Santa Cruz River
Paseo de Las Iglesias, Pima County, Arizona
Feasibility Study

Hydrology Report

Pima County
Flood Control District

November 2001

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Paseo de Las Iglesias, Arizona
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Project No.: 4FPDLI

Hydrology Report

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Narrative Summary

This report, entitled "Santa Cruz River, Paseo de Las Iglesias, Pima County, Arizona Feasibility Study, Hydrology Report", presents hydrologic data from reports that were prepared to model storm water discharges in the area of the proposed Paseo de Las Iglesias study. It presents discharge values for storm intensities ranging from 2-year storm events, 5-year storm events, 10-year storm events, 25-year storm events, 50-year storm events, and 100-year storm events at major drainage confluences along the Santa Cruz River, the West Branch of the Santa Cruz River, and the New West Branch Channel. The Paseo de Las Iglesias study area is shown on Exhibit 1. The general location is Township 14 South, Range 13 East, Sections 14, 22, 23, 25, 26, 27, 34 and 35, and Township 15 South, Range 13 East, Sections 2, 3, 10, 11, 14, and 15.

Data for this report was gathered from the following previously prepared reports or studies:

The City of Tucson report "Existing-Conditions Hydrologic Modeling for the Tucson Stormwater Management Study, Phase II, Stormwater Master Plan (Task 7, Subtask 7A.3)" (Reference 1), was prepared for the City of Tucson, Department of Transportation by Simons, LI & Associates, Inc., December 17, 1993, revised November 1995. This study presents hydrologic modeling that closely approximates the actual physical process of rainfall, runoff and flood routing. The report summarizes the HEC-1 Brief Summaries in tables showing the Q2, Q5, Q10, Q25, Q50 and Q 100 discharges for major discharge points on both sides of the main Santa Cruz River and the New West Branch of the Santa Cruz River.

The study, titled "Midvale Park Master Drainage Report" (Reference 2), was prepared for the Estes Company by Dooley-Jones and Associates, Inc., July 1983. Its purpose was to present an overall drainage master plan with respect to hydrology and hydraulics used in the design methods used during the development of Midvale Park. This report provided the drainage scheme for the Midvale Park Development. The Midvale Master Drainage report included the following data that will be useful in the Paseo de Las Iglesias Study,

1. Hydrologic method
2. Alternative drainage cross-sections
4. Santa Cruz River inlets
6. West Branch Channel inlets

Hydrology peak flows were based on one-hour duration, 100-year frequency storms. The hydrologic data sheets for the significant discharge points, the confluence of the Santa Cruz River and at Valencia Road and the New West Branch Channel are included in the hydrology section of the report. The West Branch Channel conveyed all major offsite runoff at the west property line. The discharges used in the Midvale Park Master Drainage Report were taken from the "Drainage Study for Mission Road and Valencia Road to Tucson City Limits" prepared by Buck Lewis Inc., July 14, 1981, revised December 1981 and March 29, 1982, and the study "Santa Cruz River and the West Branch of the Santa Cruz River, Midvale Park Project, Midvale Farms Area",

prepared Dooley-Jones and Associates Inc., Job Number N. 80-011, July 1980. HEC-1 data sheets are included from these studies.

The study “Master Drainage Study, Tohono O’odham Nation - San Xavier District, Phase 1, Panhandle Area Existing Conditions” (Reference 3), prepared by MMLA Inc. July 31, 2001. The study presents existing conditions hydrologic and hydraulic analysis for a portion of the Tohono O’odham Nation - San Xavier District that is known as the panhandle, and the adjacent area to the south. HEC-1 computer model and the Pima County methodolies to calculate peak discharges for 2-, 10- and 100-year flood events. This report includes the discharges for selected discharge points as indicated by Figure 2.

I. Introduction:

This report summarizes peak flow discharges including HEC-1 modeling for major discharge points along both sides of the main Santa Cruz River and the New West Branch Diversion Channel. The data as presented is background data for the proposed Paseo de Las Iglesias Project. The method used to compute peak discharges is outlined in the "Hydrology Manual for Engineering Design and Floodplain Management in Pima County, Arizona" and is called the Pima County method (Ref. 6). Peak flows were based on one-hour duration, 100-year frequency storms. Hydrologic drainage areas for the various studies were determined based on logical catchments and outlet points. Exhibit 2 presents major watershed boundaries used in the calculations for strategic discharge points by drainage, and TSMS node/HEC-1 file designations.

II. Existing Conditions Hydrologic Modeling:

A. The City of Tucson report "Existing Conditions Hydrologic Modeling for the Tucson Stormwater Management Study (TSMS), Phase II, Stormwater Master Plan, Task 7, Subtask 7A3" (Ref. 1) provided the hydrologic analysis for existing (baseline) storm water quantity conditions for tributaries along the Santa Cruz River within the City limits. Watersheds predominantly located within unincorporated Pima County and having minor impacts on the City of Tucson were not included in the study. The major watersheds for this section of the Santa Cruz River that are not included in the City of Tucson study are watersheds feeding the New West Branch Diversion Channel. The City report provided hydrologic model compilation methods, hydrologic model calibration, and summaries of the hydrologic analyses performed for each watershed in the study area. It modeled the actual physical processes of rainfall, runoff, and flood routing and was used to generate HEC-1 output. It was calibrated to both frequent and infrequent storm events, and used information such as overland flow lengths, overland roughness, soil types, land-use data, routing and reach data, etc. The TSMS HEC-1 model consists of several elements and includes 3-hour thunderstorms and 24-hour general storms as the rainfall components; NRCS (SCS) curve numbers for rainfall to runoff; kinematic-wave methodology for overland-flow; Modified-Puls methodology for flood-routing; USGS storm-gauge data to assist in model calibration; field-verified impervious estimates; and contributing watershed areas. The TSMS HEC-1 model parameters include a **rainfall component** - utilizing areally-reduced point rainfall values for 2-year, 5-year, 25-year, 50-year, and 100-year design storms in the HEC-1 model; **runoff component** - rainfall interception, infiltration, and excess; **overland flow component** - kinematic wave methodology used to simulate overland flow and to model runoff by collector watercourses; **flood routing component** - accounts for the effects of overbank and channel storage on channel routing and routing time.

Transmission losses were not included in the HEC-1 model. The model output consists of peak discharges, flood volumes, and flood hydrographs for the 2-year, 5-year, 10-year, 25-year, 50-year and 100-year frequency stormwater runoff events. The City of Tucson report presents the model outputs for watersheds east of the Santa Cruz River between Los Reales Road and Congress Street, and the area west of the Santa Cruz River and north of Irvington Road to Congress Street. Data for these reaches are shown as discharges at the confluence of the various washes and main Santa Cruz River channel. Precipitation/Duration data for each watershed is also summarized from the report. Data from the Tucson Stormwater Management Study is summarized in Tables 1 and 2 and the HEC-1 Brief Summaries are attached as Appendix 1.

The following lists the tributaries from south to north that are included in the discharge points along the main Santa Cruz River, and the West Branch of the Santa Cruz River, and excludes discharge points for the New West Branch Diversion Channel.

<u>East Side tributaries of the SCR</u>

1. Hughes Wash
2. Santa Clara Wash
3. El Vado Wash
4. Valencia Wash (east)
5. Airport Wash
6. Wyoming Wash
7. Irvington Wash (east)
8. Rodeo Wash
9. Julian Wash
10. Mission View Wash
11. 18th Street Wash
12. Cushing Wash

<u>West Branch Tributaries</u>

13. Ajo Wash
14. Enchanted Hills Wash
27. San Jaun Wash
42. Cholla Wash
17. Confluence of the West Branch with the SCR

Table 1

Santa Cruz River/Paseo de Las Iglesias
Hydrologic information
Data at the Confluence of Washes and the Santa Cruz River

Number System	Tributaries, South to North Watercourse Names	HEC-1 File & TSMS nodes	WS Acres	Q 100 CFS	Q 50 CFS	Q 25 CFS	Q 10 CFS	Q 5 CFS	Q 2 CFS	Other Hydrologic Information – Confluence and Channel Lining
1	Hughes Wash	AC0250	5336	2376	1875	1258	738	334	93	Earthen
2	Santa Clara Wash	AH0020	250	389	314	221	143	86	47	Earthen
3	El Vado Wash	AG0100	1468	1558	1327	1003	716	474	287	Earthen
4	Valencia Wash	AL0070	1047	1510	1292	1026	721	441	230	Earthen
5	Airport Wash	AW0750	14546	5164	3981	2691	1549	740	346	Earthen
6	Wyoming Wash	BC0030	449	877	719	519	335	184	82	Soil Cement
7	Irvington Wash	BL0020	161	427	343	237	145	75	40	Soil Cement
8	Rodeo Wash	BR0400	5371	3453	2839	2448	1340	744	321	Concrete Channel
9	Julian Wash	BW1210	27859	5962	4767	3202	1901	945	389	Earthen
10	Mission View Wash	CC0080	1039	1802	1538	1201	885	599	355	Soil Cement
11	18th Street Wash	CL0150	2345	3085	2503	1921	1363	886	523	Soil Cement
12	Cushing Street Wash	CR0020	323	1165	993	770	562	375	221	Soil Cement
13	Ajo Wash	CG0051	1224	3465	2817	2007	1286	689	242	Earthen
14	Enchanted Hills Wash	CG0152	1989	3968	3270	2386	1540	801	256	Earthen
15	San Juan Wash	CG0221	731	1757	1470	1104	757	423	152	Earthen
16	Cholla Wssh	CG0261	833	2273	1882	1379	920	529	224	Gabion Lined Confluence
17	Old West Branch Santa Cruz @ Confluence of the SCR	CG0290	6543	6621	5417	3818	2447	1352	397	Soil Cement
18	New West Branch SC @ Conf. Of SCR			9908	7925	5250	3665	2020	595	Soil Cement

Table 2

Santa Cruz River/Paseo de Las Iglesias
Hydrologic Information
Precipitation/Duration

Number System	Tributaries, South to North Watercourses Names	Q 100		Q 50		Q 25		Q 10		Q 5		Q 2	
		Inches	Hours	Inches	Hours	Inches	Hours	Inches	Hours	Inches	Hours	Inches	Hours
1	Hughes Wash	2.96	2.25	2.66	2.33	2.27	2.58	1.87	2.90	1.48	3.33	1.08	3.95
2	Santa Clara	3.60	0.48	3.20	0.52	2.70	0.57	2.20	0.60	1.05	0.86	1.30	0.70
3	El Vado Wash	3.44	0.45	3.10	0.47	2.64	0.50	2.18	0.53	1.73	0.57	1.26	0.62
4	Valencia Wash	3.52	0.93	3.17	0.95	2.70	1.20	2.23	1.08	1.76	1.20	1.29	1.30
5	Airport Wash	4.80	12.92	4.38	13.17	3.73	13.67	3.08	14.83	2.43	16.33	1.78	11.08
6	Wyoming Wash	3.60	0.67	3.20	0.68	2.70	0.75	2.20	0.83	1.80	0.95	1.30	0.97
7	Irvington Wash	3.60	0.48	3.20	0.50	2.70	0.55	2.20	0.63	1.80	0.63	1.30	0.67
8	Rodeo Wash	2.96	1.10	2.66	1.33	2.27	1.23	1.87	1.38	1.48	1.60	1.80	1.80
9	Julian Wash	4.78	13.50	4.30	12.42	3.66	15.58	3.03	18.25	2.39	19.75	1.75	24.17
10	Mission View	3,52	0.68	3.17	0.72	2.70	0.75	2.23	0.80	1.79	0.88	1.29	0.97
11	18th Street Wash	3.30	0.72	2.97	0.70	2.53	0.73	1.09	0.77	1.65	0.82	1.21	0.87
12	Cushing Wash	3.60	0.47	3.20	0.48	2.70	0.52	2.20	0.55	1.80	0.58	1.30	0.65
13	Ajo Wash	3.49	0.53	3.14	0.57	2.67	0.62	2.21	0.70	1.74	0.85	1.28	1.17
14	Enchanted Hills	3.35	0.77	3.02	0.82	2.57	0.88	2.12	1.00	1.67	1.23	1.23	1.78
15	San Jaun Wash	3.58	0.57	3.22	0.58	2.74	0.63	2.27	0.73	1.79	0.88	1.31	1.23
16	Cholla Wash	3.56	0.43	3.20	0.45	2.73	0.52	2.25	0.58	1.78	0.68	1.30	0.87
17	West Branch Santa Cruz River @ Confluence of the SCR	2.86	1.30	2.58	1.27	2.20	1.38	1.81	1.53	1.43	1.62	1.05	2.15

B. "The Midvale Park Master Drainage Report" (Ref. 2) prepared by Dooley-Jones and Associates, Inc., July 1983, provided analysis of hydrologic data for the New West Branch Channel (WBSCRC). Extensive hydrologic investigation and analysis had been conducted to support the development of Oak Tree 1, Midvale Park Commerce Center, and the New West Branch Channelization and associated roadways. This report was prepared for the Midvale Park community in the southwest area of the Tucson Basin and provided a master plan with respect to the hydrology and hydraulics of the area. The area includes 1340 acres of previously flat farmland and native desert.

The south boundary is the San Xavier Indian Reservation. The New West Branch of the Santa Cruz River flows form the southwest to the northeast corner of the area, and is channelized from Drexel Road to the Santa Cruz River. The Santa Cruz River lays to the east of the area. Drexel Road and Valencia Road cross the area and Mission Road is near the west side.

Runoff generated by the Midvale Park area is outlined in the Midvale Park Master Drainage Report. Onsite runoff was presented in terms of methods of conveyance, drainage and flood detention. It defined drainage catchments, Santa Cruz River Channel inlets, New West Branch Channel inlets, roadway drainage, detention sizing and outlet points, and drywell feasibility. All major drainage ways are channelized. Onsite hydrology was estimated for the respective zoning and land uses. Hydrologic drainage was determined from grading, paving, and development plans and based on logical catchments and outlet points. Detention basins were designed to reduce 100-year peak discharges. The ratio was 15 acres of drainage area per one acre-foot of basin storage. Onsite drainage was designed to be contained in roadways and routed into drainages ending in a main channel, the West Branch of the Santa Cruz River, the main Santa Cruz River or detention basins. All major offsite runoff at the west side of the development is conveyed by drainage ways into the New West Branch Channel. The New West Branch Channel was sized for peak discharges routed for the entire West Branch Basin. Discharges from the Midvale area in to the New West Branch Diversion Channel are summarized as follows;

Table 3 Discharges From the Midvale Area into the New West Channel of the Santa Cruz River

Location	Peak discharge in cfs
A	42 cfs
B	248 cfs
C	85 cfs
D	65 cfs
E	25 cfs
I	168 cfs
J1	182 cfs
V1	73 cfs
V2	65 cfs
V3	71 cfs
V4	194 cfs
U	41
CC2	Cfs

Discharges of cubic feet per second =cfs

Hydrologic data sheets are in Appendix 2.

A peak discharge (100-year storm) of 9,908 cfs has been calculated at the confluence of the New West Branch Channel and the main channel of the Santa Cruz River. A peak discharge of 8,135 cfs was also calculated at a point located at the New West Branch of the Santa Cruz Channel at Valencia Road. This point concentrates all offsite runoff from south and west of this location (19.06 sq. miles). These discharge values were reported in (Ref. 2) and referenced to the report, Drainage Study for Mission Road and Valencia Road to Tucson City Limits, prepared by Buck Lewis Inc., July 14, 1981 (Ref. 3). This report was not found.

All major offsite runoff north and west between Valencia Road and Irvington Road discharge into the New West Branch of the Santa Cruz Channel. Four washes convey runoff; the Irvington Road Channel, Dakota Wash Channel, Valencia Wash, and Mission Wash.

C. "Master Drainage Study, Tohono O'odham Nation - San Xaxier District, Phase 1, Panhandle Area Existing Conditions" (Ref. 3), prepared by MMLA Inc., July 31, 2001, provided the discharge values for all watersheds that impact the populated areas of the nation near San Xavier Mission. The purpose of the study was to present existing conditions hydrologic and hydraulic analysis for a portion of the Tohono O'odham Nation, San Xavier District and the adjacent area to the south. The study represents a start of several phases to provide solutions for drainage problems within the San Xavier District.

HEC-1 computer modeling was used for all watersheds with a watershed area greater than 5 square miles. Watershed area, length, and slope were obtained using USGS 7.5-minute guadrangle maps. Current land uses and vegetation cover were obtained from 1998 aerial photographs.

The Pima County method was used for peak discharges for the 2-year, 10-year, and 100-year storm events. Rainfall losses and soil types were taken from SCS curve number methodology and soil survey data from eastern Pima County. 24-hour storm events were used in the analysis and peak discharge calculations used the Clark Unit Hydrograph method.

Two previous studies were prepared for the general area. The study titled "Valencia Wash Basin Management Study, Phase 1 Existing Conditions" (Ref. 7), prepared by Alpha Engineering in July 1992, focused on existing hydrology and hydraulics for the Valencia Wash watershed upstream of the study area. Peak discharges from that study were considered high and not consistent with current Pima County methodology. The second study, titled "San Xavier Cooperative Farm Rehabilitation Plan" (Ref. 8), prepared by Franzoy Corey, June 1987 was prepared for agricultural lands and presented limited hydrology and hydraulics analysis for the West Branch of the Santa Cruz River. Peak discharges were generally consistent with the San Xavier District Master Drainage Study.

The overall watershed is divided into two main areas by the Los Reales Road. The watershed north of Los Reales Road includes the Valencia Wash watershed, and several smaller watersheds that convey runoff to the study area boundary along streets and alleys. The watershed areas north of Los Reales Road are relatively small, less than 5 square miles. Drainage improvements are minimal and most are located in the Valencia Wash watershed, which has been classified as a balanced basin identified as being capable of conveying 100-year discharges into existing channels. Most of this area is located within the Pima County. Discharges flow into an existing channel under Valencia Road and eventually conveyed into the Santa Cruz River. Discharge points are shown on Exhibit 2 and summary sheets are included in Appendix 3.

Table 4

Summary of Existing Peak Discharges
Panhandle Area, San Xavier District

Concentration Points	Total Area Acres	Peak Discharges			
		Q2 cfs	Q10 cfs	Q100 cfs	Method
Valencia Wash / Westover Ave.	1783	776	1982	4175	Pima Co.
Mission Ridge Wash	11584	1516	2921	5179	HEC-1
Valencia Road at Valencia Road	1571	670	1761	3680	Pima Co.
Valencia Wash at Mission Road	1830	736	1912	4080	Pima Co.
Mission Ridge at Cemetery Wash	15424	2165	4108	6809	HEC-1

III. REFERENCES CITED

1. Existing Conditions Hydrologic Modeling for the Tucson Stormwater Management Study, Phase II, Stormwater Master Plan (Task 7, subtask 7A.3). Prepared for the City of Tucson Department of Transportation by Simons, LI & Associates Inc. Dec. 17, 1993, revised Nov. 1995.

2. Midvale Park Master Drainage Report, prepared for the Estes Co. by Dooley-Jones & Associates, Inc. July 1983.

3. Drainage Study for Mission Road and Valencia Road to Tucson City Limits, prepared by Buck Lewis Inc., July 14, 1981, revised December 1981, and March 29, 1982.

4. Santa Cruz River and the West Branch of the Santa Cruz River, Midvale Park Project, Midvale Farms Area, prepared by Dooley-Jones and Associates Inc., July 1980.

5. San Xavier Master Drainage Study, Phase 1, Panhandle Area Existing Conditions, prepared by MMLA Inc., July 31, 2001.

6. Hydrology Manual for Engineering Design and Floodplain Management within Pima County, Arizona.

7. Valencia Wash Basin Management Study, prepared by Alpha Engineering, July 1992.

8. San Xavier Cooperative Farm Rehabilitation Plan, prepared by Franzoy Corey, June 1987.

Appendix 1

HEC-1 Brief Summary for Existing -Conditions Hydrologic Modeling for the Tucson Stormwater Management Study, Phase II, Stormwater Master Plan (Task 7, Subtask 7A.3)

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AC0250 (HUGHES WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 8.337 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.96 inches
Time to Peak @ N0250 = 2.25 hrs.
Peak discharge @ N0250 = 2376. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AC0250 (HUGHES WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 8.337 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.66 inches
Time to Peak @ N0250 = 2.33 hrs.
Peak discharge @ N0250 = 1875. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AC0250 (HUGHES WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 8.337 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.27 inches
Time to Peak @ N0250 = 2.58 hrs.
Peak discharge @ N0250 = 1258. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AC0250 (HUGHES WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 8.337 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.87 inches
Time to Peak @ N0250 = 2.90 hrs.
Peak discharge @ N0250 = 738. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AC0250 (HUGHES WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 8.337 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.48 inches
Time to Peak @ N0250 = 3.33 hrs.
Peak discharge @ N0250 = 334. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AC0250 (HUGHES WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 8.337 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.08 inches
Time to Peak @ N0250 = 3.95 hrs.
Peak discharge @ N0250 = 93. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AH0020 (SANTA CLARA WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 0.391 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.6 inches
Time to Peak @ N0020 = 0.48 hrs.
Peak discharge @ N0020 = 389. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

VERIFIED 5/01
Map: AH0020 (SANTA CLARA WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 0.391 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.2 inches
Time to Peak @ N0020 = 0.52 hrs.
Peak discharge @ N0020 = 314. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

VERIFIED 5/01
Map: AH0020 (SANTA CLARA WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 0.391 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.7 inches
Time to Peak @ N0020 = 0.57 hrs.
Peak discharge @ N0020 = 221. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

VERIFIED 5/01
Map: AH0020 (SANTA CLARA WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 0.391 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.2 inches
Time to Peak @ N0020 = 0.60 hrs.
Peak discharge @ N0020 = 143. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

VERIFIED 5/01
Map: AH0020 (SANTA CLARA WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 0.391 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.80 inches
Time to Peak @ N0020 = 1.05 hrs.
Peak discharge @ N0020 = 86. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

VERIFIED 5/01
Map: AH0020 (SANTA CLARA WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 0.391 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.3 inches
Time to Peak @ N0020 = 0.70 hrs.
Peak discharge @ N0020 = 47. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AG0100 (EL VADO WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 2.293 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.44 inches
Time to Peak @ N0100 = 0.45 hrs.
Peak discharge @ N0100 = 1558. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AG0100 (EL VADO WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 2.293 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.10 inches
Time to Peak @ N0100 = 0.47 hrs.
Peak discharge @ N0100 = 1317. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AG0100 (EL VADO WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 2.293 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.64 inches
Time to Peak @ N0100 = 0.50 hrs.
Peak discharge @ N0100 = 1003. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AG0100 (EL VADO WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 2.293 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.18 inches
Time to Peak @ N0100 = 0.53 hrs.
Peak discharge @ N0100 = 716. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AG0100 (EL VADO WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 2.293 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.72 inches
Time to Peak @ N0100 = 0.57 hrs.
Peak discharge @ N0100 = 474. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AG0100 (EL VADO WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 2.293 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.26 inches
Time to Peak @ N0100 = 0.62 hrs.
Peak discharge @ N0100 = 287. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AL0070 (VALENCIA WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 1.636 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.52 inches
Time to Peak @ N0070 = 0.93 hrs.
Peak discharge @ N0070 = 1510. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AL0070 (VALENCIA WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 1.636 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.17 inches
Time to Peak @ N0070 = 0.95 hrs.
Peak discharge @ N0070 = 1292. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AL0070 (VALENCIA WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 1.636 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.70 inches
Time to Peak @ N0070 = 1.02 hrs.
Peak discharge @ N0070 = 1026. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AL0070 (VALENCIA WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 1.636 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.23 inches
Time to Peak @ N0070 = 1.08 hrs.
Peak discharge @ N0070 = 721. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AL0070 (VALENCIA WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 1.636 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.76 inches
Time to Peak @ N0070 = 1.20 hrs.
Peak discharge @ N0070 = 441. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AL0070 (VALENCIA WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 1.636 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.29 inches
Time to Peak @ N0070 = 1.30 hrs.
Peak discharge @ N0070 = 230. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AW0750 (AIRPORT WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: G1-STORM100 (100-YEAR, 24 HR TYPE-1 STORM)
Return Period: 100 yrs, Interval: 30 min
Total Watershed Area= 22.729 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 4.8 inches
Time to Peak @ N0750 = 12.92 hrs.
Peak discharge @ N0750 = 5164. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AW0750 (AIRPORT WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: G1-STORM50 (50-YEAR, 24 HR TYPE-1 STORM)
Return Period: 50 yrs, Interval: 30 min
Total Watershed Area= 22.729 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 4.38 inches
Time to Peak @ N0750 = 13.17 hrs.
Peak discharge @ N0750 = 3981. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AW0750 (AIRPORT WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: G1-STORM25 (25-YEAR, 24 HR TYPE-1 STORM)
Return Period: 25 yrs, Interval: 30 min
Total Watershed Area= 22.729 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.73 inches
Time to Peak @ N0750 = 13.67 hrs.
Peak discharge @ N0750 = 2691. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AW0750 (AIRPORT WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: G1-STORM10 (10-YEAR, 24 HR TYPE-1 STORM)
Return Period: 10 yrs, Interval: 30 min
Total Watershed Area= 22.729 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.08 inches
Time to Peak @ N0750 = 14.83 hrs.
Peak discharge @ N0750 = 1549. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: AW0750 (AIRPORT WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: G1-STORM5 (5-YEAR, 24 HR TYPE-1 STORM)
Return Period: 5 yrs, Interval: 30 min
Total Watershed Area= 22.729 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.43 inches
Time to Peak @ N0750 = 16.33 hrs.
Peak discharge @ N0750 = 740. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERFIED
Map: AW0750 (AIRPORT WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: G1-STORM2 (2-YEAR, 24 HR TYPE-1 STORM)
Return Period: 2 yrs, Interval: 30 min
Total Watershed Area= 22.729 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.78 inches
Time to Peak @ N0750 = 11.08 hrs.
Peak discharge @ N0750 = 346. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BC0030 (WYOMING WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 0.701 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.6 inches
Time to Peak @ N0030 = 0.67 hrs.
Peak discharge @ N0030 = 877. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BC0030 (WYOMING WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 0.701 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.2 inches
Time to Peak @ N0030 = 0.68 hrs.
Peak discharge @ N0030 = 719. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BC0030 (WYOMING WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 0.701 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.7 inches
Time to Peak @ N0030 = 0.75 hrs.
Peak discharge @ N0030 = 519. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERFIED
Map: BC0030 (WYOMING WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 0.701 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.2 inches
Time to Peak @ N0030 = 0.83 hrs.
Peak discharge @ N0030 = 335. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BC0030 (WYOMING WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 0.701 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.80 inches
Time to Peak @ N0030 = 0.95 hrs.
Peak discharge @ N0030 = 184. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BC0030 (WYOMING WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 0.701 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.3 inches
Time to Peak @ N0030 = 0.97 hrs.
Peak discharge @ N0030 = 82. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BL0020 (IRVINGTON WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 0.252 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.6 inches
Time to Peak @ N0020 = 0.48 hrs.
Peak discharge @ N0020 = 428. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BL0020 (IRVINGTON WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 0.252 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.2 inches
Time to Peak @ N0020 = 0.50 hrs.
Peak discharge @ N0020 = 343. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BL0020 (IRVINGTON WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 0.252 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.7 inches
Time to Peak @ N0020 = 0.55 hrs.
Peak discharge @ N0020 = 237. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BL0020 (IRVINGTON WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 0.252 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.2 inches
Time to Peak @ N0020 = 0.63 hrs.
Peak discharge @ N0020 = 145. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BL0020 (IRVINGTON WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 0.252 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.80 inches
Time to Peak @ N0020 = 0.63 hrs.
Peak discharge @ N0020 = 75. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BL0020 (IRVINGTON WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 0.252 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.3 inches
Time to Peak @ N0020 = 0.67 hrs.
Peak discharge @ N0020 = 40. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BR0400 (RODEO WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 8.392 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.96 inches
Time to Peak @ N0400 = 1.10 hrs.
Peak discharge @ N0400 = 3453. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BR0400 (RODEO WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 8.392 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.66 inches
Time to Peak @ N0400 = 1.13 hrs.
Peak discharge @ N0400 = 2839. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BR0400 (RODEO WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 8.392 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.27 inches
Time to Peak @ N0400 = 1.23 hrs.
Peak discharge @ N0400 = 2048. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BR0400 (RODEO WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 8.392 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.87 inches
Time to Peak @ N0400 = 1.38 hrs.
Peak discharge @ N0400 = 1340. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BR0400 (RODEO WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 8.392 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.48 inches
Time to Peak @ N0400 = 1.60 hrs.
Peak discharge @ N0400 = 744. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BR0400 (RODEO WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 8.392 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.08 inches
Time to Peak @ N0400 = 1.80 hrs.
Peak discharge @ N0400 = 321. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
5 DET BASINS
Map: BW1210 (JULIAN)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: G1-STORM100 (100-YEAR, 24 HR TYPE-1 STORM)
Return Period: 100 yrs, Interval: 30 min
Total Watershed Area= 43.53 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 4.78 inches
Time to Peak @ N1210 = 13.50 hrs.
Peak discharge @ N1210 = 5980. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
5 DET BASINS
Map: BW1210 (JULIAN)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: G1-STORM50 (50-YEAR, 24 HR TYPE-1 STORM)
Return Period: 50 yrs, Interval: 30 min
Total Watershed Area= 43.53 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 4.30 inches
Time to Peak @ N1210 = 14.08 hrs.
Peak discharge @ N1210 = 4767. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BW1210 (JULIAN)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: G1-STORM25 (25-YEAR, 24 HR TYPE-1 STORM)
Return Period: 25 yrs, Interval: 30 min
Total Watershed Area= 43.53 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.66 inches
Time to Peak @ N1210 = 15.58 hrs.
Peak discharge @ N1210 = 3292. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BW1210 (JULIAN)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: G1-STORM10 (10-YEAR, 24 HR TYPE-1 STORM)
Return Period: 10 yrs, Interval: 30 min
Total Watershed Area= 43.53 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.03 inches
Time to Peak @ N1210 = 18.25 hrs.
Peak discharge @ N1210 = 1901. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BW1210 (JULIAN)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: G1-STORM5 (5-YEAR, 24 HR TYPE-1 STORM)
Return Period: 5 yrs, Interval: 30 min
Total Watershed Area= 43.53 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.39 inches
Time to Peak @ N1210 = 19.75 hrs.
Peak discharge @ N1210 = 945. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: BW1210 (JULIAN)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: G1-STORM2 (2-YEAR, 24 HR TYPE-1 STORM)
Return Period: 2 yrs, Interval: 30 min
Total Watershed Area= 43.53 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.75 inches
Time to Peak @ N1210 = 24.17 hrs.
Peak discharge @ N1210 = 389. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CC0080 (MISSION VIEW WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 1.624 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.52 inches
Time to Peak @ N0080 = 0.68 hrs.
Peak discharge @ N0080 = 1802. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CC0080 (MISSION VIEW WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 1.624 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.17 inches
Time to Peak @ N0080 = 0.72 hrs.
Peak discharge @ N0080 = 1538. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CC0080 (MISSION VIEW WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 1.624 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.70 inches
Time to Peak @ N0080 = 0.75 hrs.
Peak discharge @ N0080 = 1201. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CC0080 (MISSION VIEW WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 1.624 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.23 inches
Time to Peak @ N0080 = 0.80 hrs.
Peak discharge @ N0080 = 885. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CC0080 (MISSION VIEW WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 1.624 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.76 inches
Time to Peak @ N0080 = 0.88 hrs.
Peak discharge @ N0080 = 599. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CC0080 (MISSION VIEW WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 1.624 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.29 inches
Time to Peak @ N0080 = 0.97 hrs.
Peak discharge @ N0080 = 355. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CL0150 (18TH ST WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 3.664 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.30 inches
Time to Peak @ N0150 = 0.72 hrs.
Peak discharge @ N0150 = 3085. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CL0150 (18TH ST WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 3.664 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.97 inches
Time to Peak @ N0150 = 0.70 hrs.
Peak discharge @ N0150 = 2503. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CL0150 (18TH ST WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 3.664 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.53 inches
Time to Peak @ N0150 = 0.73 hrs.
Peak discharge @ N0150 = 1921. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CL0150 (18TH ST WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 3.664 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.09 inches
Time to Peak @ N0150 = 0.77 hrs.
Peak discharge @ N0150 = 1363. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CL0150 (18TH ST WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 3.664 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.65 inches
Time to Peak @ N0150 = 0.82 hrs.
Peak discharge @ N0150 = 886. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CL0150 (18TH ST WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 3.664 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.21 inches
Time to Peak @ N0150 = 0.87 hrs.
Peak discharge @ N0150 = 523. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CR0020 (CUSHING ST. WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 0.505 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.80 inches
Time to Peak @ N0020 = 0.58 hrs.
Peak discharge @ N0020 = 375. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CR0020 (CUSHING ST. WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 0.505 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.3 inches
Time to Peak @ N0020 = 0.65 hrs.
Peak discharge @ N0020 = 221. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CR0020 (CUSHING ST. WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 0.505 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.7 inches
Time to Peak @ N0020 = 0.52 hrs.
Peak discharge @ N0020 = 770. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CR0020 (CUSHING ST. WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 0.505 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.2 inches
Time to Peak @ N0020 = 0.55 hrs.
Peak discharge @ N0020 = 562. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CR0020 (CUSHING ST. WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 0.505 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.6 inches
Time to Peak @ N0020 = 0.47 hrs.
Peak discharge @ N0020 = 1165. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CR0020 (CUSHING ST. WASH)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 0.505 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.2 inches
Time to Peak @ N0020 = 0.48 hrs.
Peak discharge @ N0020 = 993. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0051 (AJO WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 1.913 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.49 inches
Time to Peak @ N0050 = 0.53 hrs.
Peak discharge @ N0050 = 3465. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0051 (AJO WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 1.913 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.14 inches
Time to Peak @ N0050 = 0.57 hrs.
Peak discharge @ N0050 = 2817. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0051 (AJO WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 1.913 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.67 inches
Time to Peak @ N0050 = 0.62 hrs.
Peak discharge @ N0050 = 2007. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0051 (AJO WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 1.913 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.21 inches
Time to Peak @ N0050 = 0.70 hrs.
Peak discharge @ N0050 = 1286. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0051 (AJO WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 1.913 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.74 inches
Time to Peak @ N0050 = 0.85 hrs.
Peak discharge @ N0050 = 689. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0051 (AJO WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 1.913 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.28 inches
Time to Peak @ N0050 = 1.17 hrs.
Peak discharge @ N0050 = 242. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0221 (SAN JUAN WASH ONLY @ CONFLUENCE W/WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 1.142 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.58 inches
Time to Peak @ N0220 = 0.57 hrs.
Peak discharge @ N0220 = 1757. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0221 (SAN JUAN WASH ONLY @ CONFLUENCE W/WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 1.142 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.22 inches
Time to Peak @ N0220 = 0.58 hrs.
Peak discharge @ N0220 = 1470. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0221 (SAN JUAN WASH ONLY @ CONFLUENCE W/WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 1.142 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.74 inches
Time to Peak @ N0220 = 0.63 hrs.
Peak discharge @ N0220 = 1104. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0221 (SAN JUAN WASH ONLY @ CONFLUENCE W/WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 1.142 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.27 inches
Time to Peak @ N0220 = 0.73 hrs.
Peak discharge @ N0220 = 757. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0221 (SAN JUAN WASH ONLY @ CONFLUENCE W/WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 1.142 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.79 inches
Time to Peak @ N0220 = 0.88 hrs.
Peak discharge @ N0220 = 423. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0221 (SAN JUAN WASH ONLY @ CONFLUENCE W/WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 1.142 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.31 inches
Time to Peak @ N0220 = 1.23 hrs.
Peak discharge @ N0220 = 152. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0152 (ENCHANTED HILLS WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 3.108 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.35 inches
Time to Peak @ N0150 = 0.77 hrs.
Peak discharge @ N0150 = 3968. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0152 (ENCHANTED HILLS WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 3.108 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.02 inches
Time to Peak @ N0150 = 0.82 hrs.
Peak discharge @ N0150 = 3270. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0152 (ENCHANTED HILLS WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 3.108 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.57 inches
Time to Peak @ N0150 = 0.88 hrs.
Peak discharge @ N0150 = 2386. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0152 (ENCHANTED HILLS WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 3.108 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.12 inches
Time to Peak @ N0150 = 1.00 hrs.
Peak discharge @ N0150 = 1540. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0152 (ENCHANTED HILLS WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 3.108 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.67 inches
Time to Peak @ N0150 = 1.23 hrs.
Peak discharge @ N0150 = 801. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0152 (ENCHANTED HILLS WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 3.108 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.23 inches
Time to Peak @ N0150 = 1.78 hrs.
Peak discharge @ N0150 = 256. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0261 (CHOLLA WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 1.302 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.56 inches
Time to Peak @ N0260 = 0.43 hrs.
Peak discharge @ N0260 = 2273. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0261 (CHOLLA WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 1.302 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 3.2 inches
Time to Peak @ N0260 = 0.45 hrs.
Peak discharge @ N0260 = 1882. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0261 (CHOLLA WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 1.302 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.73 inches
Time to Peak @ N0260 = 0.52 hrs.
Peak discharge @ N0260 = 1379. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0261 (CHOLLA WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 1.302 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.25 inches
Time to Peak @ N0260 = 0.58 hrs.
Peak discharge @ N0260 = 920. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0261 (CHOLLA WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 1.302 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.78 inches
Time to Peak @ N0260 = 0.68 hrs.
Peak discharge @ N0260 = 529. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0261 (CHOLLA WASH AT THE WBSCR)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 1.302 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.30 inches
Time to Peak @ N0260 = 0.87 hrs.
Peak discharge @ N0260 = 224. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0290 (WEST BRANCH SANTA CRUZ)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM100 (100-YEAR, 3 HR THUNDER STORM)
Return Period: 100 yrs, Interval: 1 min
Total Watershed Area= 10.223 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.86 inches
Time to Peak @ N0290 = 1.20 hrs.
Peak discharge @ N0290 = 6621. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0290 (WEST BRANCH SANTA CRUZ)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM50 (50-YEAR, 3 HR THUNDER STORM)
Return Period: 50 yrs, Interval: 1 min
Total Watershed Area= 10.223 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.58 inches
Time to Peak @ N0290 = 1.27 hrs.
Peak discharge @ N0290 = 5417. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0290 (WEST BRANCH SANTA CRUZ)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM25 (25-YEAR, 3 HR THUNDER STORM)
Return Period: 25 yrs, Interval: 1 min
Total Watershed Area= 10.223 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 2.2 inches
Time to Peak @ N0290 = 1.38 hrs.
Peak discharge @ N0290 = 3818. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0290 (WEST BRANCH SANTA CRUZ)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM10 (10-YEAR, 3 HR THUNDER STORM)
Return Period: 10 yrs, Interval: 1 min
Total Watershed Area= 10.223 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.81 inches
Time to Peak @ N0290 = 1.53 hrs.
Peak discharge @ N0290 = 2447. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0290 (WEST BRANCH SANTA CRUZ)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM5 (5-YEAR, 3 HR THUNDER STORM)
Return Period: 5 yrs, Interval: 1 min
Total Watershed Area= 10.223 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.43 inches
Time to Peak @ N0290 = 1.62 hrs.
Peak discharge @ N0290 = 1352. cfs

HEC-1 Brief Summary

City of Tucson Stormwater Planner

NOT VERIFIED
Map: CG0290 (WEST BRANCH SANTA CRUZ)
Scenario: EXIST (EXISTING CONDITIONS)
Storm: T-STORM2 (2-YEAR, 3 HR THUNDER STORM)
Return Period: 2 yrs, Interval: 1 min
Total Watershed Area= 10.223 sq mi
Areal Reduction of Rainfall Applied

Total storm precipitation = 1.05 inches
Time to Peak @ N0290 = 2.15 hrs.
Peak discharge @ N0290 = 397. cfs

Appendix 2

Hydrologic Data Sheets for the Midvale Park Master Drainage Report

HYDROLOGIC DATA SHEET

roject Name and Location: Tributaries (13) thru (16) & Part (19) - West Branch of Sant

ainage Concentration Point: At Los Reales Road

atershed Area (A): 19.06 ~~acres~~/square miles.

ength of Watercourse (L_c): 84,340 ft. Length to Center of Gravity (L_{ca}): 34,000 f

ncremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) -
22,550 & 28,660	650 & 700
16,130	200
14,960	100
2,040	10

ean Slope (S_c): .0157 ft./ft. Watershed Type(s): Foothills (futur

asin Factor (n_b): .037 (future) Flood Frequency: 100 y

24 (24 hour): _____ in. Areal Value: _____ i

6 (6 hour): 3.80 in. Areal Value: 3.64 i

1 (1 hour): 2.80 in. Areal Value: 2.49 i

2 (2 hour): 3.14 in. Areal Value: 2.87 i

3 (3 hour): 3.37 in. Areal Value: 3.18 i

oil Group(s): 29% B, 15% C, 56% D Cover Type(s): Desert Brush & Minor Agricul.

overDensity (pervious areas): 30% Impervious Cover: 3.28% (fut

N(s): 82, 87, 90 (curve number) (pervious & impervious areas) CN*(s): 85.96, 89.70, 92.08 (adjusted curve number

unoff to Rainfall Ratio(s), (C): .495, .602, .679 (pervious areas) .953 (impervious ar

Runoff Supply Rate (q): .625 i in./hr. (function of i)

ime of Concentration (T_c): 3.23 $i^{-.4}$ hrs./~~min~~. (function of i)

Iterative Solution of T_c: 3.24 hrs./~~min~~.

ainfall Intensity (i) at T_c: .993 in./hr.

unoff Supply Rate (q) at T_c: .621 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): _____ cfs.

645.33qA (square miles): 7638 cfs.

Note: For impervious areas, CN* = 99 (constant).

M.E.R. - 2/3/97

HYDROLOGIC DATA SHEET

Project Name and Location: Midvale Park Master

Drainage Concentration Point: A

Watershed Area (A): 5.75 acres/

Length of Watercourse (L_c): 600 ft. Length to Center of Gravity (L_{ca}): 270 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
600	2430.5 - 2428 = 2.5 feet

Mean Slope (S_c): 0.0042 ft./ft. Watershed Type(s): Light to moderate Urban (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.8 in. Areal Value: in.

P_6 (6 hour): 3.8 in. Areal Value: in.

P_1 (1 hour): 2.8 in. Areal Value: in.

P_2 (2 hour): 3.1 in. Areal Value: in.

P_3 (3 hour): 3.4 in. Areal Value: in.

Soil Group(s): 80% B 20% D Cover Type(s): Urban Lawn

Cover Density (pervious areas): 20% Impervious Cover: 50% (future)

CN(s): 79 90 99 (pervious & impervious areas) CN*(s): 84.56 92.57 99
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.498 0.723 (pervious areas) 0.958 (impervious areas)

Runoff Supply Rate (q): 0.751 i in./hr. (function of i)

Time of Concentration (T_c): 5 mintues $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: hrs./mins.

Rainfall Intensity (i) at T_c: 9.74 in./hr.

Runoff Supply Rate (q) at T_c: 7.32 in./hr.

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours}$$

Peak Discharge:

1.008 qA (acres): 42 cfs

645.33qA (square miles): cfs

Discharge Location

Dooley-Jones & Associates, Inc

HYDROLOGIC DATA SHEET

Project Name and Location: Midvale Park Master

Drainage Concentration Point: B

Watershed Area (A): 38.05 acres/square miles.

Length of Watercourse (L_c): 2450 ft. Length to Center of Gravity (L_{ca}): 1550 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2300	2437 - 2328 = 9 feet

Mean Slope (S_c): 0.0039 ft./ft. Watershed Type(s): Light to moderate Urban (future)

Basin Factor (n_b): 0.020 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.8 in. Areal Value: in.

P_6 (6 hour): 3.8 in. Areal Value: in.

P_1 (1 hour): 2.8 in. Areal Value: in.

P_2 (2 hour): 3.1 in. Areal Value: in.

P_3 (3 hour): 3.4 in. Areal Value: in.

Soil Group(s): 80% B 20% D Cover Type(s): Urban Lawns

Cover Density (pervious areas): 20% Impervious Cover: 65% (future)

CN(s): 79 90 99 (pervious & impervious areas) CN*(s): 84.56 92.57 99
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.498 0.723 (pervious areas) 0.958 (impervious areas)

Runoff Supply Rate (q): 0.813 i in./hr. (function of i)

Time of Concentration (T_c): 9 minutes $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: hrs./mins.

Rainfall Intensity (i) at T_c: 7.95 in./hr.

Runoff Supply Rate (q) at T_c: 6.46 in./hr.

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours}$$

Peak Discharge:

1.008 qA (acres): 248 cfs

645.33qA (square miles): cfs

Discharge Location

Dooley-Jones & Associates, Inc.

HYDROLOGIC DATA SHEET

Project Name and Location: Midvale Park Master

Drainage Concentration Point: C

Watershed Area (A): 11.15 acres/

Length of Watercourse (L_c): 850 ft. Length to Center of Gravity (L_{ca}): 430 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
850	2431 - 2428.5 = 2.5 feet

Mean Slope (S_c): 0.0029 ft./ft. Watershed Type(s): Light to moderate Urban (future)

Basin Factor (n_b): 0.018 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.8 in. Areal Value: in.

P_6 (6 hour): 3.8 in. Areal Value: in.

P_1 (1 hour): 2.8 in. Areal Value: in.

P_2 (2 hour): 3.1 in. Areal Value: in.

P_3 (3 hour): 3.4 in. Areal Value: in.

Soil Group(s): 80% B 20% D Cover Type(s): Urban Lawn

Cover Density (pervious areas): 20% Impervious Cover: 65% (future)

CN(s): 79 90 99 (pervious & impervious areas) CN*(s): 84.56 92.57 99
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.498 0.723 (pervious areas) 0.958 (impervious areas)

Runoff Supply Rate (q): 0.813 i in./hr. (function of i)

Time of Concentration (T_c): 5 minutes $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: hrs./mins.

Rainfall Intensity (i) at T_c: 9.30 in./hr.

Runoff Supply Rate (q) at T_c: 7.56 in./hr.

Peak Discharge:

1.008 qA (acres): 85 cfs

645.33qA (square miles): cfs

Discharge Location

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours}$$

Dooley-Jones & Associates, Inc
CONSULTING ENGINEERS | PLANNERS

HYDROLOGIC DATA SHEET

Project Name and Location: Midvale Park Master

Drainage Concentration Point: D

Watershed Area (A): 8.36 acres/

Length of Watercourse (L_c): 750 ft. Length to Center of Gravity (L_{ca}): 350 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
750	2431 - 2428 = 3 feet

Mean Slope (S_c): 0.0040 ft./ft. Watershed Type(s): Light to moderate Urban (future)

Basin Factor (n_b): 0.020 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.8 in. Areal Value: in.

P_6 (6 hour): 3.8 in. Areal Value: in.

P_1 (1 hour): 2.8 in. Areal Value: in.

P_2 (2 hour): 3.1 in. Areal Value: in.

P_3 (3 hour): 3.4 in. Areal Value: in.

Soil Group(s): 80% B 20% D Cover Type(s): Urban Lawn

Cover Density (pervious areas): 20% Impervious Cover: 60% (future)

CN(s): 79 90 99 (pervious & impervious areas) CN*(s): 84.56 92.57 99
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.498 0.723 (pervious areas) 0.958 (impervious areas)

Runoff Supply Rate (q): 0.792 i in./hr. (function of i)

Time of Concentration (T_c): 5 minutes $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: hrs./mins.

Rainfall Intensity (i) at T_c: 9.74 in./hr.

Runoff Supply Rate (q) at T_c: 7.72 in./hr.

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours}$$

Peak Discharge:

1.008 qA (acres): 65 cfs

645.33qA (square miles): cfs

Discharge Location

Dooley-Jones & Associates, Inc.

HYDROLOGIC DATA SHEET

Project Name and Location: Midvale Park Master

Drainage Concentration Point: E

Watershed Area (A): 3.24 acres/

Length of Watercourse (L_c): 1000 ft. Length to Center of Gravity (L_{ca}): 700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1000	2429 - 2427.5 = 1.5 feet

Mean Slope (S_c): 0.0015 ft./ft. Watershed Type(s): Light to moderate Urban (future)

Basin Factor (n_b): 0.020 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.8 in. Areal Value: in.

P_6 (6 hour): 3.8 in. Areal Value: in.

P_1 (1 hour): 2.8 in. Areal Value: in.

P_2 (2 hour): 3.1 in. Areal Value: in.

P_3 (3 hour): 3.4 in. Areal Value: in.

Soil Group(s): 80% B 20% D Cover Type(s): Urban Lawn

Cover Density (pervious areas): 20% Impervious Cover: 60% (future)

CN(s): 79 90 99 (pervious & impervious areas) CN*(s): 84.56 92.57 99
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.498 0.723 (pervious areas) 0.958 (impervious areas)

Runoff Supply Rate (q): 0.792 i in./hr. (function of i)

Time of Concentration (T_c): 5 minutes $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: hrs./mins.

Rainfall Intensity (i) at T_c: 9.74 in./hr.

Runoff Supply Rate (q) at T_c: 7.72 in./hr.

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours}$$

Peak Discharge:

1.008 qA (acres): 25 cfs

645.33qA (square miles): cfs

Discharge Location

Dooley-Jones & Associates, Inc.

HYDROLOGIC DATA SHEET

Project Name and Location: Midvale Park Master

Drainage Concentration Point: I

Watershed Area (A): 23.82 acres/

Length of Watercourse (L_c): 1600 ft. Length to Center of Gravity (L_{ca}): 850 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1540	2438.5 - 2433.5 = 5.0 feet

Mean Slope (S_c): 0.0032 ft./ft. Watershed Type(s): Light to moderate Urban (future)

Basin Factor (n_b): 0.020 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.8 in. Areal Value: in.

P_6 (6 hour): 3.8 in. Areal Value: in.

P_1 (1 hour): 2.8 in. Areal Value: in.

P_2 (2 hour): 3.1 in. Areal Value: in.

P_3 (3 hour): 3.4 in. Areal Value: in.

Soil Group(s): 80% B 20% D Cover Type(s): Urban Lawn

Cover Density (pervious areas): 20% Impervious Cover: 60% (future)

CN(s): 79 90 99 (pervious & impervious areas) CN*(s): 84.56 92.57 99
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.498 0.723 (pervious areas) 0.958 (impervious areas)

Runoff Supply Rate (q): 0.792 i in./hr. (function of i)

Time of Concentration (T_c): 7 minutes $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: hrs./mins.

Rainfall Intensity (i) at T_c: 8.82 in./hr.

Runoff Supply Rate (q) at T_c: 6.99 in./hr.

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours}$$

Peak Discharge:

1.008 qA (acres): 168 cfs

645.33qA (square miles): cfs

Discharge Location

Dooley-Jones & Associates, Inc.
CONSULTING ENGINEERS / PLANNERS

HYDROLOGIC DATA SHEET

Project Name and Location: Midvale Park Master

Drainage Concentration Point: J1

Watershed Area (A): 25.94 acres/

Length of Watercourse (L_c): 1700 ft. Length to Center of Gravity (L_{ca}): 930 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1300	2437 - 2433 = 4 feet

Mean Slope (S_c): 0.0031 ft./ft. Watershed Type(s): Light to moderate Urban (future)

Basin Factor (n_b): 0.020 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.8 in. Areal Value: in.

P_6 (6 hour): 3.8 in. Areal Value: in.

P_1 (1 hour): 2.8 in. Areal Value: in.

P_2 (2 hour): 3.1 in. Areal Value: in.

P_3 (3 hour): 3.4 in. Areal Value: in.

Soil Group(s): 80% B 20% D Cover Type(s): Urban Lawn

Cover Density (pervious areas): 20% Impervious Cover: 60% (future)

CN(s): 79 90 99 (pervious & impervious areas) CN*(s): 84.56 92.57 99
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.498 0.723 (pervious areas) 0.958 (impervious areas)

Runoff Supply Rate (q): 0.792 i in./hr. (function of i)

Time of Concentration (T_c): 7 minutes $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: hrs./mins.

Rainfall Intensity (i) at T_c: 8.82 in./hr.

Runoff Supply Rate (q) at T_c: 6.99 in./hr.

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours}$$

Peak Discharge:

1.008 qA (acres): 182 cfs

645.33qA (square miles): cfs

Discharge Location

Dooley-Jones & Associates, Inc

HYDROLOGIC DATA SHEET

Project Name and Location: Midvale Park Master

Drainage Concentration Point: TEP

Watershed Area (A): 6.78 acres/

Length of Watercourse (L_c): 850 ft. Length to Center of Gravity (L_{ca}): 450 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
750	2451 - 2447 = 4 feet

Mean Slope (S_c): 0.0053 ft./ft. Watershed Type(s): Light to moderate Urban (future)

Basin Factor (n_b): 0.018 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.8 in. Areal Value: in.

P_6 (6 hour): 3.8 in. Areal Value: in.

P_1 (1 hour): 2.8 in. Areal Value: in.

P_2 (2 hour): 3.1 in. Areal Value: in.

P_3 (3 hour): 3.4 in. Areal Value: in.

Soil Group(s): 80% B 20% D Cover Type(s): Urban Lawn

Cover Density (pervious areas): 20% Impervious Cover: 65% (future)

CN(s): 79 90 99 (pervious & impervious areas) CN*(s): 84.56 92.57 99
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.498 0.723 (pervious areas) 0.958 (impervious areas)

Runoff Supply Rate (q): 0.813 i in./hr. (function of i)

Time of Concentration (T_c): 5 minutes $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: hrs./mins.

Rainfall Intensity (i) at T_c: 9.74 in./hr.

Runoff Supply Rate (q) at T_c: 7.92 in./hr.

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours}$$

Peak Discharge:

1.008 qA (acres): 54 cfs

645.33qA (square miles): cfs

Discharge Location

Dooley-Jones & Associates, Inc.

HYDROLOGIC DATA SHEET

Project Name and Location: Midvale Park Master

Drainage Concentration Point: V 1

Watershed Area (A): 12.9 acres/square miles.

Length of Watercourse (L_c): 1750 ft. Length to Center of Gravity (L_{ca}): 1200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1750	2465 - 2460.5 - 4.5 feet

Mean Slope (S_c): 0.0026 ft./ft. Watershed Type(s): light to moderate Urban (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.8 in. Areal Value: in.

P_6 (6 hour): 3.8 in. Areal Value: in.

P_1 (1 hour): 2.8 in. Areal Value: in.

P_2 (2 hour): 3.1 in. Areal Value: in.

P_3 (3 hour): 3.4 in. Areal Value: in.

Soil Group(s): 80% B 20% D Cover Type(s): Urban Lawns

Cover Density (pervious areas): 20% Impervious Cover: 40% (future)

CN(s): 79 90 99 (pervious & impervious areas) CN*(s): 84.56 92 57 99
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.498 0.723 (pervious areas) 0.958 (impervious areas)

Runoff Supply Rate (q): 0.709 i in./hr. (function of i)

Time of Concentration (T_c): 9 minutes $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: hrs./mins.

Rainfall Intensity (i) at T_c: 7.95 in./hr.

Runoff Supply Rate (q) at T_c: 5.64 in./hr.

Peak Discharge:

1.008 qA (acres): 73 cfs

645.33qA (square miles): cfs

Discharge Location

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours}$$

Dooley-Jones & Associates, Inc.

HYDROLOGIC DATA SHEET

Project Name and Location: Midvale Park Master

Drainage Concentration Point: V 2

Watershed Area (A): 10.8 acres/square miles.

Length of Watercourse (L_c): 1500 ft. Length to Center of Gravity (L_{ca}): 1150 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1500	2464 - 2460.5 = 3.5 feet

Mean Slope (S_c): 0.0023 ft./ft. Watershed Type(s): light to moderate Urban (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.8 in. Areal Value: in.

P_6 (6 hour): 3.8 in. Areal Value: in.

P_1 (1 hour): 2.8 in. Areal Value: in.

P_2 (2 hour): 3.1 in. Areal Value: in.

P_3 (3 hour): 3.4 in. Areal Value: in.

Soil Group(s): 80% B 20% D Cover Type(s): Urban Lawns

Cover Density (pervious areas): 20% Impervious Cover: 40% (future)

CN(s): 79 90 99 (pervious & impervious areas) CN*(s): 84.56 92.57 99
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.498 0.723 (pervious areas) 0.958 (impervious areas)

Runoff Supply Rate (q): 0.709 i in./hr. (function of i)

Time of Concentration (T_c): 8 minutes $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: hrs./mins.

Rainfall Intensity (i) at T_c: 8.37 in./hr.

Runoff Supply Rate (q) at T_c: 5.94 in./hr.

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours}$$

Peak Discharge:

1.008 qA (acres): 65 cfs

645.33qA (square miles): cfs

Discharge Location

Dooley-Jones & Associates, Inc.
CONSULTING ENGINEERS | PLANNERS

HYDROLOGIC DATA SHEET

Project Name and Location: Midvale Park Master

Drainage Concentration Point: V 3

Watershed Area (A): 11.2 acres/square miles.

Length of Watercourse (L_c): 1500 ft. Length to Center of Gravity (L_{ca}): 800 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1500	2461 - 2459 = 2 feet

Mean Slope (S_c): 0.0013 ft./ft. Watershed Type(s): light to moderate Urban (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.8 in. Areal Value: in.

P_6 (6 hour): 3.8 in. Areal Value: in.

P_1 (1 hour): 2.8 in. Areal Value: in.

P_2 (2 hour): 3.1 in. Areal Value: in.

P_3 (3 hour): 3.4 in. Areal Value: in.

Soil Group(s): 80% B 20% D Cover Type(s): Urban Lawns

Cover Density (pervious areas): 20% Impervious Cover: 40% (future)

CN(s): 79 90 99 (pervious & impervious areas) CN*(s): 84.56 92.57 99
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.498 0.723 (pervious areas) 0.958 (impervious areas)

Runoff Supply Rate (q): 0.709 i in./hr. (function of i)

Time of Concentration (T_c): 7 minutes $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: hrs./mins.

Rainfall Intensity (i) at T_c: 8.82 in./hr.

Runoff Supply Rate (q) at T_c: 6.25 in./hr.

Peak Discharge:

1.008 qA (acres): 71 cfs

645.33qA (square miles): cfs

Discharge Location

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours}$$

Dooley-Jones & Associates, Inc.

HYDROLOGIC DATA SHEET

Project Name and Location: Midvale Park Master

Drainage Concentration Point: CC 2

Watershed Area (A): 24.2 acres/~~square miles~~

Length of Watercourse (L_c): 1900 ft. Length to Center of Gravity (L_{ca}): 1050 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1900	2471 - 2464.5 = 6.5 feet

Mean Slope (S_c): 0.0034 ft./ft. Watershed Type(s): light to moderate Urban (future)

Basin Factor (n_b): 0.022 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): 4.8 in. Areal Value: _____ in.

P_6 (6 hour): 3.8 in. Areal Value: _____ in.

P_1 (1 hour): 2.8 in. Areal Value: _____ in.

P_2 (2 hour): 3.1 in. Areal Value: _____ in.

P_3 (3 hour): 3.4 in. Areal Value: _____ in.

Soil Group(s): 80% B 20% D Cover Type(s): Urban Lawns

Cover Density (pervious areas): 20% Impervious Cover: 50% (future)

CN(s): 79 90 99 (pervious & impervious areas) CN*(s): 84.56 92.57 99
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.498 0.723 (pervious areas) 0.958 (impervious areas)

Runoff Supply Rate (q): 0.751 i in./hr. (function of i)

Time of Concentration (T_c): 8 minutes $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: _____ hrs./mins.

Rainfall Intensity (i) at T_c: 8.37 in./hr.

Runoff Supply Rate (q) at T_c: 6.29 in./hr.

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours}$$

Peak Discharge:

1.008 qA (acres): 153 cfs

645.33qA (square miles): _____ cfs

Discharge Location _____

Dooley-Jones & Associates, Inc.

Appendix 3

Data Sheets for selected discharges from the Master Drainage Study, Tohono O'odham Nation - San Xavier District, Phase 1, Panhandle Area Existing Conditions.

PROJECT NAME AND LOCATION: SAN XAVIER BASIN STUDY

DRAINAGE CONCENTRATION POINT: 10 (Valencia Wash at Mission Road)

WATERSHED AREA (A): 1830.00 acres

LENGTH OF WATERCOURSE (Lc): 18950. ft

LENGTH TO CENTER OF GRAVITY (Lca): 9550. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft	INCREMENTAL CHANGE IN ELEV (Hi) - ft
900.	500.0
1200.	100.0
5000.	100.0
5600.	80.0
4000.	30.0
800.	3.0
1450.	14.0

MEAN SLOPE (Sc): .0138 ft BASIN FACTOR (Nb): .0350

WATERSHED TYPE(S): MIXED

RAINFALL VALUES

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
P 1	1.33	1.65	1.86	2.13	2.38	2.62
P 2	1.42	1.80	2.05	2.37	2.67	2.95
P 3	1.48	1.90	2.18	2.53	2.86	3.18
P 6	1.60	2.09	2.42	2.84	3.22	3.60
P24	1.80	2.49	2.95	3.54	4.07	4.60

SOIL GROUPS

18. % B, CN= 83, COVER TYPE= DESERT BRUSH , COVER DENSITY= 20 %
82. % D, CN= 91, COVER TYPE= DESERT BRUSH , COVER DENSITY= 20 %

IMPERVIOUS COVER= 23. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
RUNOFF SUPPLY RATE (q/i):	.483	.581	.632	.685	.723	.753
Tc (FUNCTION OF i) :	93.68	87.01	84.12	81.47	79.72	78.40
SOLUTION OF Tc (MINUTES):	101	79	69	60	55	51
RAINFL INT. @ Tc (IN/HR):	.827	1.286	1.640	2.130	2.520	2.936
RUNOFF RATE @ Tc (IN/HR):	.399	.747	1.037	1.458	1.821	2.212
PEAK DISCHARGE (CFS) :	736.	1378.	1912.	2690.	3360.	4080.

PROJECT NAME AND LOCATION: SAN XAVIER BASIN STUDY

DRAINAGE CONCENTRATION POINT: 7 (Valencia Wash at Westover Avenue)

WATERSHED AREA (A): 1783.00 acres

LENGTH OF WATERCOURSE (Lc): 17500. ft

LENGTH TO CENTER OF GRAVITY (Lca): 9400. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft	INCREMENTAL CHANGE IN ELEV (Hi) - ft
900.	500.0
1200.	100.0
5000.	100.0
5600.	80.0
4000.	30.0
800.	3.0

MEAN SLOPE (Sc): .0142 ft BASIN FACTOR (Nb): .0350

WATERSHED TYPE(S): MIXED

RAINFALL VALUES

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
P 1	1.33	1.65	1.86	2.13	2.38	2.62
P 2	1.42	1.80	2.05	2.37	2.67	2.95
P 3	1.48	1.90	2.18	2.53	2.86	3.18
P 6	1.60	2.09	2.42	2.84	3.22	3.60
P24	1.80	2.49	2.95	3.54	4.07	4.60

SOIL GROUPS

17. % B, CN= 83, COVER TYPE= DESERT BRUSH , COVER DENSITY= 20 %
83. % D, CN= 91, COVER TYPE= DESERT BRUSH , COVER DENSITY= 20 %

IMPERVIOUS COVER= 24. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
RUNOFF SUPPLY RATE (q/i):	.490	.587	.638	.690	.727	.757
Tc (FUNCTION OF i) :	89.33	83.11	80.41	77.92	76.28	75.05
SOLUTION OF Tc (MINUTES):	94	73	65	57	52	48
RAINFL INT. @ Tc (IN/HR):	.882	1.380	1.730	2.215	2.615	3.067
RUNOFF RATE @ Tc (IN/HR):	.432	.810	1.103	1.527	1.902	2.323
PEAK DISCHARGE (CFS) :	776.	1456.	1982.	2745.	3418.	4175.

PROJECT NAME AND LOCATION: SAN XAVIER BASIN STUDY

DRAINAGE CONCENTRATION POINT: 6 (Valencia Wash at Valencia Road)

WATERSHED AREA (A): 1571.00 acres

LENGTH OF WATERCOURSE (Lc): 16700. ft

LENGTH TO CENTER OF GRAVITY (Lca): 9000. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft	INCREMENTAL CHANGE IN ELEV (Hi) - ft
900.	500.0
1200.	100.0
5000.	100.0
5600.	80.0
4000.	30.0

MEAN SLOPE (Sc): .0156 ft BASIN FACTOR (Nb): .0370

WATERSHED TYPE(S): MIXED

RAINFALL VALUES

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
P 1	1.33	1.65	1.86	2.13	2.38	2.62
P 2	1.42	1.80	2.05	2.37	2.67	2.95
P 3	1.48	1.90	2.18	2.53	2.86	3.18
P 6	1.60	2.09	2.42	2.84	3.22	3.60
P24	1.80	2.49	2.95	3.54	4.07	4.60

SOIL GROUPS

10. % B, CN= 83, COVER TYPE= DESERT BRUSH , COVER DENSITY= 20 %
90. % D, CN= 91, COVER TYPE= DESERT BRUSH , COVER DENSITY= 20 %

IMPERVIOUS COVER= 20. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
RUNOFF SUPPLY RATE (q/i):	.480	.582	.634	.688	.727	.758
Tc (FUNCTION OF i) :	89.31	82.70	79.88	77.33	75.65	74.40
SOLUTION OF Tc (MINUTES):	94	73	64	56	52	48
RAINFL INT. @ Tc (IN/HR):	.882	1.380	1.754	2.236	2.615	3.067
RUNOFF RATE @ Tc (IN/HR):	.423	.802	1.112	1.539	1.900	2.324
PEAK DISCHARGE (CFS) :	670.	1271.	1761.	2436.	3009.	3680.

```
                                  V
157                          TOCP15
                                  .
                                  .
160                                .        SUB17
                                  .          .
                                  .          .
165                          CP17.......................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                        *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *
*              MAY   1991                *
*           VERSION 4.0.1E               *
*     Lahey F77L-EM/32 version 5.01      *
*       Dodson & Associates, Inc.        *
*  RUN DATE  06/21/01  TIME  16:03:45    *
*****************************************
```

```
*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*          (916) 551-1748               *
*                                       *
*****************************************
```

San Xavier Reservation Basin Managment Study
Existing Conditions Peak Discharges
100 Year, 24-hour event

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

    IT        HYDROGRAPH TIME DATA
                 NMIN          10  MINUTES IN COMPUTATION INTERVAL
                 IDATE      1   0  STARTING DATE
                 ITIME       0000  STARTING TIME
                    NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                NDDATE      3   0  ENDING DATE
                NDTIME       0150  ENDING TIME
                 ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL    0.17 HOURS
                   TOTAL TIME BASE   49.83 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
```

****** WARNING ****** THE FLOW RATE THAT YOU ARE ROUTING IS GREATER THAN WHAT CAN BE CALCULATE FROM THE 8 POINT CROSS SECTION YOU ENTERED ON RC, RX, AND RY RECORDS. THE PROGRAM HAD TO EXTRAPOLATE BEYOND THE MAXIMUM STORAGE-DISCHARGE VALUE CALCULATED. INCREASE ELMAX ON THE RC RECORD OR MAKE THE CROSS SECTION LARGER.

1

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 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	SUB18	2201.	13.50	1244.	420.	202.	4.50		
+	ROUTED TO	TOCP19	2202.	14.00	1244.	420.	203.	4.50		
+	HYDROGRAPH AT	SUB19	1735.	13.33	827.	265.	128.	3.30		
+	2 COMBINED AT	CP19	3707.	13.67	2054.	685.	330.	7.80		
+	DIVERSION TO	DIV19	930.	13.67	515.	172.	83.	7.80		
+	HYDROGRAPH AT	CP19	2777.	13.67	1539.	513.	247.	7.80		
+	ROUTED TO	TOCP23	2769.	13.83	1539.	513.	247.	7.80		
+	HYDROGRAPH AT	SUB23	1186.	14.00	768.	273.	131.	3.40		
+	2 COMBINED AT	CP23	3953.	13.83	2306.	786.	379.	11.20		

+	ROUTED TO	TOCP24	3945.	14.17	2305.	786.	379.	11.20
+	HYDROGRAPH AT	SUB24	1536.	12.50	418.	132.	64.	1.50
+	2 COMBINED AT	CP24	4233.	14.00	2650.	917.	442.	12.70
+	ROUTED TO	TOCP26	4051.	15.00	2623.	917.	442.	12.70
+	HYDROGRAPH AT	SUB26	1535.	13.33	733.	233.	112.	3.10
+	2 COMBINED AT	CP26	4767.	14.83	3285.	1150.	555.	15.80
+	HYDROGRAPH AT	SUB25	2083.	12.67	640.	203.	98.	2.30
+	ROUTED TO	TOCP26	1911.	13.00	639.	203.	98.	2.30
+	2 COMBINED AT	CP26	5179.	14.67	3880.	1352.	652.	18.10
+	ROUTED TO	TOCP27	5165.	14.83	3872.	1352.	652.	18.10
+	HYDROGRAPH AT	SUB20	1252.	13.83	723.	241.	116.	3.20
+	HYDROGRAPH AT	RET19	930.	13.67	515.	172.	83.	0.00
+	ROUTED TO	TOCP20	929.	14.00	515.	172.	83.	0.00
+	2 COMBINED AT	CP20	2170.	13.83	1232.	413.	199.	3.20
+	ROUTED TO	TOCP21	2094.	14.50	1226.	413.	199.	3.20
+	HYDROGRAPH AT	SUB21	1793.	12.50	529.	167.	81.	1.90
+	2 COMBINED AT	CP21	2419.	14.33	1684.	580.	280.	5.10
+	DIVERSION TO	DIV21	789.	14.33	549.	189.	91.	5.10
+	HYDROGRAPH AT	DIV21	1630.	14.33	1135.	391.	188.	5.10
+	ROUTED TO	CP22	1611.	14.67	1131.	391.	188.	5.10
+	HYDROGRAPH AT	SUB22	220.	12.50	72.	23.	11.	0.30
+	2 COMBINED AT	CP22	1656.	14.67	1198.	413.	199.	5.40
+	ROUTED TO	TOCP27	1643.	14.83	1194.	413.	199.	5.40
+	2 COMBINED AT	CP27	6809.	14.83	5064.	1765.	852.	23.50
+	HYDROGRAPH AT	SUB15	2016.	15.00	1488.	578.	279.	7.70
+	HYDROGRAPH AT	SUB16	1225.	14.17	802.	284.	137.	3.90
+	2 COMBINED AT	CP16	3108.	14.67	2279.	862.	416.	11.60
+	ROUTED TO	TO17	3091.	14.83	2274.	862.	416.	11.60
+	HYDROGRAPH AT	RET21	789.	14.33	549.	189.	91.	0.00
+	ROUTED TO	TOCP15	777.	14.67	547.	189.	91.	0.00
+	HYDROGRAPH AT	SUB17	680.	13.17	320.	102.	49.	1.40
	3 COMBINED AT							

```
                .          .          V
  157           .          .      TOCP15
                .          .          .
                .          .          .
  160           .          .          .      SUB17
                .          .          .          .
                .          .          .          .
  165           .       CP17.......................
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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              MAY   1991               *
*           VERSION 4.0.1E              *
*     Lahey F77L-EM/32 version 5.01     *
*       Dodson & Associates, Inc.       *
*  RUN DATE  06/21/01  TIME  16:03:45   *
*****************************************
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*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*          (916) 551-1748               *
*                                       *
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San Xavier Reservation Basin Managment Study
Existing Conditions Peak Discharges
100 Year, 24-hour event

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

   IT         HYDROGRAPH TIME DATA
                    NMIN         10  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1   0  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      3   0  ENDING DATE
                  NDTIME       0150  ENDING TIME
                  ICENT          19  CENTURY MARK

              COMPUTATION INTERVAL    0.17 HOURS
                   TOTAL TIME BASE   49.83 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
```

****** WARNING ****** THE FLOW RATE THAT YOU ARE ROUTING IS GREATER THAN WHAT CAN BE CALCULATE FROM THE 8 POINT CROSS SECTION YOU ENTERED ON RC, RX, AND RY RECORDS. THE PROGRAM HAD TO EXTRAPOLATE BEYOND THE MAXIMUM STORAGE-DISCHARGE VALUE CALCULATED. INCREASE ELMAX ON THE RC RECORD OR MAKE THE CROSS SECTION LARGER.

1

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 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	SUB18	2201.	13.50	1244.	420.	202.	4.50		
+	ROUTED TO	TOCP19	2202.	14.00	1244.	420.	203.	4.50		
+	HYDROGRAPH AT	SUB19	1735.	13.33	827.	265.	128.	3.30		
+	2 COMBINED AT	CP19	3707.	13.67	2054.	685.	330.	7.80		
+	DIVERSION TO	DIV19	930.	13.67	515.	172.	83.	7.80		
+	HYDROGRAPH AT	CP19	2777.	13.67	1539.	513.	247.	7.80		
+	ROUTED TO	TOCP23	2769.	13.83	1539.	513.	247.	7.80		
+	HYDROGRAPH AT	SUB23	1186.	14.00	768.	273.	131.	3.40		
+	2 COMBINED AT	CP23	3953.	13.83	2306.	786.	379.	11.20		

ROUTED TO	TOCP24	3945.	14.17	2305.	786.	379.	11.20
HYDROGRAPH AT	SUB24	1536.	12.50	418.	132.	64.	1.50
2 COMBINED AT	CP24	4233.	14.00	2650.	917.	442.	12.70
ROUTED TO	TOCP26	4051.	15.00	2623.	917.	442.	12.70
HYDROGRAPH AT	SUB26	1535.	13.33	733.	233.	112.	3.10
2 COMBINED AT	CP26	4767.	14.83	3285.	1150.	555.	15.80
HYDROGRAPH AT	SUB25	2083.	12.67	640.	203.	98.	2.30
ROUTED TO	TOCP26	1911.	13.00	639.	203.	98.	2.30
2 COMBINED AT	CP26	5179.	14.67	3880.	1352.	652.	18.10
ROUTED TO	TOCP27	5165.	14.83	3872.	1352.	652.	18.10
HYDROGRAPH AT	SUB20	1252.	13.83	723.	241.	116.	3.20
HYDROGRAPH AT	RET19	930.	13.67	515.	172.	83.	0.00
ROUTED TO	TOCP20	929.	14.00	515.	172.	83.	0.00
2 COMBINED AT	CP20	2170.	13.83	1232.	413.	199.	3.20
ROUTED TO	TOCP21	2094.	14.50	1226.	413.	199.	3.20
HYDROGRAPH AT	SUB21	1793.	12.50	529.	167.	81.	1.90
2 COMBINED AT	CP21	2419.	14.33	1684.	580.	280.	5.10
DIVERSION TO	DIV21	789.	14.33	549.	189.	91.	5.10
HYDROGRAPH AT	DIV21	1630.	14.33	1135.	391.	188.	5.10
ROUTED TO	CP22	1611.	14.67	1131.	391.	188.	5.10
HYDROGRAPH AT	SUB22	220.	12.50	72.	23.	11.	0.30
2 COMBINED AT	CP22	1656.	14.67	1198.	413.	199.	5.40
ROUTED TO	TOCP27	1643.	14.83	1194.	413.	199.	5.40
2 COMBINED AT	CP27	6809.	14.83	5064.	1765.	852.	23.50
HYDROGRAPH AT	SUB15	2016.	15.00	1488.	578.	279.	7.70
HYDROGRAPH AT	SUB16	1225.	14.17	802.	284.	137.	3.90
2 COMBINED AT	CP16	3108.	14.67	2279.	862.	416.	11.60
ROUTED TO	TO17	3091.	14.83	2274.	862.	416.	11.60
HYDROGRAPH AT	RET21	789.	14.33	549.	189.	91.	0.00
ROUTED TO	TOCP15	777.	14.67	547.	189.	91.	0.00
HYDROGRAPH AT	SUB17	680.	13.17	320.	102.	49.	1.40
3 COMBINED AT							