.66	4.612	0.0*	5-S2n	0.981	2.093	1.103	2.567	15.527	8.555
571.00	571.00	2620.74	4.695	0.0*	5-S2n	1.052	2.246	1.196	2.691	15.920	8.789

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2616.05 ft, Outlet Elevation (invert): 2612.75 ft
 Culvert Length: 132.04 ft, Culvert Slope: 0.0250
 Inlet Throat Elevation: 2616.05 ft, Inlet Crest Elevation: 2619.53 ft

Site Data - CP-39 Sta 744+40

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2619.10 ft
 Outlet Station: 132.00 ft
 Outlet Elevation: 2612.75 ft
 Number of Barrels: 3

Culvert Data Summary - CP-39 Sta 744+40

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft
 Barrel Rise: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-39 Sta 744+40)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2612.75	0.00	0.00	0.00	0.00
57.10	2613.65	0.90	4.76	1.29	1.05
114.20	2614.02	1.27	5.76	1.82	1.10
171.30	2614.29	1.54	6.42	2.22	1.13
228.40	2614.52	1.77	6.93	2.54	1.15
285.50	2614.71	1.96	7.35	2.82	1.17
342.60	2614.89	2.14	7.70	3.07	1.18
399.70	2615.04	2.29	8.02	3.29	1.19
456.80	2615.18	2.43	8.30	3.49	1.20
513.90	2615.32	2.57	8.55	3.68	1.21
571.00	2615.44	2.69	8.79	3.86	1.22

Tailwater Channel Data - CP-39 Sta 744+40

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 8.00 ft
 Side Slope (H:V): 6.00 (1:1)
 Channel Slope: 0.0230
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2612.75 ft

Roadway Data for Crossing: CP-39 Sta 744+40

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2622.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-40 Sta 735+69

Headwater Elevation (ft)	Total Discharge (cfs)	CP-40 Sta 735+69 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2602.40	0.00	0.00	0.00	1
2602.73	37.20	37.20	0.00	1
2603.03	74.40	74.40	0.00	1
2603.40	111.60	111.60	0.00	1
2603.54	148.80	148.80	0.00	1
2603.72	186.00	186.00	0.00	1
2603.89	223.20	223.20	0.00	1
2604.05	260.40	260.40	0.00	1
2604.20	297.60	297.60	0.00	1
2604.35	334.80	334.80	0.00	1
2604.49	372.00	372.00	0.00	1
2610.00	2037.24	2037.24	0.00	Overtopping

Culvert Summary Table: CP-40 Sta 735+69

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2602.40	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
37.20	37.20	2602.73	0.324	0.0*	1-S2n	0.069	0.218	0.108	0.304	4.770	2.448
74.40	74.40	2603.03	0.623	0.0*	1-S2n	0.138	0.435	0.165	0.456	6.582	3.140
111.60	111.60	2603.40	0.997	0.0*	1-S2n	0.207	0.614	0.213	0.577	8.066	3.616
148.80	148.80	2603.54	1.134	0.0*	1-S2n	0.276	0.733	0.283	0.681	8.759	3.987
186.00	186.00	2603.72	1.316	0.0*	1-S2n	0.345	0.852	0.346	0.773	9.672	4.295
223.20	223.20	2603.89	1.485	0.0*	1-S2n	0.414	0.971	0.414	0.857	10.614	4.560
260.40	260.40	2604.05	1.645	0.0*	1-S2n	0.483	1.090	0.483	0.934	11.741	4.794
297.60	297.60	2604.20	1.798	0.0*	1-S2n	0.553	1.192	0.553	1.007	13.138	5.004
334.80	334.80	2604.35	1.945	0.0*	1-S2n	0.594	1.284	0.616	1.075	14.883	5.194
372.00	372.00	2604.49	2.087	0.0*	1-S2n	0.629	1.376	0.636	1.139	14.624	5.369

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2602.40 ft, Outlet Elevation (invert): 2597.85 ft
 Culvert Length: 157.07 ft, Culvert Slope: 0.0290

Site Data - CP-40 Sta 735+69

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2602.07 ft

Outlet Station: 157.00 ft

Outlet Elevation: 2597.52 ft

Number of Barrels: 4

Culvert Data Summary - CP-40 Sta 735+69

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 6.00 ft
Barrel Material: Concrete
Embedment: 4.00 in
Barrel Manning's n: 0.0120 (top and sides)
Manning's n: 0.0120 (bottom)
Inlet Type: Conventional
Inlet Edge Condition: Square Edge (90°) Headwall
Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-40 Sta 735+69)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2597.84	0.00	0.00	0.00	0.00
37.20	2598.14	0.30	2.45	0.34	0.81
74.40	2598.30	0.46	3.14	0.51	0.86
111.60	2598.42	0.58	3.62	0.65	0.90
148.80	2598.52	0.68	3.99	0.76	0.92
186.00	2598.61	0.77	4.30	0.87	0.94
223.20	2598.70	0.86	4.56	0.96	0.95
260.40	2598.77	0.93	4.79	1.05	0.96
297.60	2598.85	1.01	5.00	1.13	0.97
334.80	2598.91	1.07	5.19	1.21	0.98
372.00	2598.98	1.14	5.37	1.28	0.99

Tailwater Channel Data - CP-40 Sta 735+69

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 46.00 ft
Side Slope (H:V): 13.00 (1:1)
Channel Slope: 0.0180
Channel Manning's n: 0.0350
Channel Invert Elevation: 2597.84 ft

Roadway Data for Crossing: CP-40 Sta 735+69

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 30.00 ft
Crest Elevation: 2610.00 ft
Roadway Surface: Paved
Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-41 Sta 730+92

Headwater Elevation (ft)	Total Discharge (cfs)	CP-41 Sta 730+92 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2593.11	0.00	0.00	0.00	1
2596.62	8.00	8.00	0.00	1
2596.70	16.00	16.00	0.00	1
2596.76	24.00	24.00	0.00	1
2596.82	32.00	32.00	0.00	1
2596.88	40.00	40.00	0.00	1
2596.93	48.00	48.00	0.00	1
2596.98	56.00	56.00	0.00	1
2597.03	64.00	64.00	0.00	1
2597.07	72.00	72.00	0.00	1
2597.11	80.00	80.00	0.00	1
2600.00	235.13	235.13	0.00	Overtopping

Culvert Summary Table: CP-41 Sta 730+92

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2593.11	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
8.00	8.00	2596.62	3.506	0.0*	5-S2n	0.365	0.576	0.366	0.155	8.005	2.051
16.00	16.00	2596.70	3.586	0.0*	5-S2n	0.490	0.837	0.527	0.233	8.508	2.655
24.00	24.00	2596.76	3.654	0.0*	5-S2n	0.614	1.051	0.641	0.296	9.816	3.080
32.00	32.00	2596.82	3.714	0.0*	5-S2n	0.724	1.208	0.731	0.350	11.050	3.414
40.00	40.00	2596.88	3.769	0.0*	5-S2n	0.801	1.366	0.806	0.398	11.843	3.693
48.00	48.00	2596.93	3.821	0.0*	5-S2n	0.878	1.498	0.888	0.443	12.379	3.936
56.00	56.00	2596.98	3.869	0.0*	5-S2n	0.954	1.624	0.963	0.484	12.934	4.151
64.00	64.00	2597.03	3.916	0.0*	5-S2n	1.031	1.750	1.034	0.523	13.445	4.345
72.00	72.00	2597.07	3.961	0.0*	5-S2n	1.094	1.855	1.095	0.559	14.045	4.522
80.00	80.00	2597.11	4.004	0.0*	5-S2n	1.153	1.960	1.180	0.594	13.986	4.686

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2593.11 ft, Outlet Elevation (invert): 2587.92 ft
 Culvert Length: 186.07 ft, Culvert Slope: 0.0279
 Inlet Throat Elevation: 2593.11 ft, Inlet Crest Elevation: 2596.48 ft

Site Data - CP-41 Sta 730+92

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2596.11 ft
 Outlet Station: 186.00 ft
 Outlet Elevation: 2587.92 ft
 Number of Barrels: 2

Culvert Data Summary - CP-41 Sta 730+92

Barrel Shape: Circular

Barrel Diameter: 3.50 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-41 Sta 730+92)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2587.92	0.00	0.00	0.00	0.00
8.00	2588.07	0.15	2.05	0.29	0.94
16.00	2588.15	0.23	2.66	0.44	1.00
24.00	2588.22	0.30	3.08	0.55	1.04
32.00	2588.27	0.35	3.41	0.65	1.07
40.00	2588.32	0.40	3.69	0.75	1.09
48.00	2588.36	0.44	3.94	0.83	1.11
56.00	2588.40	0.48	4.15	0.91	1.12
64.00	2588.44	0.52	4.35	0.98	1.14
72.00	2588.48	0.56	4.52	1.05	1.15
80.00	2588.51	0.59	4.69	1.11	1.16

Tailwater Channel Data - CP-41 Sta 730+92

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 24.00 ft
 Side Slope (H:V): 8.00 (1:1)
 Channel Slope: 0.0300
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2587.92 ft

Roadway Data for Crossing: CP-41 Sta 730+92

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2600.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-44 Sta 716+38

Headwater Elevation (ft)	Total Discharge (cfs)	CP-44 Sta 716+38 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2562.00	0.00	0.00	0.00	1
2565.76	118.50	118.50	0.00	1
2565.96	237.00	237.00	0.00	1
2566.12	355.50	355.50	0.00	1
2566.26	474.00	474.00	0.00	1
2566.39	592.50	592.50	0.00	1
2566.52	711.00	711.00	0.00	1
2566.63	829.50	829.50	0.00	1
2566.75	948.00	948.00	0.00	1
2566.85	1066.50	1066.50	0.00	1
2566.96	1185.00	1185.00	0.00	1
2570.00	2247.93	2247.93	0.00	Overtopping

Culvert Summary Table: CP-44 Sta 716+38

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2562.00	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
118.50	118.50	2565.76	3.765	0.0*	1-S2n	0.210	0.650	0.293	0.681	10.109	4.138
237.00	237.00	2565.96	3.957	0.0*	1-S2n	0.420	1.031	0.455	1.027	13.010	5.356
355.50	355.50	2566.12	4.118	0.0*	1-S2n	0.565	1.352	0.572	1.304	15.550	6.207
474.00	474.00	2566.26	4.262	0.0*	1-S2n	0.670	1.637	0.687	1.544	17.242	6.878
592.50	592.50	2566.39	4.394	0.0*	1-S2n	0.775	1.900	0.867	1.759	17.087	7.439
711.00	711.00	2566.52	4.518	0.0*	1-S2n	0.880	2.145	0.995	1.956	17.856	7.926
829.50	829.50	2566.63	4.634	0.0*	1-S2n	0.985	2.378	1.123	2.139	18.472	8.356
948.00	948.00	2566.75	4.746	0.0*	1-S2n	1.070	2.599	1.246	2.310	19.021	8.744
1066.50	1066.50	2566.85	4.853	0.0*	1-S2n	1.151	2.811	1.367	2.472	19.500	9.098
1185.00	1185.00	2566.96	4.956	0.0*	1-S2n	1.232	3.016	1.486	2.626	19.937	9.424

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2562.00 ft, Outlet Elevation (invert): 2557.00 ft
 Culvert Length: 135.09 ft, Culvert Slope: 0.0370
 Inlet Throat Elevation: 2562.00 ft, Inlet Crest Elevation: 2565.44 ft

Site Data - CP-44 Sta 716+38

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2564.90 ft
 Outlet Station: 135.00 ft
 Outlet Elevation: 2557.00 ft
 Number of Barrels: 4

Culvert Data Summary - CP-44 Sta 716+38

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft
 Barrel Rise: 5.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-44 Sta 716+38)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2557.00	0.00	0.00	0.00	0.00
118.50	2557.68	0.68	4.14	0.72	0.90
237.00	2558.03	1.03	5.36	1.09	0.96
355.50	2558.30	1.30	6.21	1.38	1.00
474.00	2558.54	1.54	6.88	1.64	1.02
592.50	2558.76	1.76	7.44	1.87	1.04
711.00	2558.96	1.96	7.93	2.07	1.06
829.50	2559.14	2.14	8.36	2.27	1.07
948.00	2559.31	2.31	8.74	2.45	1.09
1066.50	2559.47	2.47	9.10	2.62	1.10
1185.00	2559.63	2.63	9.42	2.79	1.11

Tailwater Channel Data - CP-44 Sta 716+38

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 40.00 ft
 Side Slope (H:V): 3.00 (_:1)
 Channel Slope: 0.0170
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2557.00 ft

Roadway Data for Crossing: CP-44 Sta 716+38

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2570.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft

Summary of Culvert Flows at Crossing: CP-45 Sta 711+44

Headwater Elevation (ft)	Total Discharge (cfs)	CP-45 Sta 711+44 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2554.30	0.00	0.00	0.00	1
2557.57	17.20	17.20	0.00	1
2557.68	34.40	34.40	0.00	1
2557.78	51.60	51.60	0.00	1
2557.87	68.80	68.80	0.00	1
2557.95	86.00	86.00	0.00	1
2558.02	103.20	103.20	0.00	1
2558.09	120.40	120.40	0.00	1
2558.16	137.60	137.60	0.00	1
2558.22	154.80	154.80	0.00	1
2558.49	172.00	172.00	0.00	1
2560.00	246.85	246.85	0.00	Overtopping

Culvert Summary Table: CP-45 Sta 711+44

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2554.30	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
17.20	17.20	2557.57	3.270	0.0*	1-S2n	0.567	0.844	0.584	0.339	7.310	2.610
34.40	34.40	2557.68	3.385	0.0*	1-S2n	0.837	1.215	0.844	0.496	8.985	3.233
51.60	51.60	2557.78	3.482	0.0*	1-S2n	1.017	1.492	1.022	0.615	10.093	3.645
68.80	68.80	2557.87	3.568	0.0*	1-S2n	1.197	1.735	1.197	0.715	10.883	3.959
86.00	86.00	2557.95	3.647	0.0*	1-S2n	1.336	1.957	1.376	0.802	11.201	4.218
103.20	103.20	2558.02	3.721	0.0*	1-S2n	1.474	2.148	1.484	0.880	12.135	4.439
120.40	120.40	2558.09	3.791	0.0*	1-S2n	1.610	2.333	1.665	0.950	12.155	4.633
137.60	137.60	2558.16	3.858	0.0*	1-S2n	1.730	2.500	1.739	1.015	13.118	4.806
154.80	154.80	2558.22	3.922	0.0*	1-S2n	1.849	2.656	1.928	1.076	12.909	4.963
172.00	172.00	2558.49	4.194	0.0*	5-S2n	1.969	2.810	2.058	1.133	13.206	5.106

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2554.30 ft, Outlet Elevation (invert): 2552.06 ft
 Culvert Length: 149.02 ft, Culvert Slope: 0.0150
 Inlet Throat Elevation: 2554.30 ft, Inlet Crest Elevation: 2557.37 ft

Site Data - CP-45 Sta 711+44

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2557.10 ft
 Outlet Station: 149.00 ft
 Outlet Elevation: 2552.06 ft
 Number of Barrels: 2

Culvert Data Summary - CP-45 Sta 711+44

Barrel Shape: Circular

Barrel Diameter: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-45 Sta 711+44)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2552.06	0.00	0.00	0.00	0.00
17.20	2552.40	0.34	2.61	0.44	0.87
34.40	2552.56	0.50	3.23	0.65	0.92
51.60	2552.68	0.62	3.65	0.81	0.95
68.80	2552.78	0.72	3.96	0.94	0.97
86.00	2552.86	0.80	4.22	1.05	0.99
103.20	2552.94	0.88	4.44	1.15	1.00
120.40	2553.01	0.95	4.63	1.25	1.01
137.60	2553.08	1.02	4.81	1.33	1.02
154.80	2553.14	1.08	4.96	1.41	1.03
172.00	2553.19	1.13	5.11	1.48	1.03

Tailwater Channel Data - CP-45 Sta 711+44

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 15.00 ft
 Side Slope (H:V): 13.00 (1:1)
 Channel Slope: 0.0210
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2552.06 ft

Roadway Data for Crossing: CP-45 Sta 711+44

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2560.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-46 Sta 706+73

Headwater Elevation (ft)	Total Discharge (cfs)	CP-46 Sta 706+73 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2548.92	0.00	0.00	0.00	1
2550.86	43.50	43.50	0.00	1
2551.08	87.00	87.00	0.00	1
2551.27	130.50	130.50	0.00	1
2551.43	174.00	174.00	0.00	1
2551.59	217.50	217.50	0.00	1
2551.73	261.00	261.00	0.00	1
2551.87	304.50	304.50	0.00	1
2552.12	348.00	348.00	0.00	1
2552.41	391.50	391.50	0.00	1
2552.70	435.00	435.00	0.00	1
2555.00	761.22	761.22	0.00	Overtopping

Culvert Summary Table: CP-46 Sta 706+73

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2548.92	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
43.50	43.50	2550.86	1.939	0.0*	1-S2n	0.224	0.529	0.269	0.881	8.092	4.742
87.00	87.00	2551.08	2.161	0.0*	1-S2n	0.423	0.839	0.429	1.243	10.130	5.730
130.50	130.50	2551.27	2.348	0.0*	1-S2n	0.534	1.100	0.540	1.509	12.085	6.383
174.00	174.00	2551.43	2.514	0.0*	1-S2n	0.644	1.332	0.652	1.727	13.334	6.883
217.50	217.50	2551.59	2.667	0.0*	1-S2n	0.755	1.546	0.756	1.915	14.381	7.295
261.00	261.00	2551.73	2.810	0.0*	1-S2n	0.850	1.746	0.858	2.081	15.209	7.648
304.50	304.50	2551.87	2.946	0.0*	1-S2n	0.934	1.935	1.008	2.231	15.104	7.959
348.00	348.00	2552.12	3.204	0.0*	1-S2n	1.018	2.115	1.031	2.368	16.871	8.237
391.50	391.50	2552.41	3.494	0.0*	1-S2n	1.102	2.288	1.218	2.496	16.072	8.490
435.00	435.00	2552.70	3.781	0.0*	1-S2n	1.186	2.454	1.318	2.615	16.497	8.721

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2548.92 ft, Outlet Elevation (invert): 2545.23 ft
 Culvert Length: 160.04 ft, Culvert Slope: 0.0231
 Inlet Throat Elevation: 2548.92 ft, Inlet Crest Elevation: 2550.48 ft

Site Data - CP-46 Sta 706+73

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2550.32 ft
 Outlet Station: 160.00 ft
 Outlet Elevation: 2545.23 ft
 Number of Barrels: 2

Culvert Data Summary - CP-46 Sta 706+73

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft
 Barrel Rise: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-46 Sta 706+73)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2545.20	0.00	0.00	0.00	0.00
43.50	2546.08	0.88	4.74	1.32	1.06
87.00	2546.44	1.24	5.73	1.86	1.11
130.50	2546.71	1.51	6.38	2.26	1.14
174.00	2546.93	1.73	6.88	2.59	1.16
217.50	2547.11	1.91	7.29	2.87	1.18
261.00	2547.28	2.08	7.65	3.12	1.19
304.50	2547.43	2.23	7.96	3.34	1.21
348.00	2547.57	2.37	8.24	3.55	1.22
391.50	2547.70	2.50	8.49	3.74	1.23
435.00	2547.81	2.61	8.72	3.92	1.23

Tailwater Channel Data - CP-46 Sta 706+73

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 6.00 ft
 Side Slope (H:V): 5.00 (_:1)
 Channel Slope: 0.0240
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2545.20 ft

Roadway Data for Crossing: CP-46 Sta 706+73

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2555.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-48 Sta 694+27

Headwater Elevation (ft)	Total Discharge (cfs)	CP-48 Sta 694+27 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2535.86	0.00	0.00	0.00	1
2538.11	8.80	8.80	0.00	1
2538.21	17.60	17.60	0.00	1
2538.29	26.40	26.40	0.00	1
2538.36	35.20	35.20	0.00	1
2538.42	44.00	44.00	0.00	1
2538.48	52.80	52.80	0.00	1
2538.54	61.60	61.60	0.00	1
2538.60	70.40	70.40	0.00	1
2538.66	79.20	79.20	0.00	1
2538.84	88.00	88.00	0.00	1
2541.68	208.89	208.89	0.00	Overtopping

Culvert Summary Table: CP-48 Sta 694+27

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2535.86	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
8.80	8.80	2538.11	2.253	0.0*	1-S2n	0.441	0.610	0.450	0.288	5.867	2.270
17.60	17.60	2538.21	2.347	0.0*	1-S2n	0.642	0.880	0.649	0.419	7.081	2.798
26.40	26.40	2538.29	2.427	0.0*	1-S2n	0.788	1.098	0.797	0.518	7.939	3.146
35.20	35.20	2538.36	2.498	0.0*	1-S2n	0.912	1.271	0.924	0.600	8.596	3.413
44.00	44.00	2538.42	2.563	0.0*	1-S2n	1.036	1.435	1.037	0.671	9.208	3.631
52.80	52.80	2538.48	2.624	0.0*	1-S2n	1.134	1.574	1.143	0.735	9.647	3.818
61.60	61.60	2538.54	2.682	0.0*	1-S2n	1.229	1.712	1.232	0.793	10.150	3.982
70.40	70.40	2538.60	2.737	0.0*	1-S2n	1.324	1.834	1.348	0.846	10.292	4.128
79.20	79.20	2538.66	2.804	0.0*	1-S2n	1.416	1.949	1.418	0.896	10.835	4.261
88.00	88.00	2538.84	2.983	0.0*	1-S2n	1.498	2.065	1.504	0.942	11.127	4.383

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2535.86 ft, Outlet Elevation (invert): 2533.87 ft
 Culvert Length: 153.01 ft, Culvert Slope: 0.0130
 Inlet Throat Elevation: 2535.86 ft, Inlet Crest Elevation: 2537.95 ft

Site Data - CP-48 Sta 694+27

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2537.80 ft
 Outlet Station: 153.00 ft
 Outlet Elevation: 2533.87 ft
 Number of Barrels: 2

Culvert Data Summary - CP-48 Sta 694+27

Barrel Shape: Circular

Barrel Diameter: 3.50 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Beveled Edge (1.5:1)
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-48 Sta 694+27)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2533.87	0.00	0.00	0.00	0.00
8.80	2534.16	0.29	2.27	0.27	0.84
17.60	2534.29	0.42	2.80	0.39	0.88
26.40	2534.39	0.52	3.15	0.48	0.91
35.20	2534.47	0.60	3.41	0.56	0.93
44.00	2534.54	0.67	3.63	0.63	0.94
52.80	2534.60	0.73	3.82	0.69	0.95
61.60	2534.66	0.79	3.98	0.74	0.96
70.40	2534.72	0.85	4.13	0.79	0.97
79.20	2534.77	0.90	4.26	0.84	0.98
88.00	2534.81	0.94	4.38	0.88	0.98

Tailwater Channel Data - CP-48 Sta 694+27

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 10.00 ft
 Side Slope (H:V): 12.00 (1:1)
 Channel Slope: 0.0150
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 2533.87 ft

Roadway Data for Crossing: CP-48 Sta 694+27

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2541.68 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-49.1 Sta 691+04

Headwater Elevation (ft)	Total Discharge (cfs)	CP-49.1 Sta 691+04 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2533.30	0.00	0.00	0.00	1
2533.84	1.40	1.40	0.00	1
2534.07	2.80	2.80	0.00	1
2534.26	4.20	4.20	0.00	1
2534.45	5.60	5.60	0.00	1
2534.61	7.00	7.00	0.00	1
2534.76	8.40	8.40	0.00	1
2534.90	9.80	9.80	0.00	1
2535.04	11.20	11.20	0.00	1
2535.17	12.60	12.60	0.00	1
2535.32	14.00	14.00	0.00	1
2545.00	53.45	53.45	0.00	Overtopping

Culvert Summary Table: CP-49.1 Sta 691+04

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2533.30	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
1.40	1.40	2533.84	0.541	0.0*	1-S2n	0.237	0.407	0.247	0.167	9.067	2.393
2.80	2.80	2534.07	0.775	0.0*	1-S2n	0.336	0.580	0.340	0.248	7.718	3.010
4.20	4.20	2534.26	0.961	0.0*	1-S2n	0.422	0.713	0.427	0.312	8.645	3.423
5.60	5.60	2534.45	1.147	0.0*	1-S2n	0.483	0.833	0.492	0.365	9.250	3.741
7.00	7.00	2534.61	1.315	0.0*	1-S2n	0.544	0.935	0.545	0.413	10.045	4.001
8.40	8.40	2534.76	1.464	0.0*	1-S2n	0.604	1.030	0.605	0.455	10.487	4.224
9.80	9.80	2534.90	1.603	0.0*	1-S2n	0.651	1.115	0.654	0.495	10.934	4.418
11.20	11.20	2535.04	1.738	0.0*	1-S2n	0.698	1.200	0.699	0.531	11.406	4.593
12.60	12.60	2535.17	1.874	0.0*	1-S2n	0.745	1.272	0.751	0.565	11.659	4.751
14.00	14.00	2535.32	2.016	0.0*	5-S2n	0.791	1.344	0.793	0.597	12.065	4.896

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2533.30 ft, Outlet Elevation (invert): 2527.75 ft
 Culvert Length: 187.08 ft, Culvert Slope: 0.0297

Site Data - CP-49.1 Sta 691+04

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2533.30 ft
 Outlet Station: 187.00 ft
 Outlet Elevation: 2527.75 ft
 Number of Barrels: 1

Culvert Data Summary - CP-49.1 Sta 691+04

Barrel Shape: Circular
 Barrel Diameter: 2.00 ft

Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: Beveled Edge (1:1)
 Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP-49.1 Sta 691+04)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2527.75	0.00	0.00	0.00	0.00
1.40	2527.92	0.17	2.39	0.44	1.10
2.80	2528.00	0.25	3.01	0.65	1.17
4.20	2528.06	0.31	3.42	0.82	1.20
5.60	2528.12	0.37	3.74	0.96	1.23
7.00	2528.16	0.41	4.00	1.08	1.25
8.40	2528.21	0.46	4.22	1.19	1.26
9.80	2528.24	0.49	4.42	1.30	1.28
11.20	2528.28	0.53	4.59	1.39	1.29
12.60	2528.31	0.56	4.75	1.48	1.30
14.00	2528.35	0.60	4.90	1.56	1.31

Tailwater Channel Data - CP-49.1 Sta 691+04

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 3.00 ft
 Side Slope (H:V): 3.00 (1:1)
 Channel Slope: 0.0420
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2527.75 ft

Roadway Data for Crossing: CP-49.1 Sta 691+04

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 100.00 ft
 Crest Elevation: 2545.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 40.00 ft

Summary of Culvert Flows at Crossing: CP-53 Sta 644+50

Headwater Elevation (ft)	Total Discharge (cfs)	CP-53 Sta 644+50 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2415.76	0.00	0.00	0.00	1
2418.78	14.80	14.80	0.00	1
2418.87	29.60	29.60	0.00	1
2418.95	44.40	44.40	0.00	1
2419.02	59.20	59.20	0.00	1
2419.08	74.00	74.00	0.00	1
2419.14	88.80	88.80	0.00	1
2419.20	103.60	103.60	0.00	1
2419.25	118.40	118.40	0.00	1
2419.30	133.20	133.20	0.00	1
2419.35	148.00	148.00	0.00	1
2425.00	437.95	437.95	0.00	Overtopping

Culvert Summary Table: CP-53 Sta 644+50

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2415.76	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
14.80	14.80	2418.78	3.021	0.0*	1-S2n	0.466	0.656	0.476	0.239	6.055	3.206
29.60	29.60	2418.87	3.113	0.0*	1-S2n	0.691	0.937	0.693	0.352	7.298	4.013
44.40	44.40	2418.95	3.191	0.0*	1-S2n	0.833	1.161	0.851	0.440	8.106	4.550
59.20	59.20	2419.02	3.260	0.0*	1-S2n	0.972	1.355	0.975	0.514	8.966	4.964
74.00	74.00	2419.08	3.323	0.0*	1-S2n	1.097	1.519	1.098	0.579	9.586	5.301
88.80	88.80	2419.14	3.383	0.0*	1-S2n	1.203	1.674	1.204	0.637	10.061	5.591
103.60	103.60	2419.20	3.439	0.0*	1-S2n	1.310	1.816	1.334	0.691	10.236	5.845
118.40	118.40	2419.25	3.493	0.0*	1-S2n	1.414	1.946	1.415	0.740	10.833	6.073
133.20	133.20	2419.30	3.544	0.0*	5-S2n	1.506	2.075	1.514	0.786	11.125	6.278
148.00	148.00	2419.35	3.593	0.0*	5-S2n	1.598	2.188	1.598	0.829	11.516	6.466

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2415.76 ft, Outlet Elevation (invert): 2413.76 ft
 Culvert Length: 154.01 ft, Culvert Slope: 0.0130
 Inlet Throat Elevation: 2415.76 ft, Inlet Crest Elevation: 2418.62 ft

Site Data - CP-53 Sta 644+50

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2418.40 ft
 Outlet Station: 154.00 ft
 Outlet Elevation: 2413.76 ft
 Number of Barrels: 3

Culvert Data Summary - CP-53 Sta 644+50

Barrel Shape: Circular

Barrel Diameter: 3.50 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-53 Sta 644+50)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2413.76	0.00	0.00	0.00	0.00
14.80	2414.00	0.24	3.21	0.52	1.25
29.60	2414.11	0.35	4.01	0.77	1.32
44.40	2414.20	0.44	4.55	0.96	1.37
59.20	2414.27	0.51	4.96	1.12	1.40
74.00	2414.34	0.58	5.30	1.26	1.42
88.80	2414.40	0.64	5.59	1.39	1.44
103.60	2414.45	0.69	5.84	1.51	1.45
118.40	2414.50	0.74	6.07	1.62	1.47
133.20	2414.55	0.79	6.28	1.72	1.48
148.00	2414.59	0.83	6.47	1.81	1.49

Tailwater Channel Data - CP-53 Sta 644+50

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 16.00 ft
 Side Slope (H:V): 14.00 (1:1)
 Channel Slope: 0.0350
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 2413.76 ft

Roadway Data for Crossing: CP-53 Sta 644+50

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2425.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-54 Sta 635+38

Headwater Elevation (ft)	Total Discharge (cfs)	CP-54 Sta 635+38 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2390.30	0.00	0.00	0.00	1
2393.88	12.40	12.40	0.00	1
2393.98	24.80	24.80	0.00	1
2394.06	37.20	37.20	0.00	1
2394.13	49.60	49.60	0.00	1
2394.20	62.00	62.00	0.00	1
2394.26	74.40	74.40	0.00	1
2394.32	86.80	86.80	0.00	1
2394.37	99.20	99.20	0.00	1
2394.43	111.60	111.60	0.00	1
2394.48	124.00	124.00	0.00	1
2405.00	373.36	373.36	0.00	Overtopping

Culvert Summary Table: CP-54 Sta 635+38

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2390.30	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
12.40	12.40	2393.88	3.581	0.0*	5-S2n	0.480	0.741	0.491	0.208	7.291	2.089
24.80	24.80	2393.98	3.678	0.0*	5-S2n	0.713	1.066	0.715	0.305	8.806	2.602
37.20	37.20	2394.06	3.758	0.0*	5-S2n	0.860	1.310	0.869	0.380	9.884	2.944
49.60	49.60	2394.13	3.830	0.0*	5-S2n	1.008	1.523	1.013	0.443	10.703	3.205
62.00	62.00	2394.20	3.897	0.0*	5-S2n	1.131	1.718	1.137	0.498	11.401	3.419
74.40	74.40	2394.26	3.959	0.0*	5-S2n	1.245	1.886	1.246	0.547	12.071	3.602
86.80	86.80	2394.32	4.017	0.0*	5-S2n	1.358	2.049	1.364	0.592	12.491	3.762
99.20	99.20	2394.37	4.073	0.0*	5-S2n	1.462	2.194	1.503	0.633	12.547	3.906
111.60	111.60	2394.43	4.127	0.0*	5-S2n	1.560	2.332	1.562	0.672	13.425	4.036
124.00	124.00	2394.48	4.178	0.0*	5-S2n	1.658	2.466	1.714	0.708	13.234	4.155

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2390.30 ft, Outlet Elevation (invert): 2387.37 ft
 Culvert Length: 162.03 ft, Culvert Slope: 0.0181
 Inlet Throat Elevation: 2390.30 ft, Inlet Crest Elevation: 2393.72 ft

Site Data - CP-54 Sta 635+38

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2393.40 ft
 Outlet Station: 162.00 ft
 Outlet Elevation: 2387.37 ft
 Number of Barrels: 2

Culvert Data Summary - CP-54 Sta 635+38

Barrel Shape: Circular

Barrel Diameter: 3.50 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End Projecting
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-54 Sta 635+38)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2387.37	0.00	0.00	0.00	0.00
12.40	2387.58	0.21	2.09	0.32	0.88
24.80	2387.68	0.31	2.60	0.48	0.93
37.20	2387.75	0.38	2.94	0.59	0.96
49.60	2387.81	0.44	3.20	0.69	0.98
62.00	2387.87	0.50	3.42	0.78	1.00
74.40	2387.92	0.55	3.60	0.85	1.01
86.80	2387.96	0.59	3.76	0.92	1.02
99.20	2388.00	0.63	3.91	0.99	1.03
111.60	2388.04	0.67	4.04	1.05	1.04
124.00	2388.08	0.71	4.16	1.11	1.05

Tailwater Channel Data - CP-54 Sta 635+38

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 23.00 ft
 Side Slope (H:V): 27.00 (1:1)
 Channel Slope: 0.0250
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2387.37 ft

Roadway Data for Crossing: CP-54 Sta 635+38

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2405.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-55 Sta 627+84

Headwater Elevation (ft)	Total Discharge (cfs)	CP-55 Sta 627+84 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2368.99	0.00	0.00	0.00	1
2371.36	15.70	15.70	0.00	1
2371.48	31.40	31.40	0.00	1
2371.58	47.10	47.10	0.00	1
2371.67	62.80	62.80	0.00	1
2371.75	78.50	78.50	0.00	1
2371.90	94.20	94.20	0.00	1
2372.17	109.90	109.90	0.00	1
2372.43	125.60	125.60	0.00	1
2372.68	141.30	141.30	0.00	1
2372.94	157.00	157.00	0.00	1
2375.00	259.40	259.40	0.00	Overtopping

Culvert Summary Table: CP-55 Sta 627+84

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2368.99	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
15.70	15.70	2371.36	2.369	0.0*	1-S2n	0.602	0.811	0.610	0.342	6.276	2.532
31.40	31.40	2371.48	2.489	0.0*	1-S2n	0.879	1.155	0.885	0.489	7.540	3.087
47.10	47.10	2371.58	2.590	0.0*	1-S2n	1.081	1.420	1.089	0.599	8.453	3.453
62.80	62.80	2371.67	2.680	0.0*	1-S2n	1.263	1.658	1.271	0.689	9.127	3.734
78.50	78.50	2371.75	2.763	0.0*	1-S2n	1.418	1.860	1.420	0.767	9.791	3.963
94.20	94.20	2371.90	2.913	0.0*	1-S2n	1.572	2.052	1.575	0.837	10.243	4.160
109.90	109.90	2372.17	3.181	0.0*	1-S2n	1.710	2.220	1.752	0.900	10.371	4.333
125.60	125.60	2372.43	3.438	0.0*	1-S2n	1.844	2.389	1.852	0.957	11.026	4.488
141.30	141.30	2372.68	3.691	0.0*	1-S2n	1.978	2.533	1.982	1.011	11.373	4.628
157.00	157.00	2372.94	3.949	0.0*	1-S2n	2.106	2.676	2.115	1.061	11.649	4.757

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2368.99 ft, Outlet Elevation (invert): 2367.61 ft
 Culvert Length: 138.01 ft, Culvert Slope: 0.0100
 Inlet Throat Elevation: 2368.99 ft, Inlet Crest Elevation: 2371.15 ft

Site Data - CP-55 Sta 627+84

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2371.00 ft
 Outlet Station: 138.00 ft
 Outlet Elevation: 2367.61 ft
 Number of Barrels: 2

Culvert Data Summary - CP-55 Sta 627+84

Barrel Shape: Circular

Barrel Diameter: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-55 Sta 627+84)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2367.61	0.00	0.00	0.00	0.00
15.70	2367.95	0.34	2.53	0.47	0.88
31.40	2368.10	0.49	3.09	0.67	0.93
47.10	2368.21	0.60	3.45	0.82	0.95
62.80	2368.30	0.69	3.73	0.95	0.97
78.50	2368.38	0.77	3.96	1.05	0.99
94.20	2368.45	0.84	4.16	1.15	1.00
109.90	2368.51	0.90	4.33	1.24	1.01
125.60	2368.57	0.96	4.49	1.31	1.02
141.30	2368.62	1.01	4.63	1.39	1.03
157.00	2368.67	1.06	4.76	1.46	1.03

Tailwater Channel Data - CP-55 Sta 627+84

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 12.00 ft
 Side Slope (H:V): 18.00 (1:1)
 Channel Slope: 0.0220
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2367.61 ft

Roadway Data for Crossing: CP-55 Sta 627+84

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2375.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 80.00 ft

Summary of Culvert Flows at Crossing: CP 55.1 Sta 630+75 Driveway

Headwater Elevation (ft)	Total Discharge (cfs)	CP 55.1 Sta 630+75 Driveway Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2375.70	0.00	0.00	0.00	1
2376.17	2.10	2.10	0.00	1
2376.38	4.20	4.20	0.00	1
2376.54	6.30	6.30	0.00	1
2376.68	8.40	8.40	0.00	1
2376.82	10.50	10.50	0.00	1
2376.94	12.60	12.60	0.00	1
2377.06	14.70	14.70	0.00	1
2377.16	16.80	16.80	0.00	1
2377.27	18.90	18.90	0.00	1
2377.36	21.00	21.00	0.00	1
2378.50	42.79	42.79	0.00	Overtopping

Culvert Summary Table: CP 55.1 Sta 630+75 Driveway

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2375.70	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
2.10	2.10	2376.17	0.469	0.0*	1-S2n	0.266	0.342	0.272	0.165	3.961	2.016
4.20	4.20	2376.38	0.675	0.0*	1-S2n	0.394	0.494	0.395	0.248	4.773	2.605
6.30	6.30	2376.54	0.842	0.0*	1-S2n	0.475	0.618	0.478	0.315	5.420	3.013
8.40	8.40	2376.68	0.979	0.0*	1-S2n	0.554	0.713	0.562	0.373	5.774	3.334
10.50	10.50	2376.82	1.116	0.125	1-S2n	0.625	0.807	0.630	0.425	6.215	3.603
12.60	12.60	2376.94	1.241	0.173	1-S2n	0.686	0.884	0.693	0.473	6.503	3.835
14.70	14.70	2377.06	1.357	0.217	1-S2n	0.747	0.960	0.750	0.517	6.817	4.039
16.80	16.80	2377.16	1.464	0.259	1-S2n	0.806	1.030	0.806	0.559	7.085	4.223
18.90	18.90	2377.27	1.566	0.298	1-S2n	0.859	1.094	0.863	0.598	7.275	4.390
21.00	21.00	2377.36	1.664	0.335	1-S2n	0.911	1.158	0.917	0.635	7.469	4.545

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2375.70 ft, Outlet Elevation (invert): 2375.20 ft
 Culvert Length: 50.00 ft, Culvert Slope: 0.0100

Site Data - CP 55.1 Sta 630+75 Driveway

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2375.70 ft
 Outlet Station: 50.00 ft
 Outlet Elevation: 2375.20 ft
 Number of Barrels: 2

Culvert Data Summary - CP 55.1 Sta 630+75 Driveway

Barrel Shape: Circular
 Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Grooved End in Headwall

Inlet Depression: NONE

Downstream Channel Rating Curve (Crossing: CP 55.1 Sta 630+75 Driveway)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2375.40	0.00	0.00	0.00	0.00
2.10	2375.56	0.16	2.02	0.21	0.90
4.20	2375.65	0.25	2.61	0.31	0.96
6.30	2375.72	0.32	3.01	0.39	0.99
8.40	2375.77	0.37	3.33	0.47	1.01
10.50	2375.83	0.43	3.60	0.53	1.03
12.60	2375.87	0.47	3.83	0.59	1.05
14.70	2375.92	0.52	4.04	0.65	1.06
16.80	2375.96	0.56	4.22	0.70	1.07
18.90	2376.00	0.60	4.39	0.75	1.08
21.00	2376.04	0.64	4.54	0.79	1.09

Tailwater Channel Data - CP 55.1 Sta 630+75 Driveway

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 6.00 ft

Side Slope (H:V): 2.00 (1:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0300

Channel Invert Elevation: 2375.40 ft

Roadway Data for Crossing: CP 55.1 Sta 630+75 Driveway

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	2378.90
1	100.00	2378.50
2	102.00	2379.46

Roadway Surface: Paved

Roadway Top Width: 20.00 ft

Summary of Culvert Flows at Crossing: CP-56 Sta 613+05

Headwater Elevation (ft)	Total Discharge (cfs)	CP-56 Sta 613+05 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2327.95	0.00	0.00	0.00	1
2331.42	23.20	23.20	0.00	1
2331.49	46.40	46.40	0.00	1
2331.54	69.60	69.60	0.00	1
2331.59	92.80	92.80	0.00	1
2331.63	116.00	116.00	0.00	1
2331.67	139.20	139.20	0.00	1
2331.71	162.40	162.40	0.00	1
2331.75	185.60	185.60	0.00	1
2331.78	208.80	208.80	0.00	1
2331.81	232.00	232.00	0.00	1
2335.00	2311.49	2311.49	0.00	Overtopping

Culvert Summary Table: CP-56 Sta 613+05

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2327.95	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
23.20	23.20	2331.42	3.469	0.0*	1-S2n	0.053	0.136	0.086	0.323	3.658	2.560
46.40	46.40	2331.49	3.533	0.0*	1-S2n	0.106	0.272	0.162	0.467	4.187	3.141
69.60	69.60	2331.54	3.586	0.0*	1-S2n	0.159	0.407	0.197	0.575	5.338	3.525
92.80	92.80	2331.59	3.633	0.0*	1-S2n	0.213	0.543	0.233	0.664	6.265	3.818
116.00	116.00	2331.63	3.677	0.0*	1-S2n	0.266	0.628	0.268	0.742	7.085	4.059
139.20	139.20	2331.67	3.717	0.0*	1-S2n	0.319	0.702	0.321	0.811	7.558	4.265
162.40	162.40	2331.71	3.756	0.0*	1-S2n	0.372	0.777	0.372	0.873	8.123	4.445
185.60	185.60	2331.75	3.792	0.0*	1-S2n	0.425	0.851	0.425	0.931	8.733	4.607
208.80	208.80	2331.78	3.828	0.0*	1-S2n	0.478	0.925	0.478	0.985	9.442	4.753
232.00	232.00	2331.81	3.862	0.0*	1-S2n	0.531	0.999	0.531	1.035	10.275	4.887

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2327.95 ft, Outlet Elevation (invert): 2324.98 ft
 Culvert Length: 156.03 ft, Culvert Slope: 0.0190
 Inlet Throat Elevation: 2327.95 ft, Inlet Crest Elevation: 2331.31 ft

Site Data - CP-56 Sta 613+05

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2330.62 ft
 Outlet Station: 156.00 ft
 Outlet Elevation: 2324.65 ft
 Number of Barrels: 4

Culvert Data Summary - CP-56 Sta 613+05

Barrel Shape: Concrete Box
Barrel Span: 10.00 ft
Barrel Rise: 6.00 ft
Barrel Material: Concrete
Embedment: 4.00 in
Barrel Manning's n: 0.0120 (top and sides)
Manning's n: 0.0120 (bottom)
Inlet Type: Conventional
Inlet Edge Condition: Square Edge (30-75° flare) Wingwall
Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-56 Sta 613+05)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2324.97	0.00	0.00	0.00	0.00
23.20	2325.29	0.32	2.56	0.46	0.90
46.40	2325.44	0.47	3.14	0.67	0.95
69.60	2325.54	0.57	3.52	0.82	0.98
92.80	2325.63	0.66	3.82	0.95	1.00
116.00	2325.71	0.74	4.06	1.06	1.01
139.20	2325.78	0.81	4.26	1.16	1.02
162.40	2325.84	0.87	4.44	1.25	1.03
185.60	2325.90	0.93	4.61	1.34	1.04
208.80	2325.95	0.98	4.75	1.41	1.05
232.00	2326.00	1.03	4.89	1.49	1.06

Tailwater Channel Data - CP-56 Sta 613+05

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 20.00 ft
Side Slope (H:V): 25.00 (1:1)
Channel Slope: 0.0230
Channel Manning's n: 0.0350
Channel Invert Elevation: 2324.97 ft

Roadway Data for Crossing: CP-56 Sta 613+05

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 30.00 ft
Crest Elevation: 2335.00 ft
Roadway Surface: Paved
Roadway Top Width: 110.00 ft

Summary of Culvert Flows at Crossing: CP-58 Sta 596+45

Headwater Elevation (ft)	Total Discharge (cfs)	CP-58 Sta 596+45 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2285.55	0.00	0.00	0.00	1
2288.26	9.10	9.10	0.00	1
2288.36	18.20	18.20	0.00	1
2288.44	27.30	27.30	0.00	1
2288.51	36.40	36.40	0.00	1
2288.57	45.50	45.50	0.00	1
2288.63	54.60	54.60	0.00	1
2288.69	63.70	63.70	0.00	1
2288.75	72.80	72.80	0.00	1
2288.80	81.90	81.90	0.00	1
2288.85	91.00	91.00	0.00	1
2297.00	336.36	336.36	0.00	Overtopping

Culvert Summary Table: CP-58 Sta 596+45

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2285.55	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
9.10	9.10	2288.26	2.713	0.0*	1-S2n	0.428	0.623	0.433	0.168	6.429	1.997
18.20	18.20	2288.36	2.808	0.0*	1-S2n	0.615	0.896	0.629	0.248	7.627	2.511
27.30	27.30	2288.44	2.887	0.0*	1-S2n	0.763	1.116	0.766	0.311	8.705	2.854
36.40	36.40	2288.51	2.957	0.0*	1-S2n	0.878	1.295	0.885	0.364	9.440	3.119
45.50	45.50	2288.57	3.022	0.0*	1-S2n	0.994	1.459	0.998	0.410	10.021	3.336
54.60	54.60	2288.63	3.083	0.0*	1-S2n	1.095	1.602	1.101	0.452	10.509	3.521
63.70	63.70	2288.69	3.140	0.0*	1-S2n	1.184	1.745	1.185	0.490	11.067	3.684
72.80	72.80	2288.75	3.195	0.0*	1-S2n	1.272	1.865	1.275	0.526	11.452	3.830
81.90	81.90	2288.80	3.248	0.0*	1-S2n	1.361	1.985	1.364	0.559	11.791	3.961
91.00	91.00	2288.85	3.298	0.0*	1-S2n	1.443	2.103	1.448	0.590	12.123	4.082

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2285.55 ft, Outlet Elevation (invert): 2282.83 ft
 Culvert Length: 170.02 ft, Culvert Slope: 0.0160
 Inlet Throat Elevation: 2285.55 ft, Inlet Crest Elevation: 2288.10 ft

Site Data - CP-58 Sta 596+45

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2287.90 ft
 Outlet Station: 170.00 ft
 Outlet Elevation: 2282.83 ft
 Number of Barrels: 2

Culvert Data Summary - CP-58 Sta 596+45

Barrel Shape: Circular

Barrel Diameter: 3.50 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-58 Sta 596+45)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2282.83	0.00	0.00	0.00	0.00
9.10	2283.00	0.17	2.00	0.30	0.92
18.20	2283.08	0.25	2.51	0.45	0.98
27.30	2283.14	0.31	2.85	0.56	1.01
36.40	2283.19	0.36	3.12	0.66	1.03
45.50	2283.24	0.41	3.34	0.74	1.05
54.60	2283.28	0.45	3.52	0.82	1.06
63.70	2283.32	0.49	3.68	0.89	1.08
72.80	2283.36	0.53	3.83	0.95	1.09
81.90	2283.39	0.56	3.96	1.01	1.10
91.00	2283.42	0.59	4.08	1.07	1.10

Tailwater Channel Data - CP-58 Sta 596+45

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 23.00 ft
 Side Slope (H:V): 25.00 (1:1)
 Channel Slope: 0.0290
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2282.83 ft

Roadway Data for Crossing: CP-58 Sta 596+45

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2297.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-59 Sta 592+82

Headwater Elevation (ft)	Total Discharge (cfs)	CP-59 Sta 592+82 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2277.50	0.00	0.00	0.00	1
2280.27	16.10	16.10	0.00	1
2280.43	32.20	32.20	0.00	1
2280.56	48.30	48.30	0.00	1
2280.68	64.40	64.40	0.00	1
2280.79	80.50	80.50	0.00	1
2280.90	96.60	96.60	0.00	1
2280.99	112.70	112.70	0.00	1
2281.09	128.80	128.80	0.00	1
2281.24	144.90	144.90	0.00	1
2281.51	161.00	161.00	0.00	1
2285.00	314.96	314.96	0.00	Overtopping

Culvert Summary Table: CP-59 Sta 592+82

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2277.50	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
16.10	16.10	2280.27	2.770	0.0*	1-S2n	0.549	0.820	0.574	0.346	7.012	2.462
32.20	32.20	2280.43	2.930	0.0*	1-S2n	0.814	1.172	0.821	0.493	8.704	2.992
48.30	48.30	2280.56	3.064	0.0*	1-S2n	0.983	1.439	0.989	0.601	9.890	3.342
64.40	64.40	2280.68	3.184	0.0*	1-S2n	1.152	1.679	1.158	0.691	10.648	3.611
80.50	80.50	2280.79	3.294	0.0*	1-S2n	1.293	1.886	1.296	0.768	11.385	3.831
96.60	96.60	2280.90	3.397	0.0*	1-S2n	1.422	2.078	1.428	0.836	11.963	4.020
112.70	112.70	2280.99	3.494	0.0*	1-S2n	1.552	2.250	1.559	0.898	12.413	4.186
128.80	128.80	2281.09	3.587	0.0*	1-S2n	1.670	2.420	1.679	0.955	12.863	4.334
144.90	144.90	2281.24	3.740	0.0*	1-S2n	1.783	2.566	1.786	1.008	13.337	4.469
161.00	161.00	2281.51	4.006	0.0*	5-S2n	1.895	2.712	1.961	1.057	13.137	4.593

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2277.50 ft, Outlet Elevation (invert): 2274.94 ft
 Culvert Length: 171.02 ft, Culvert Slope: 0.0150
 Inlet Throat Elevation: 2277.50 ft, Inlet Crest Elevation: 2280.00 ft

Site Data - CP-59 Sta 592+82

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2279.80 ft
 Outlet Station: 171.00 ft
 Outlet Elevation: 2274.94 ft
 Number of Barrels: 2

Culvert Data Summary - CP-59 Sta 592+82

Barrel Shape: Circular

Barrel Diameter: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0130
 Inlet Type: Conventional
 Inlet Edge Condition: Grooved End in Headwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-59 Sta 592+82)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2274.94	0.00	0.00	0.00	0.00
16.10	2275.29	0.35	2.46	0.45	0.86
32.20	2275.43	0.49	2.99	0.65	0.91
48.30	2275.54	0.60	3.34	0.79	0.93
64.40	2275.63	0.69	3.61	0.91	0.95
80.50	2275.71	0.77	3.83	1.01	0.96
96.60	2275.78	0.84	4.02	1.10	0.97
112.70	2275.84	0.90	4.19	1.18	0.98
128.80	2275.90	0.96	4.33	1.25	0.99
144.90	2275.95	1.01	4.47	1.32	1.00
161.00	2276.00	1.06	4.59	1.39	1.01

Tailwater Channel Data - CP-59 Sta 592+82

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 12.00 ft
 Side Slope (H:V): 20.00 (1:1)
 Channel Slope: 0.0210
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2274.94 ft

Roadway Data for Crossing: CP-59 Sta 592+82

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2285.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 150.00 ft

Summary of Culvert Flows at Crossing: CP-60 Sta 588+63

Headwater Elevation (ft)	Total Discharge (cfs)	CP-60 Sta 588+63 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2268.36	0.00	0.00	0.00	1
2271.09	31.20	31.20	0.00	1
2271.29	62.40	62.40	0.00	1
2271.46	93.60	93.60	0.00	1
2271.62	124.80	124.80	0.00	1
2271.76	156.00	156.00	0.00	1
2271.89	187.20	187.20	0.00	1
2272.01	218.40	218.40	0.00	1
2272.13	249.60	249.60	0.00	1
2272.24	280.80	280.80	0.00	1
2272.35	312.00	312.00	0.00	1
2275.00	663.52	663.52	0.00	Overtopping

Culvert Summary Table: CP-60 Sta 588+63

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2268.36	0.000	0.0*	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
31.20	31.20	2271.09	2.728	0.0*	1-S2n	0.208	0.492	0.282	0.334	6.923	3.187
62.40	62.40	2271.29	2.932	0.0*	1-S2n	0.408	0.780	0.409	0.482	9.525	3.913
93.60	93.60	2271.46	3.103	0.0*	1-S2n	0.512	1.023	0.513	0.594	11.410	4.391
124.80	124.80	2271.62	3.255	0.0*	1-S2n	0.617	1.239	0.629	0.687	12.402	4.757
156.00	156.00	2271.76	3.396	0.0*	1-S2n	0.721	1.438	0.758	0.768	12.869	5.057
187.20	187.20	2271.89	3.527	0.0*	1-S2n	0.819	1.623	0.862	0.839	13.568	5.314
218.40	218.40	2272.01	3.651	0.0*	1-S2n	0.900	1.799	0.911	0.904	14.986	5.539
249.60	249.60	2272.13	3.769	0.0*	1-S2n	0.980	1.967	0.993	0.964	15.717	5.741
280.80	280.80	2272.24	3.882	0.0*	1-S2n	1.061	2.127	1.161	1.020	15.112	5.923
312.00	312.00	2272.35	3.991	0.0*	1-S2n	1.141	2.282	1.256	1.072	15.524	6.092

* theoretical depth is impractical. Depth reported is corrected.

 Inlet Elevation (invert): 2268.36 ft, Outlet Elevation (invert): 2265.04 ft
 Culvert Length: 151.04 ft, Culvert Slope: 0.0220
 Inlet Throat Elevation: 2268.36 ft, Inlet Crest Elevation: 2270.74 ft

Site Data - CP-60 Sta 588+63

Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 2270.50 ft
 Outlet Station: 151.00 ft
 Outlet Elevation: 2265.04 ft
 Number of Barrels: 2

Culvert Data Summary - CP-60 Sta 588+63

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft
 Barrel Rise: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Inlet Type: Conventional
 Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
 Inlet Depression: Yes

Downstream Channel Rating Curve (Crossing: CP-60 Sta 588+63)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2265.04	0.00	0.00	0.00	0.00
31.20	2265.37	0.33	3.19	0.71	1.10
62.40	2265.52	0.48	3.91	1.02	1.16
93.60	2265.63	0.59	4.39	1.26	1.19
124.80	2265.73	0.69	4.76	1.46	1.22
156.00	2265.81	0.77	5.06	1.63	1.24
187.20	2265.88	0.84	5.31	1.78	1.25
218.40	2265.94	0.90	5.54	1.92	1.26
249.60	2266.00	0.96	5.74	2.05	1.28
280.80	2266.06	1.02	5.92	2.16	1.29
312.00	2266.11	1.07	6.09	2.27	1.30

Tailwater Channel Data - CP-60 Sta 588+63

Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 21.00 ft
 Side Slope (H:V): 25.00 (_:1)
 Channel Slope: 0.0340
 Channel Manning's n: 0.0350
 Channel Invert Elevation: 2265.04 ft

Roadway Data for Crossing: CP-60 Sta 588+63

Roadway Profile Shape: Constant Roadway Elevation
 Crest Length: 30.00 ft
 Crest Elevation: 2275.00 ft
 Roadway Surface: Paved
 Roadway Top Width: 100.00 ft