

**Cherne, Curtis**

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**To:** Eric Froberg

**Subject:** RE: Osuna Road Report and Drain

Eric,  
Sorry it has taken so long to get to the review of the Drainage Report.

It is comprehensive. I usually ask that these reports are 3/4" thick or less.

Comments:

1. I could not locate the pond hydrographs. Per the DPM page 22-170 "Ponds that take more than 6 hours to drain will be designed for a design storm equal to or exceeding the evacuation time".
2. Spillways are to be designed for the flow rate coming into the pond minus the outflow.
3. I am concerned that Arno St will not have capacity for the spill from the Horsey Pond.
4. I'm having some difficulty bouncing the flows from basins against the proposed 100 yr-6 hr storm drain profiles. Would it be possible to add the pipe designation to Exhibit 3 and pointing me to where in the report the 100 yr-6hr storm proposed storm drain profile is located. I've looked and found the church basin profile and I see existing and 10 year profiles.

Curtis

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**From:** Eric Froberg [mailto:eric.froberg@tylin.com]

**Sent:** Tuesday, June 14, 2011 12:26 PM

**To:** Cherne, Curtis

**Subject:** Osuna Road Report and Drain

Good afternoon Curtis

I hope your week is going well so far.

I'm wondering how your review of our Osuna Drainage Report is coming along. There are a few things in there that could have an impact on the plans which we are currently updating.

I'm also wondering if you would have some time in the next couple days to help me track down some additional information about a PVC drain into the Osuna median, south of Broadway Boulevard (see attached picture). It appears to be site drainage from the new office building/complex along the south side of Osuna. I have called and left a message for the developer but I thought I would ask you too.

Thanks in advance and I look forward to speaking with you.

Respectfully,

Eric J. Froberg, P.E.

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6/16/2011

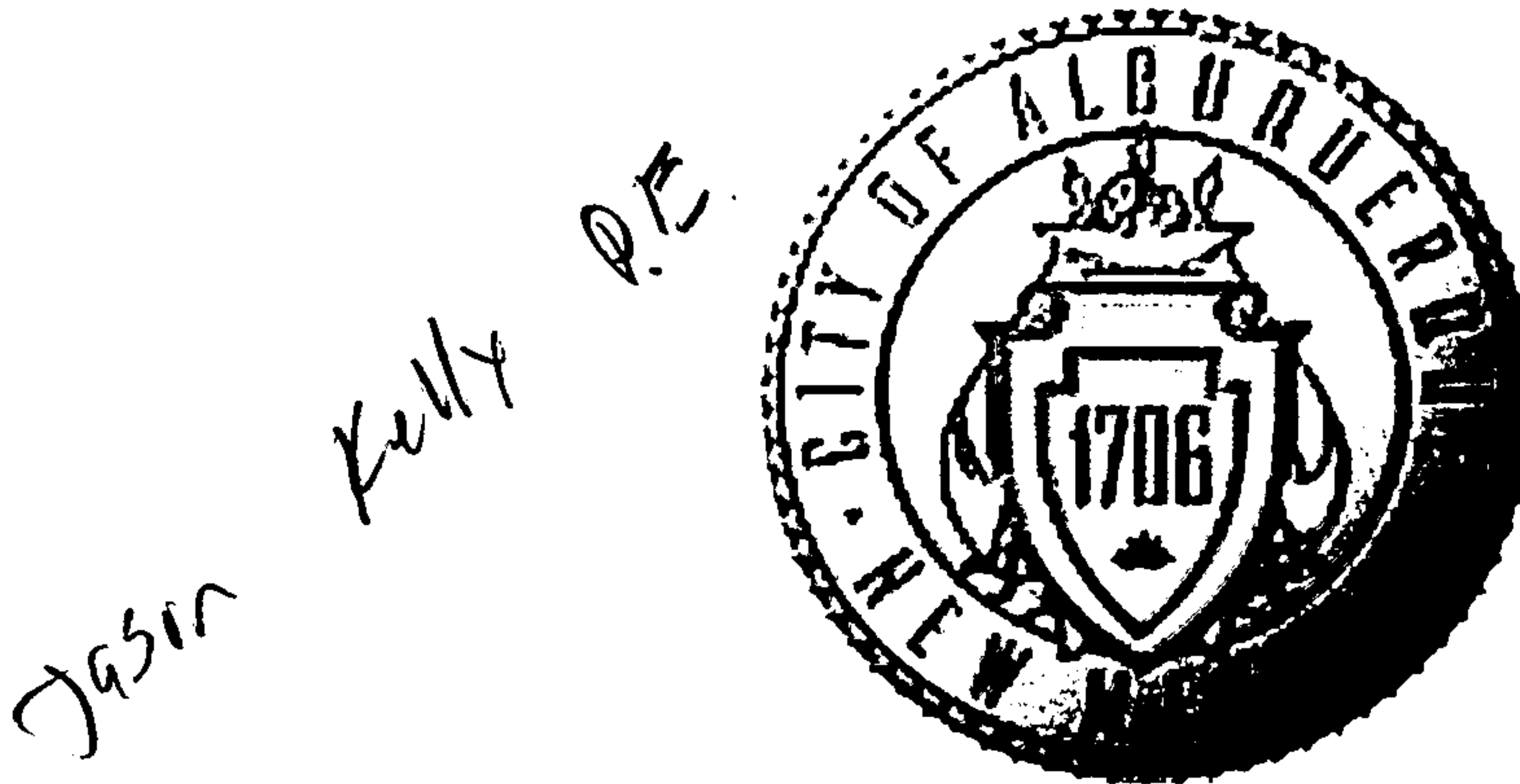
E16-D100

# Osuna Road Widening I-25 to Edith Boulevard

VOL 1 Summary

## Drainage Report

Prepared for:

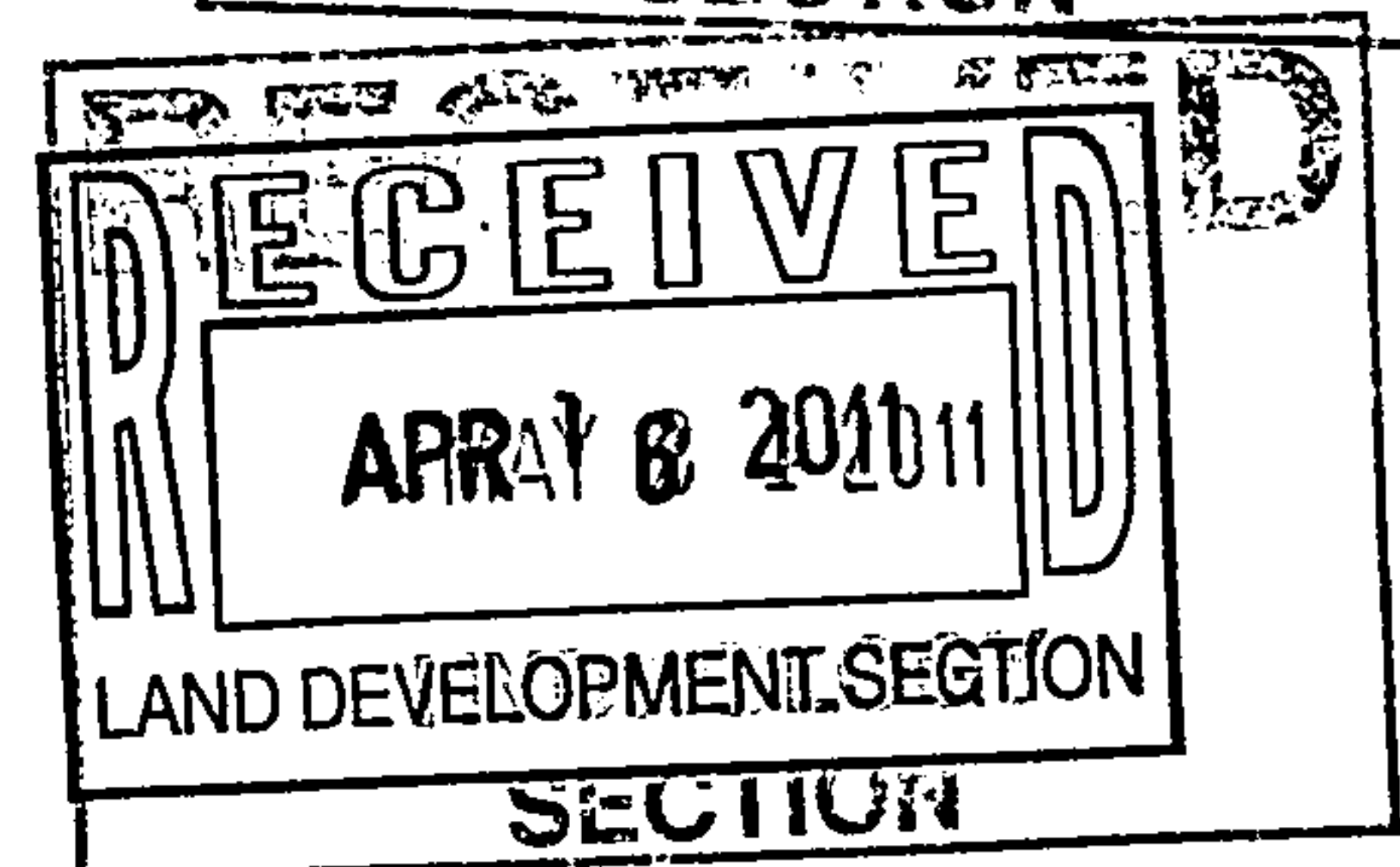
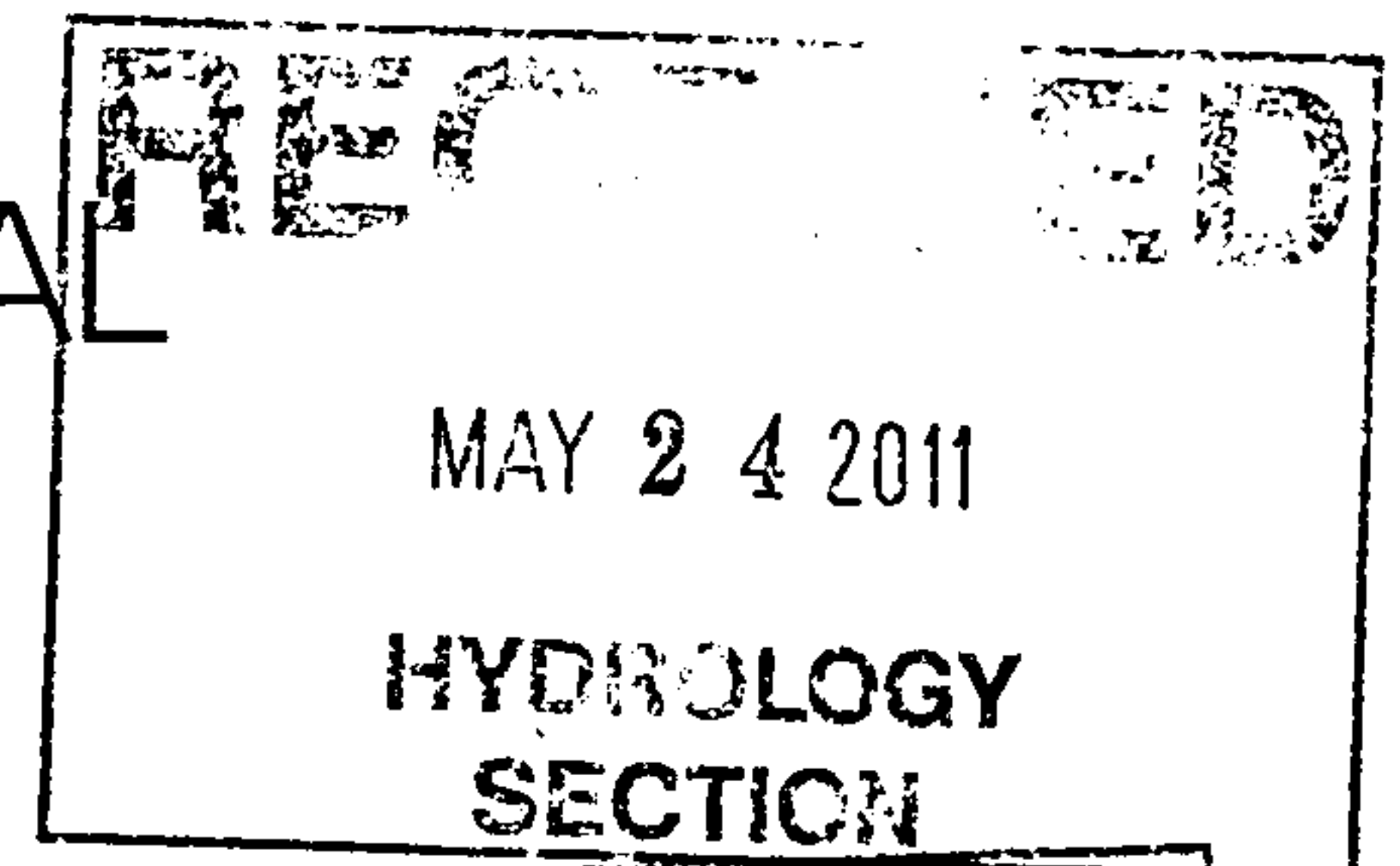


Prepared by:

**TYLIN** INTERNATIONAL

Project Number 5575.91

October 29, 2010





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## **1.0 Introduction**

TYLIN was retained by the City to provide engineering services for the Osuna Road Widening project. In addition to roadway design, there was a need to design drainage improvements to account for a reduction in existing onsite detention and to handle potential flooding. Historically, flooding problems have occurred in and along the project corridor. This report documents the drainage analysis and results to provide the required detention and conveyance systems to mitigate flooding.

## **2.0 Project Background**

### **2.1 Osuna West**

A drainage study for the western portion of the project corridor from 2<sup>nd</sup> Street to the NDC was completed over 20 years ago by Bernalillo County. This study was completed by Espey, Huston and Associates, Inc. (E&H Study) in August, 1986. The study identified 10-year volumes and peak flows. From 1988 to 1990, drainage improvements were designed and constructed to handle the 10-year volumes via a new storm drain and detention storage within the roadway in three interconnected median detention basins. The basins and outfall to the Alameda Drain were limited with orifice plates to 15 cfs per requirements by the MRGCD.

Near the same time as the E&H Study, ABC Inc. was conducting a drainage study for Edith Boulevard extending north and south of Osuna Road. This study accounted for a portion of the watershed contributing to Osuna Road along the east side of Edith Boulevard. It was determined that a certain portion of the flows (60 cfs) affecting the intersection would be intercepted and conveyed in the future Edith system. Construction of the Osuna Road drainage improvements from Vista Del Norte Drive to 2<sup>nd</sup> Street included a battery of catch basins at the east leg of the intersection on both sides of the street. This catchbasins would drain into a 30" pipe stubout that would later be connected to the Edith system. Catchbasins were plugged until the connection was completed later.

### **2.2 Osuna East**

Historically, large storm events have created floodwaves that have traveled down Osuna Road from I-25, crossing over the bridge at the NDC and overwhelming the three median detention areas between the railroad and 2<sup>nd</sup> Street. This flooding caused backwater ponding in adjacent neighborhoods north of Osuna Road which lie in a sumped situation relative to the elevated roadway section (see Flood Insurance Rate Maps, Appendix E).

A drainage study for the eastern portion of the project corridor from I-25 to the North Diversion Channel (NDC) was completed by the City and AMAFCA in 2007-2008. This study was completed by Bohannon-Huston (BHI Study) in June of 2007. The study identified 100-year and 10-year peak flows. From 2007 to 2008, the drainage improvements were designed and mostly constructed to handle the 100-year flows via a new storm drain/catch basin system that outfalls into the NDC. A portion of the designed system has yet to be constructed between Jefferson Street and I-25. The intent of the system is to prevent similar flooding that has occurred in the past.



### 3.0 Hydrologic Analysis

#### 3.1 Osuna Road from NDC to 2<sup>nd</sup> Street

A hydrologic evaluation was performed using AHYMO-S4. The input parameters and methodology are described below.

##### 3.1.1 Offsite/Onsite Watershed

The offsite watershed for the west end of Osuna Road is comprised of empty lots, residential areas and commercial areas along the north side of the street. A large light industrial area on the south side of Osuna Road also contributes runoff. The onsite areas consist entirely of roadway and were subdivided based on existing and proposed catchbasin locations. These areas are delineated in Exhibit 1 - Watershed Subbasin Map located in Appendix A. The watershed drains predominantly to the west and within the street section and flows are also conveyed within an existing stormdrain system beginning at Vista Del Norte Drive. This stormdrain outlets to the first of three median detention areas located immediately east of the railroad tracks. Due to the widening of Osuna Road, this first detention area will need to be removed and new stormdrain added.

##### 3.1.2 Methodology, Parameters, Assumptions

A hydrologic evaluation was performed for the offsite and onsite areas affecting the west end of the Osuna Road project corridor. Methodology was per Chapter 22 of the City Development Process Manual (DPM), Volume 2. The design storm used in the evaluation was the 100-year 6-hr for determining pond volumes and peak discharges for storm drain sizing. The 10-year 6-hr event was evaluated in order to check catch basin spacing and spread width criteria. A rainfall-runoff model was created encompassing the contributing watershed using the AHYMO-S4 program as described in Part C.5 of the DPM. Sub-basin parameters and data input for the model were developed as described below. Appendix A presents the backup data for the analysis.

##### 3.1.2.1 Rainfall

Precipitation data was obtained from the NOAA 14 Precipitation Frequency Data Server (<http://dipper.nws.noaa.gov/hdsc/pfds/>). Point rainfall depths are listed in Table 3.1.2.1 for the 100-year and 10-year storm events (see Appendix A for all recurrence intervals). The AHYMO RAINFALL function requires input of the ¼ hour, one-hour, six-hour and 1-day precipitation depths.

Table 3.1.2.1: NOAA 14 Precipitation Depths

| Recurrence Interval<br>(years) | 15 min | 1 hour | 6 hour | 24 hour |
|--------------------------------|--------|--------|--------|---------|
| 10 Year                        | 0.66   | 1.11   | 1.53   | 1.81    |
| 100 Year                       | 1.06   | 1.77   | 2.37   | 2.69    |

##### 3.1.2.2 Time to Peak

Flow path lengths were delineated in CAD based on County contours and site visits. Calculations of time to peak flow (Tp) for all basins was carried out using a spreadsheet based on the time of concentration and time to peak equations from Part B of the DPM. Conveyance factors (K) used in the calculations were determined using Table B-1, and Lag Equation Basin Factors (KN) were determined from Table B-2. The minimum Time



of Concentration (tc) was taken as 12 min and the Time to Peak was calculated per Equation b-9 from Section B.3. Due to the impervious nature of the majority of the contributing basins, the time to peak values in many cases did not exceed the minimum tc of 12 minutes. All Tp calculations are listed in the Subbasin Parameters Table in Appendix A.

#### 3.1.2.3 Land Treatment

Land Treatment percentages (per Table A-4 of the DPM) applied to each subbasin for use in the AHYMO model were determined based on site visits, aerial photos of the watershed and delineation in CAD. The Subbasin Parameters Table and Exhibit 2 - Land Use Map in Appendix A shows the land treatment values, delineations and types. Subbasins consist predominantly of land treatment C and D and appropriate subcategories thereof. A soils report was generated from the NRCS web database and is included in Appendix D for reference purposes only. All land treatment values were per the DPM.

#### 3.1.2.4 Subbasins

Subbasins were carefully delineated using aerial maps, County Contours, previous studies, site visits and existing catch basin locations. Care was taken to determine if there was potential for breakout from adjacent watersheds to the north into the Osuna watershed. Also, flow splits, flow patterns through residential streets, alleys and empty lots and blockages were taken into account in attempting to characterize offsite watersheds. The subbasins are depicted on Exhibit 1 - Watershed Subbasin Map in Appendix A.

#### 3.1.2.5 Routing in AHYMO

Route commands using Muskingum-Cunge were configured to simulate the affect of runoff collecting within offsite areas, traveling to the roadway and also runoff accumulating on the surface of the road and being collected and combining in the proposed and existing stormdrain. Routing length extends from upstream to downstream end of basin.

Within the street section, offsite areas combine at estimated inflow locations and street flows travel along the gutter on each side of the street. Street subbasins are split along the approximate center line of Osuna Road. Flows from both halves of the roadway are then combined (simulating interception by catchbasins) and routed to the next downstream manhole location. These flows are then, in turn, combined with the next portion of roadway surface flows and routed downstream to the next manhole location and so forth.

For simplicity, backbone routing along Osuna Road does not account for the portion of flow bypassing each set of existing or proposed inlets and continuing as gutter flow. This dynamic was evaluated using StormCAD V8i for appropriate inlet sizing (see Section 4.2). The reason for this is that the system is designed such that all flows are contained within the stormdrain before being diverted into each basin and therefore, whether a small portion of flow is carried in the street for a short period of time before being intercepted does not significantly affect the overall volume requiring storage. Peak discharges were hardcoded into StormCAD for inlet, gutter flow and pipe HGL analyses (see Section 4.2).



Hydrograph divide commands were added to determine and represent total runoff volume being split into the three proposed detention basins. Hydrograph divide rating curves were initially developed by hand to divert the maximum volume the basin was sized for. These rating curves were later updated using PondPack 10.1 based on actual orifice sizes and pipe configurations required at junction structures. Hydrograph results from AHYMO were used as input into PondPack in order to accurately model and design the basins (see Section 4.1). The routing schematic depicted in Exhibits 3 & 4 - AHYMO Schematic Maps in Appendix A, provide a clear visual of the coding of the AHYMO model for both the 100-year and 10-year, 6-hour storms. Table 3.1.2.5 lists peak discharge and volume results at key locations along the project corridor (compare with Exhibits 3 & 4). All AHYMO model input and summary output is located in Appendix A.

Table 3.1.2.5: Discharge and Volume Results from AHYMO

| AHYMO I.D.                                | 100-year, 6-hour   |                   | 10-year, 6-hour    |                   |
|-------------------------------------------|--------------------|-------------------|--------------------|-------------------|
|                                           | Discharge<br>(cfs) | Volume<br>(ac-ft) | Discharge<br>(cfs) | Volume<br>(ac-ft) |
| ROUTE.TOT.1                               | 2.3                | 0.092             | 1.4                | 0.054             |
| ROUTE.TOT.2                               | 14.9               | 0.623             | 9.1                | 0.370             |
| ROUTE.TOT.3                               | 17.9               | 0.745             | 10.9               | 0.442             |
| ROUTE.TOT.4                               | 88.4               | 3.590             | 54.6               | 2.114             |
| OK ROUTE.TOT.5 (Church Basin)             | 92.6               | 3.781             | 57.4               | 2.228             |
| ROUTE.TOT.1                               | 5.2                | 0.207             | 3.2                | 0.123             |
| ROUTE.TOT.2                               | 9.7                | 0.385             | 5.9                | 0.228             |
| ROUTE.TOT.3                               | 33.7               | 1.344             | 20.6               | 0.797             |
| ROUTE.TOT.4                               | 73.6               | 2.904             | 44.6               | 1.712             |
| ROUTE.TOT.5                               | 89.7               | 3.538             | 54.4               | 2.084             |
| ROUTE.TOT.6                               | 102.7              | 4.062             | 62.5               | 2.392             |
| ROUTE.TOT.7                               | 117.4              | 4.681             | 72.1               | 2.755             |
| ROUTE.TOT.8                               | 166.7              | 7.168             | 100.5              | 4.187             |
| ROUTE.TOT.9                               | 168.1              | 7.235             | 101.2              | 4.227             |
| ROUTE.TOT.10                              | 170.2              | 7.338             | 102.7              | 4.228             |
| ROUTE.TOT.11                              | 196.2              | 8.506             | 120.6              | 4.958             |
| ROUTE.TOT.12                              | 194.2              | 8.538             | 122.0              | 4.981             |
| ADD.TOT.13                                | 213.2              | 9.200             | 129.4              | 5.313             |
| 103.HORSY (Horsy Basin)                   | 192.0              | 6.744             | 112.3              | 3.533             |
| ROUTE.TOT.13                              | 21.2               | 2.456             | 17.1               | 1.780             |
| ROUTE.TOT.14                              | 26.5               | 2.688             | 20.5               | 1.917             |
| ROUTE.TOT.15                              | 34.2               | 3.005             | 25.2               | 2.106             |
| ROUTE.TOT.16                              | 40.2               | 3.247             | 28.8               | 2.249             |
| ROUTE.TOT.17                              | 83.1               | 5.524             | 54.9               | 3.600             |
| ROUTE.TOT.18<br>(Railroad Basin)          | 113.0              | 6.953             | 73.1               | 4.448             |
| TO ALAMEDA DRAIN<br>(From Railroad Basin) | 11.7               | -                 | 11.7               | -                 |
| TO ALAMEDA DRAIN<br>(From Upstream Basin) | 3.3                | -                 | 3.3                | -                 |



#### 3.1.2.6 Edith Stormdrain

Flowsplit calculations were conducted using FlowMaster V8 and within StormCAD to determine how much water was intercepted into the Edith system. These calculations were done for the two inlets located on Bear Canyon Road and Edith Boulevard, for the small detention basin riser located in the Fort Know Storage facility parking lot and for the battery of inlets located on Osuna which drain into the Edith system (see AHYMO Flow Splits in Appendix A). Either hydrograph divide commands were used to represent flows entering the Edith stormdrain system or non-contributing subbasins were not accounted for since all the flows are handled by the Edith system.

## 4.0 Hydraulic Analysis

### 4.1 Detention Basins

#### 4.1.1 Background

During the preliminary drainage evaluation and discussions with the City, it became evident that stormwater storage was the only viable near term solution to flooding problems on Osuna Road. This was due to the MRGCD policy restriction of outflow to the Alameda Drain. Several potential pond locations were identified, all of which were empty parcels along Osuna Road between 2<sup>nd</sup> Street to just east of Vista Del Norte Drive. These were evaluated by City right-of-way specialists and the project manager for feasibility. Three parcels large enough to handle the stormwater, minimize right-of-way purchase adjacent to Osuna Road and located strategically to provide storage of accumulated stormwater were selected. These three locations (and basin configuration) are depicted in Exhibit 5 - Basin Layout, located in Appendix B.

24 hr storm?

The easternmost basin, the "Church Basin", is located at the southwest corner of the church property on Vista Del Norte Drive. This basin stores 3.4 acre-feet, nearly the entire 100-year, 6-hour volume generated from the offsite and onsite areas along Osuna Road from the NDC to just east of Vista Del Norte Drive. This basin is crucial due to the limited areas available for basins further west. Beginning just west of this basin, the stormwater accumulation for the design event will have been reduced to near zero which provides the storage needed for the other two basins to store the remaining offsite/onsite flows. A new stormdrain system extending from Chappell Road to Vista Del Norte Drive intercepts, conveys and outlets the stormwater to the church basin (see Section 4.2). The configuration of the Church Basin is to encourage multi-use and easy access.

The middle basin, the "Horsy Basin", is located north of Osuna Road between the Alameda Lateral and Arno Street. This basin stores 6.7 acre-feet, approximately 73% of the 100-year, 6-hour volume generated from the offsite/onsite areas along Osuna Road between Vista Del Norte Drive to Edith Boulevard. Due to the volume of stormwater generated by this portion of the watershed (nearly 9.2 acre-feet) and the neighboring constraints around it, maximizing the volume of this basin was essential. This was accomplished by utilizing vertical retaining wall around the entire perimeter of the basin. The basin will be entirely fenced and access to the basin will be limited to maintenance only. Interception and conveyance of stormwater to the Horsy Basin is accomplished by upsizing/upgrading the existing system from Vista Del



Norte Drive to just west of Edith Boulevard (see Section 4.2). The basin receives a peak flow of 192 cfs (100-year, 6-hour) thus significantly attenuating a peak flow of 213 cfs at the intersection of Edith Boulevard and Osuna Road. A bypass flow of 21 cfs continues west in the improved stormdrain to the Railroad Basin.

The westernmost basin, the "Railroad Basin" is located along the south side of Osuna Road just west of the railroad tracks. This basin stores 7.8 acre-feet, handling the 100-year, 6-hour flows generated between Edith Boulevard and Tierra Drive including the 27% bypass volume not stored in the Horsy Basin. Due to the volume of stormwater generated by the remaining portion of the watershed, the bypass volume from the Horsy Basin, the right-of-way constraints and high fill area along the east side of the Railroad Basin, maximizing the volume was essential. This was accomplished by utilizing vertical retaining wall around the entire perimeter of the basin. The basin will be entirely fenced and access to the basin will be limited to maintenance only. Interception and conveyance of stormwater to the Railroad Basin is accomplished by upsizing/upgrading the existing system from Edith Boulevard to Tierra Drive (see Section 4.2).

#### 4.1.2 PondPack Analysis

A PondPack analysis was conducted to design the detention basins. The PondPack model was developed using GIS shapefiles to locate infrastructure such as pipes, junctions and the basins at the correct scale. The ponds were designed in AutoCAD using proposed contours interfaced with existing contours and adjacent right-of-way in order to develop correct stage-storage relationships for each basin. The stage-storage relationship for each basin is shown in Table 4.1.2.1. The stage-storage values account for side slopes, retaining walls and freeboard. The basins are depicted in Exhibit 5 - Basin Layout, in Appendix B.

**Table 4.1.2.1: Basin Stage-Storage Relationships**

| Church Basin     |                      | Horsy Basin      |                      | Railroad Basin   |                      |
|------------------|----------------------|------------------|----------------------|------------------|----------------------|
| Elevation (feet) | Total Volume (ac-ft) | Elevation (feet) | Total Volume (ac-ft) | Elevation (feet) | Total Volume (ac-ft) |
| 5049.0           | 0.00                 | 4986.85          | 0.00                 | 4977.0           | 0.00                 |
| 5050.0           | 0.71                 | 4990.0           | 3.15                 | 4978.0           | 1.11                 |
| 5051.0           | 1.47                 | 4991.0           | 4.16                 | 4979.0           | 2.21                 |
| 5052.0           | 2.30                 | 4992.0           | 5.17                 | 4980.0           | 3.33                 |
| 5053.0           | 3.18                 | 4993.0           | 6.69                 | 4981.0           | 4.44                 |
| 5054.0           | 4.12                 | 4994.0           | 7.20                 | 4982.0           | 5.56                 |
| 5055.0           | 5.13                 | -                | -                    | 4983.0           | 6.68                 |
| -                | -                    | -                | -                    | 4984.0           | 7.80                 |
| -                | -                    | -                | -                    | 4985.0           | 8.93                 |

In PondPack, each basin was associated with a catchment area representing the watershed contributing to it (see PondPack Input and Output, Appendix B). The catchment areas were loaded with the runoff hydrographs from the AHYMO model. These in turn are 'split' at a junction structure. The inflow hydrographs for the Church and Horsy basins pass through junction structures comprised of one inflow and two outflow pipes. The hydrograph for the



Railroad Basin is completely passed through the basin. These configurations are described below.

The hydrograph for the catchment watershed contributing to the Church Basin, except for a small bypass amount of 0.25 cfs, is fully routed into the Church Basin via a 42-inch pipe. The diversion is created by a (2-inch) orifice in the plate covering the 24-inch downstream mainline. The resulting constriction causes a majority of storm water (92.2 cfs) to divert to the secondary pipe and is conveyed into the Church Basin. The junction structure was modeled in PondPack and output can be found in Appendix B.

The majority of the hydrograph for the catchment watershed contributing to the Horsy Basin, except for a small bypass amount of 21.2 cfs, is routed into the Horsy Basin via a 54-inch pipe. The diversion is created by a 17.5-inch orifice in the plate covering the 48-inch downstream mainline. The resulting constriction causes a majority of storm water (192 cfs) to divert to the secondary pipe and is conveyed into the Horsy Basin. The junction structure was modeled in PondPack and output can be found in Appendix B. A summary of the diversions are listed in Table 4.1.2.2.

Table 4.1.2.2: Basin Junction Structure Summary

| Basin  | Junction Structure [type] | Inflow to Junction |      | Bypass Pipe/Orifice West in Osuna Road |      |         | Outlet to Basin |      |
|--------|---------------------------|--------------------|------|----------------------------------------|------|---------|-----------------|------|
|        |                           | Inflow [cfs]       | Dia. | Outflow [cfs]                          | Dia. | Orifice | Outflow [cfs]   | Dia. |
| Church | Manhole                   | 95.4               | 42"  | 0.25                                   | 24"  | 2.0"    | 95.2            | 42"  |
| Horsy  | Manhole                   | 213.2              | 48"  | 21.2                                   | 48"  | 17.5"   | 192.1           | 54"  |

Initially, the Railroad Basin outflow pipe was tied into the existing remaining two median detention areas. However, due to backflow and HGL conditions, it was necessary to hydraulically disconnect the outflow pipe from the existing system. Therefore, a new 24" outflow pipe extends from the Railroad Basin to the Alameda Drain.

PondPack results indicate that the three basins function to retain, attenuate and safely outlet the 100-year, 6-hour volume. PondPack accounts for the inflow, bypass and outflow volumes affecting the next downstream basin. Volume, stage and outflow curves are located in the PondPack Input and Output in Appendix B. A summary of results is shown in Table 4.1.2.3.

Table 4.1.2.3: PondPack Results Summary

|                     | Church Basin | Horsy Basin | Railroad Basin |
|---------------------|--------------|-------------|----------------|
| Peak Volume (ac-ft) | 3.4          | 6.7         | 7.8            |
| Peak Stage (ft)     | 5053.3       | 4993.0      | 4984.0         |
| Peak Outflow (cfs)  | 1.5          | 2.8         | 11.7           |
| Drain Time (hrs)    | 59.4         | 57.6        | 71.6           |



## 4.2 Storm Drain

### 4.2.1 Background

The existing storm drain system was analyzed using StormCAD V8i. New storm drain is needed between Chappell Road and Vista Del Norte Drive to intercept and convey flow to the Church Basin. An enlargement of the existing storm drain between Vista Del Norte and Edith Boulevard is required to convey flows to both the Horsy and Railroad basins. Storm drain layout schematics can be found in the StormCAD output in Appendix B.

### 4.2.2 Existing Conditions

An existing conditions model was created to determine the efficiency/deficiency of the existing system for the 100-year, 6-hour and 10-year, 6-hour storm events. The model was developed using project survey and as-built plans to accurately code in manholes, inlets and pipes. Type A and Type C inlets were recreated in the StormCAD Inlet Library in order to evaluate interception capacity and spread width. Gutter and roadway cross-slopes and longitudinal slopes were obtained from project survey and design files and coded into each inlet. 'Dummy' catchment areas were created in order to mimic AHYMO peak surface flows arriving at each inlet. Bypass flows were accounted for with the a Gutter Network in StormCAD. Results indicate that the current system would not handle a 100-year, 6-hour event (see Appendix B for Existing Conditions StormCAD model output).

### 4.2.3 Proposed Conditions

Two proposed conditions models were created for the west end of Osuna Road. The first model represents a completely new storm drain from Chappell Road to Vista Del Norte Drive. This storm drain diverts flow into the Church Basin. Pipes and inlets were spaced and sized in order to capture the 100-year, 6-hour flows. The second model is an upsizing/enlargement of the existing system from Vista Del Norte to the railroad. To minimize costs, all existing inlets were preserved in addition to a portion of the downstream main line pipe. New inlets were added near Edith Boulevard and along side streets in sump areas to enhance interception. The new storm drain discharges into the Horsy Basin and then into the Railroad Basin. Each proposed condition model was run for both the 100-year and 10-year flows. The 10-year flows were used to evaluate spread width criteria. The results of the hydraulic analysis show that the proposed system would collect and convey the 100-year discharges without overtopping the sidewalks. See Appendix B for StormCAD input, profiles and results. The proposed stormdrain system is documented in the Osuna Road Widening – Phase 2, COA Project No. 5575.92 Final Design Plans.

## 4.3 Hydraulic Evaluation: Osuna Road from I-25 Street to NDC

Existing conditions were evaluated along Osuna Road between Interstate Highway I-25 and the North Diversion Channel. Specifically, the existing storm drain scheme was reviewed to verify that the drainage system, as constructed, was adequate to capture and convey the design discharges (100-year, 6-hour) once the Osuna Widening project was finished. Analysis included reviewing the hydrology and checking hydraulic calculations completed under the drainage study prepared with the design of the Osuna Road storm drain by Bohannon Huston, Inc. (BH) in June of 2007. The results of this evaluation indicate that the system will function as designed and constructed with the widening project in place.



The drainage report prepared with the design of the Osuna Road storm drain was prepared by Bohannon Huston, Inc. (BH) in June of 2007. The report documents the existing conditions hydrology using the AHYMO-97 modeling software. The model was reviewed and determined to be of acceptable detail for designing drainage infrastructure.

The hydraulic analysis, for sizing the storm drain system was reviewed and the results duplicated following City methodology. The design, as documented within BH's report, provides a system that meets the design guidelines for existing conditions and would satisfy proposed widening conditions as well.

One exception noted is that the proposed storm drain was not completely constructed. The recently constructed existing system begins west of the intersection of Jefferson Street while the drainage study identified inlets and laterals to the north, south and east of the intersection at Jefferson Street. Without these improvements, under existing and proposed conditions, the storm drain system is inadequate to collect all the design event storm water likely to inundate the intersection of Jefferson Street at Osuna Road. Flows that would be intercepted at Jefferson Street will not be fully captured by the current system and will bypass inlets and travel west within the roadway. Once the missing laterals are constructed at Jefferson Street, the storm drain should effectively intercept the design discharge.

The existing system, including the sections not yet constructed, were modeled accounting for the wider roadway. The results were reviewed specifically looking for locations where the inlets, connector pipes, or mainline capacities were exceeded and for locations where the spread into the streets exceeded design standards. No additional inlets or laterals are required (see Hydraulic Evaluation: Osuna Road from Jefferson Street to NDC, Appendix B).

## **5.0 North Diversion Channel Pedestrian Notch**

### **5.1 Background**

A multi-use trail exists on the west bank of the North Diversion Channel (NDC) with an at-grade crossing of Osuna Road. Proposed improvements to the NDC, in and around the Osuna Road project, includes the design of a multi-use trail underpass of the Osuna Road bridge. The proposed notch located in the left bank of the NDC would begin, bank high, several hundred feet upstream of the Osuna Road bridge dipping below the bank on the channel side and crossing under the bridge with sufficient headroom to allow full multi-use access. The proposed notch continues as an undercrossing extending downstream beyond the limits of the proposed Essayons Boulevard bridge before returning and matching the top of bank.

Along this reach of the NDC, the existing channel is a concrete lined trapezoidal channel with a twenty-five foot wide bottom width, 2:1 side slopes, is approximately twenty feet in depth and has an average longitudinal slope of about 0.0026 ft/ft. Additional features, within the NDC, include a 5-foot high drop structure located about 700-feet upstream of the Osuna Road bridge, a spillway at the confluence of Bear Arroyo with the NDC which occurs about 200-feet upstream of the Osuna Road bridge and the Osuna Road bridge itself, which crosses the NDC at a slight skew. Downstream of the bridge, the existing physical conditions consist of a straight channel section with a consistent bottom width, slope and depth. The proposed multi-use trail (notch) will



begin about 350-feet upstream of the Osuna Road bridge and end about 950-feet downstream of the bridge.

## 5.2 HEC-RAS Analysis

### 5.2.1 Design Flows

HEC-RAS models of the existing and proposed conditions were prepared so that the proposed improvements, with notch, could be compared to determine the overall hydraulic affects on the channel. Table 5.2.1 contains design information taken from Albuquerque Diversion Channels Project, Rio Grande and Tributaries, Albuquerque, New Mexico and Vicinity. Design Memorandum No. 5, North Diversion Channel – Phase II and III. Alameda Outlet Structure to Campus Wash. USACE, 1965 (see Appendix C).

**Table 5.2.1 North Diversion Channel Design Discharge**

| NDC Stationing | Location        | Peak Discharge in Channel [cfs] | Coincident Discharge in Inlet [cfs] | Maximum Discharge in Inlet [cfs] | Coincident Discharge in Channel [cfs] |
|----------------|-----------------|---------------------------------|-------------------------------------|----------------------------------|---------------------------------------|
| 289+85.55      | Vineyard Arroyo | 29,000                          | 1,000                               | 2,300                            | 22,000                                |
| 245+39.19      | Bear Arroyo     | 33,000                          | 3,000                               | 8,400                            | 24,000                                |

Notes: 1) All information from Design Memorandum No. 5

From this table, it was determined that the design discharge in the NDC upstream of the confluence with Bear Arroyo is 29,000 cfs. Beginning at the confluence with Bear Arroyo and continuing downstream the design discharge in the NDC is 33,000 cfs while the design discharge for Bear Arroyo would be 8,400 cfs.

### 5.2.2 Existing Conditions Model

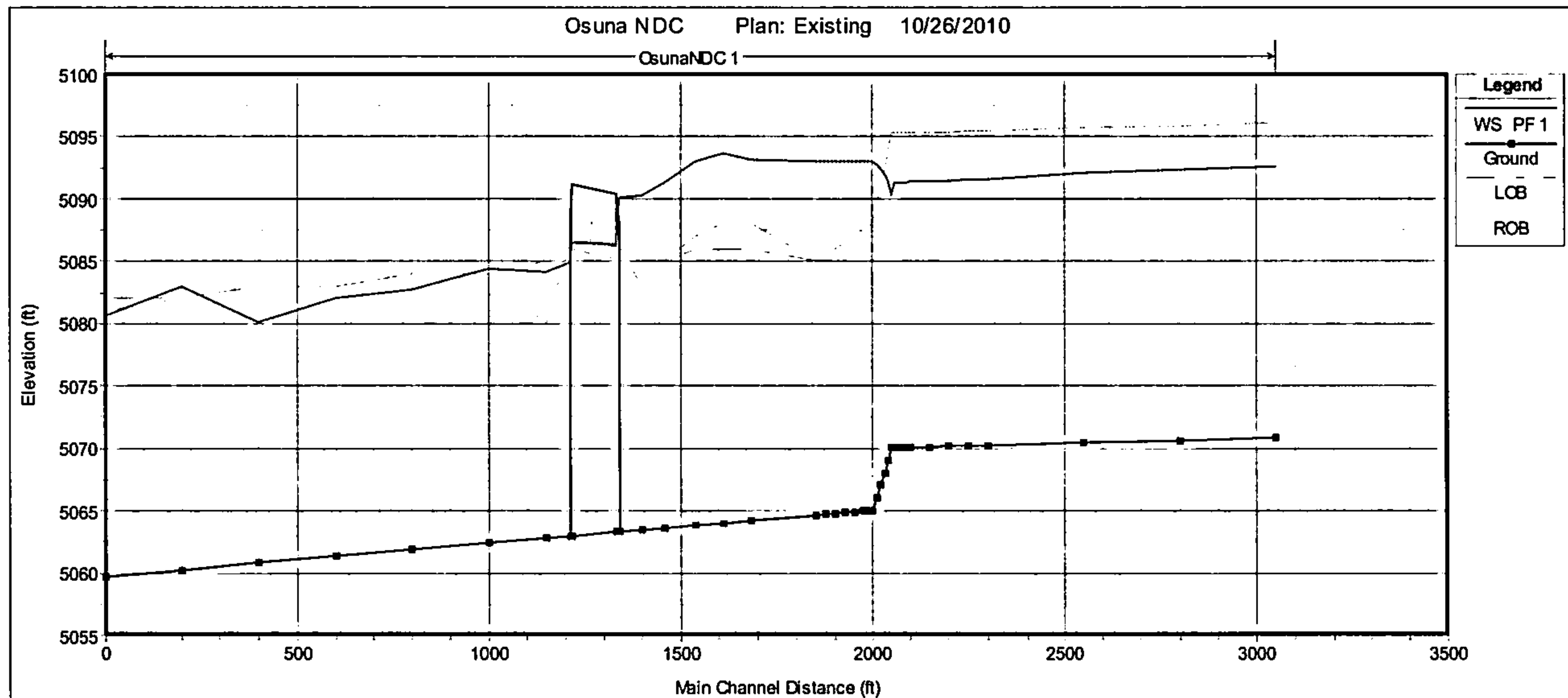
The existing conditions model was developed using the North Diversion Channel construction plans, the Osuna Road as-built plans, and new contour mapping prepared with the Osuna Road widening project. The construction and the as-built plans are on a different datum than the contours generated from the new mapping. The datum shift is: new mapping – 3.0 feet = construction and as-built plans. To simplify development and comparison of results the model was created using the original datum as that of the design/construction and as-built plans. HEC-RAS cross section locations are shown in Exhibit 6, Appendix C.

After the first model run, of the existing conditions, issues were raised regarding the NDC's conveyance capacity. A hydraulic jump was expected in the main channel downstream of the inline drop structure, however, the effect of the junction/confluence of Bear Arroyo with an increased discharge rate caused a backwater affect which washed out the hydraulic jump. When the Osuna Road bridge was added to the model the results indicated a pressure flow condition against the upstream bridge face. At the direction of AMAFCA, the junction with Bear Arroyo was removed, although the increase in the peak discharge was maintained, and the fluctuations in the right bank at the confluence with Bear Arroyo were removed and



replaced by a normal and uniform channel section. The following profile demonstrates the capacity issue.

**Figure 5.2.2 - Existing Conditions Profile of NDC at Osuna Road**



The resulting model continues to result in capacity issues, however, the intent of this analysis is to determine what affect the new notch has when compared with existing conditions. Existing conditions HEC-RAS input, output and results are located in Appendix C.

### 5.2.3 Proposed Conditions Model

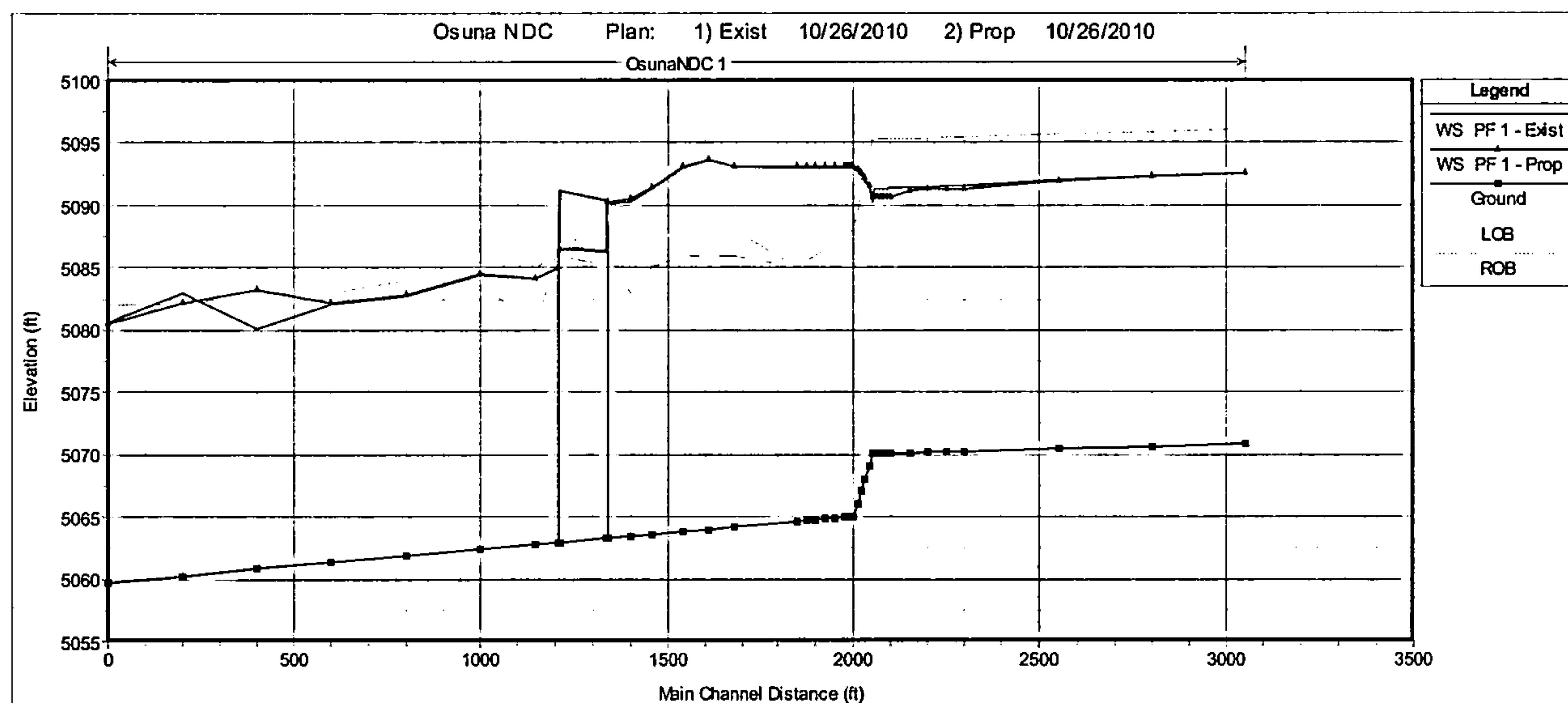
A second model, the proposed conditions model with notch, was developed blocking out the notch as an obstruction to the full width of the notch and to a height equal to the top of the proposed safety railing. Although the safety railing is not solid this method provides a conservative approach representing potential debris blockage or buildup against the railing. Proposed conditions HEC-RAS input, output and results are located in Appendix C. Table 5.2.3 and Figure 5.2.3 show a comparison of existing and proposed conditions.



Table 5.2.3 Affect of Notch on North Diversion Channel

| Description                          | HEC-RAS Station | Peak Q [cfs] | Existing WSE [ft] | Proposed WSE [ft] | Delta Elev. [ft] |
|--------------------------------------|-----------------|--------------|-------------------|-------------------|------------------|
| Upstream end of hydraulic model      | 62+00           | 29,000       | 5092.58           | 5092.55           | -0.03            |
| Top of Drop Structure/Chute          | 52+00           | 29,000       | 5090.30           | 5090.58           | 0.28             |
| Toe of Drop Structure/Chute          | 51+50           | 29,000       | 5093.01           | 5093.13           | 0.12             |
| 150' downstream of Drop/Chute        | 50+00           | 29,000       | 5093.02           | 5093.15           | 0.13             |
| Beginning of Notch                   | 48+32           | 29,000       | 5093.05           | 5093.17           | 0.12             |
| Confluence with Bear Arroyo          | 47+62           | 33,000       | 5093.62           | 5093.66           | 0.04             |
| Osuna Road Bridge (Upstream)         | 44+90           | 33,000       | 5090.06           | 5090.19           | 0.13             |
| Osuna Road Bridge (Downstream)       | 43+60           | 33,000       | 5084.94           | 5085.02           | 0.08             |
| Proposed crossing of Essayons bridge | 37+50           | 33,000       | 5082.10           | 5082.24           | 0.14             |
| End of Notch                         | 33+50           | 33,000       | 5082.99           | 5082.19           | -0.80            |
| Downstream end of hydraulic model    | 31+50           | 33,000       | 5080.65           | 5080.45           | -0.20            |

Figure 5.2.3 - Existing versus Proposed Conditions in the NDC



A review of the results shows that the overall affect of the notch on the system is minor. On average there is a 0.12 foot rise in the water surface elevation consistent throughout the reach of improvement.



## 6.0 References

1. Anderson Hydro, *AHYMO-S4*, December 2009.
2. Bentley Systems, Inc., *InRoads*, V8, 2007.
3. AutoDesk, Inc., *AutoCAD*, v2008.
4. Bentley Systems, Inc., *StormCAD*, V8i, November 2008.
5. Bentley Systems, Inc., *PondPack*, V8i, October 2009.
6. Bentley Systems, Inc., *FlowMaster*, V8, August 2008.
7. Brater, Ernest F.; King, Horace Williams. *Handbook of Hydraulics*. New York: McGraw-Hill Book Company; 1976.
8. *Davis' Handbook of Applied Hydraulics*. McGraw-Hill Book Company; Third Edition, 1969.
9. Roberson, John A., John J. Cassidy, and Hanif M. Chaudhry, *Hydraulic Engineering*, Houghton Mifflin Company, Massachusetts, 1988.
10. U.S. Army Corps of Engineers, Hydrologic Engineering Center, *HEC-RAS River Analysis System*, Version 4.0.0, March 2008.
11. Albuquerque Development Process Manual, Volume II – Design Criteria, Chapter 22 *Drainage, Flood Control and Erosion Control*, October 2008.
12. Albuquerque Diversion Channels Project, Rio Grande and Tributaries, Albuquerque, New Mexico and Vicinity. *Design Memorandum No. 5, North Diversion Channel – Phase II and III. Alameda Outlet Structure to Campus Wash*, USACE, 1965.
13. *Design Analysis Report for the Osuna Road Storm Drain Project*, Prepared For: City of Albuquerque, New Mexico, Bohannon-Huston Inc., June 26, 2007.
14. *Osuna Road, Second Street Through North Diversion Channel Drainage Report*, Prepared For: Bernalillo County Road Department, County of Bernalillo, Albuquerque, New Mexico, Espey, Huston & Associates, Inc., August 1986.



## **Appendix A: Hydrology**



## **Exhibit 1 - Watershed Subbasin Map**



## **NOAA 14 Rainfall Values**



# POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14



New Mexico 35.16 N 106.6 W 5111 feet  
from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4  
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley  
NOAA, National Weather Service, Silver Spring, Maryland, 2006

Extracted: Wed Oct 20 2010

[Confidence Limits](#) | [Seasonality](#) | [Related Info](#) | [GIS data](#) | [Maps](#) | [Docs](#) | [Return to State Map](#)

| Precipitation Frequency Estimates (inches) |              |               |               |               |               |                |             |             |              |              |              |              |              |               |               |               |               |               |
|--------------------------------------------|--------------|---------------|---------------|---------------|---------------|----------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|---------------|---------------|
| ARI*<br>(years)                            | <u>5 min</u> | <u>10 min</u> | <u>15 min</u> | <u>30 min</u> | <u>60 min</u> | <u>120 min</u> | <u>3 hr</u> | <u>6 hr</u> | <u>12 hr</u> | <u>24 hr</u> | <u>48 hr</u> | <u>4 day</u> | <u>7 day</u> | <u>10 day</u> | <u>20 day</u> | <u>30 day</u> | <u>45 day</u> | <u>60 day</u> |
| 1                                          | 0.17         | 0.26          | 0.32          | 0.43          | 0.53          | 0.64           | 0.68        | 0.80        | 0.88         | 0.99         | 1.03         | 1.24         | 1.42         | 1.56          | 1.94          | 2.32          | 2.83          | 3.26          |
| 2                                          | 0.22         | 0.33          | 0.41          | 0.55          | 0.69          | 0.82           | 0.87        | 1.01        | 1.11         | 1.24         | 1.30         | 1.54         | 1.75         | 1.93          | 2.41          | 2.87          | 3.50          | 4.03          |
| 5                                          | 0.29         | 0.45          | 0.55          | 0.74          | 0.92          | 1.08           | 1.14        | 1.30        | 1.41         | 1.56         | 1.63         | 1.89         | 2.13         | 2.36          | 2.92          | 3.44          | 4.16          | 4.78          |
| 10                                         | 0.35         | 0.54          | 0.66          | 0.89          | 1.11          | 1.30           | 1.36        | 1.53        | 1.64         | 1.81         | 1.89         | 2.16         | 2.42         | 2.69          | 3.30          | 3.86          | 4.63          | 5.32          |
| 25                                         | 0.43         | 0.66          | 0.81          | 1.10          | 1.36          | 1.60           | 1.66        | 1.86        | 1.96         | 2.15         | 2.24         | 2.52         | 2.80         | 3.13          | 3.78          | 4.38          | 5.18          | 5.97          |
| 50                                         | 0.50         | 0.76          | 0.94          | 1.26          | 1.56          | 1.84           | 1.91        | 2.10        | 2.21         | 2.41         | 2.52         | 2.79         | 3.08         | 3.46          | 4.13          | 4.75          | 5.56          | 6.40          |
| 100                                        | 0.56         | 0.86          | 1.06          | 1.43          | 1.77          | 2.09           | 2.17        | 2.37        | 2.47         | 2.69         | 2.80         | 3.07         | 3.35         | 3.78          | 4.46          | 5.09          | 5.89          | 6.79          |
| 200                                        | 0.63         | 0.96          | 1.20          | 1.61          | 1.99          | 2.36           | 2.44        | 2.65        | 2.73         | 2.97         | 3.08         | 3.34         | 3.62         | 4.10          | 4.77          | 5.41          | 6.17          | 7.12          |
| 500                                        | 0.73         | 1.11          | 1.38          | 1.86          | 2.30          | 2.74           | 2.83        | 3.03        | 3.10         | 3.34         | 3.47         | 3.70         | 3.95         | 4.51          | 5.15          | 5.79          | 6.46          | 7.49          |
| 1000                                       | 0.81         | 1.23          | 1.52          | 2.05          | 2.54          | 3.04           | 3.14        | 3.33        | 3.39         | 3.64         | 3.77         | 3.97         | 4.20         | 4.80          | 5.42          | 6.04          | 6.62          | 7.70          |

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

Precipitation Intensity Estimates

| Min      | Hr      | P60  |      | 100 Year  | 10 Year   |
|----------|---------|------|------|-----------|-----------|
| Tc (min) | Tc (hr) | 100  | 10   | I (in/hr) | I (in/hr) |
| 5        | 0.08    | 1.76 | 1.10 | 4.78      | 2.99      |
| 10       | 0.17    | 1.76 | 1.10 | 4.70      | 2.94      |
| 15       | 0.25    | 1.76 | 1.10 | 4.03      | 2.52      |
| 20       | 0.33    | 1.76 | 1.10 | 3.50      | 2.19      |
| 25       | 0.42    | 1.76 | 1.10 | 3.10      | 1.94      |
| 30       | 0.50    | 1.76 | 1.10 | 2.79      | 1.74      |
| 35       | 0.58    | 1.76 | 1.10 | 2.53      | 1.58      |
| 40       | 0.67    | 1.76 | 1.10 | 2.33      | 1.46      |
| 45       | 0.75    | 1.76 | 1.10 | 2.16      | 1.35      |
| 50       | 0.83    | 1.76 | 1.10 | 2.01      | 1.26      |
| 55       | 0.92    | 1.76 | 1.10 | 1.89      | 1.18      |
| 60       | 1.00    | 1.76 | 1.10 | 1.78      | 1.11      |
| 65       | 1.08    | 1.76 | 1.10 | 1.68      | 1.05      |
| 70       | 1.17    | 1.76 | 1.10 | 1.60      | 1.00      |
| 75       | 1.25    | 1.76 | 1.10 | 1.52      | 0.95      |
| 80       | 1.33    | 1.76 | 1.10 | 1.45      | 0.91      |
| 85       | 1.42    | 1.76 | 1.10 | 1.39      | 0.87      |
| 90       | 1.50    | 1.76 | 1.10 | 1.33      | 0.83      |
| 95       | 1.58    | 1.76 | 1.10 | 1.28      | 0.80      |
| 100      | 1.67    | 1.76 | 1.10 | 1.24      | 0.77      |
| 105      | 1.75    | 1.76 | 1.10 | 1.19      | 0.75      |
| 110      | 1.83    | 1.76 | 1.10 | 1.15      | 0.72      |
| 115      | 1.92    | 1.76 | 1.10 | 1.12      | 0.70      |
| 120      | 2.00    | 1.76 | 1.10 | 1.08      | 0.68      |

Intensity had calculated as per the equation given in Section A.7



## **Subbasin Parameters Table**

Osuna Road Widening, I-25 to Edith Boulevard

Subbasin Parameters

Note: All calculations per Part B, Chapter 22, Albuquerque Development Process Manual, Vol. II

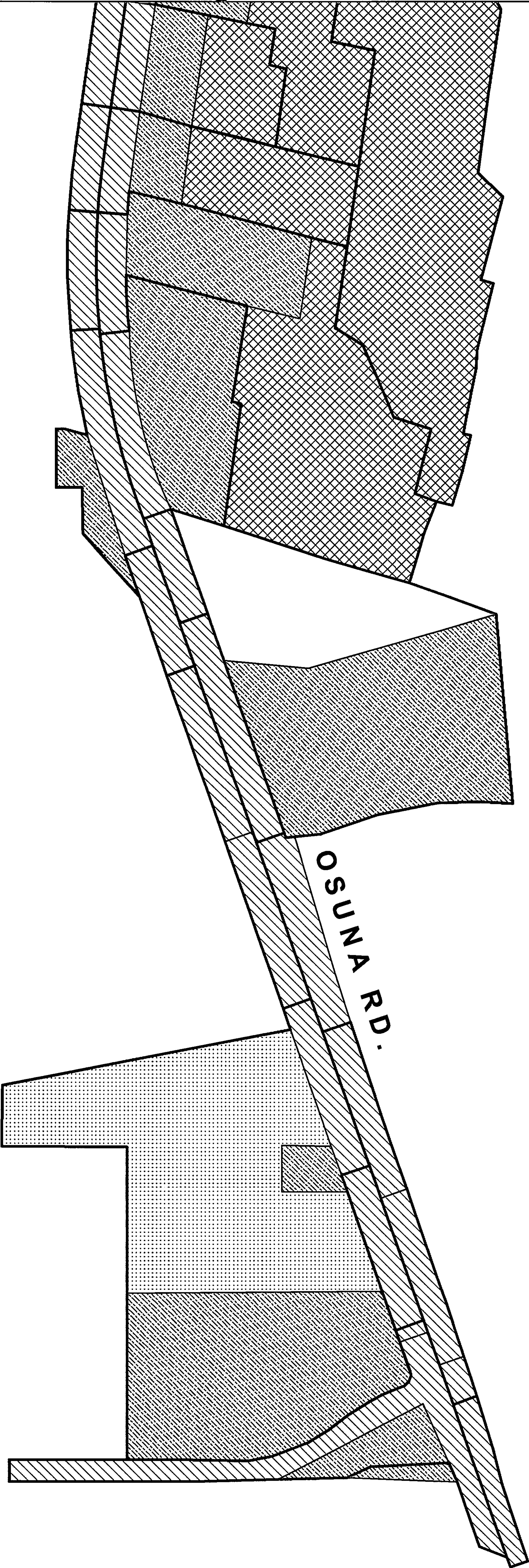
|     |                                                                                                |
|-----|------------------------------------------------------------------------------------------------|
| K   | Conveyance Condition                                                                           |
| 0.7 | Turf, landscaped areas and undisturbed natural areas, sheet flow, first 400-ft only            |
| 1   | Bare or undisturbed soil areas and paved areas, sheet flow, first 400-ft only                  |
| 2   | Shallow Concentrated Flow, paved or unpaved                                                    |
| 3   | Street flow, storm sewers, and that portion of subbasins below the upper 2000-ft for subbasins |
| 4   | Constructed Channels                                                                           |

| Watershed | Landuse     |                |                |            |                  |         |         |          | Land Treatment |    |         |         | Tp Calculation |                |                |                |                |                |                |                |                |                |                |                |                |                |  |  |
|-----------|-------------|----------------|----------------|------------|------------------|---------|---------|----------|----------------|----|---------|---------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--|--|
|           | Residential | Dwelling Units | Units Per Acre | Commercial | Light Industrial | Nursery | Basin   | Arterial | A              | B  | C       | D       | L <sub>1</sub> | S <sub>1</sub> | K <sub>1</sub> | V <sub>1</sub> | L <sub>2</sub> | S <sub>2</sub> | K <sub>2</sub> | V <sub>2</sub> | L <sub>3</sub> | S <sub>3</sub> | K <sub>3</sub> | V <sub>3</sub> | t <sub>c</sub> | t <sub>p</sub> |  |  |
|           | sf          | ea             | ea/ac          | sf         | sf               | sf      | sf      | sf       |                |    | sf      | sf      | ft             | /ft            | --             | ft/s           | ft             | /ft            | --             | ft/s           | ft             | /ft            | --             | ft/s           | hr             | min            |  |  |
| OS-EB-31a | 838,818     | 52             | 2.70           | 291,168    | --               | --      | --      | --       | --             | -- | 296,869 | 833,117 | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-WB-30  | --          | --             | --             | --         | --               | --      | --      | 118,836  | --             | -- | 11,884  | 106,952 | 400            | 0.008          | 1              | 0.87           | 1,320          | 0.002          | 2              | 0.95           | --             | --             | --             | 0.00           | 0.51           | 0.342          |  |  |
| OS-WB-31b | 344,370     | 13             | 1.64           | --         | --               | --      | --      | 20,920   | --             | -- | 81,773  | 283,517 | 400            | 0.010          | 1              | 1.00           | 840            | 0.004          | 2              | 1.20           | --             | --             | --             | 0.00           | 0.31           | 0.204          |  |  |
| OS-EB-32  | --          | --             | --             | --         | --               | --      | --      | 61,483   | --             | -- | 6,148   | 55,335  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-WB-33  | 474,270     | 38             | 3.49           | 65,591     | --               | --      | --      | 40,372   | --             | -- | 191,316 | 388,917 | 400            | 0.005          | 1              | 0.71           | 1,000          | 0.006          | 2              | 1.55           | --             | --             | --             | 0.00           | 0.34           | 0.224          |  |  |
| OS-EB-34  | --          | --             | --             | --         | --               | --      | --      | 32,322   | --             | -- | 3,232   | 29,090  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-WB-35  | --          | --             | --             | 60,810     | --               | --      | --      | 20,320   | --             | -- | 8,113   | 73,017  | 400            | 0.018          | 1              | 1.32           | --             | --             | --             | 0.00           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-EB-36  | --          | --             | --             | --         | --               | --      | --      | 29,175   | --             | -- | 2,918   | 26,258  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-WB-37  | --          | --             | --             | --         | --               | --      | --      | 31,849   | --             | -- | 3,185   | 28,664  | 367            | 0.022          | 1              | --             | --             | --             | --             | --             | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| N-2       | --          | --             | --             | --         | --               | --      | 63,811  | 37,668   | --             | -- | 67,578  | 33,901  | 400            | 0.013          | 1              | 1.12           | 200            | 0.005          | 2              | 1.41           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-EB-38  | --          | --             | --             | --         | --               | --      | --      | 18,418   | --             | -- | 1,842   | 16,576  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| O-1       | --          | --             | --             | --         | --               | --      | --      | 41,567   | --             | -- | 4,157   | 37,410  | 400            | 0.008          | 1              | 0.87           | 550            | 0.011          | 2              | 2.09           | --             | --             | --             | 0.00           | 0.20           | 0.134          |  |  |
| O-2       | --          | --             | --             | 101,123    | --               | --      | --      | --       | --             | -- | 10,112  | 91,011  | 400            | 0.010          | 1              | 1.00           | 760            | 0.009          | 2              | 1.92           | --             | --             | --             | 0.00           | 0.22           | 0.147          |  |  |
| OS-EB-40  | --          | --             | --             | --         | --               | --      | --      | 26,157   | --             | -- | 2,616   | 23,541  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-WB-41  | --          | --             | --             | --         | --               | --      | --      | 559      | --             | -- | 56      | 503     | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-EB-42  | --          | --             | --             | --         | --               | --      | --      | 23,887   | --             | -- | 2,389   | 21,498  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-WB-43  | --          | --             | --             | 89,205     | --               | --      | --      | 28,927   | --             | -- | 11,813  | 106,319 | 400            | 0.013          | 1              | 1.12           | 50             | 0.040          | 2              | 4.00           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| O-3       | 143,273     | 5              | 1.52           | 167,778    | --               | --      | --      | --       | --             | -- | 48,352  | 262,699 | 400            | 0.018          | 1              | 1.32           | 725            | 0.015          | 2              | 2.46           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| O-4       | --          | --             | --             | 131,450    | --               | --      | --      | --       | --             | -- | 13,145  | 118,305 | 400            | 0.015          | 1              | 1.22           | 200            | 0.010          | 2              | 2.00           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-EB-44  | --          | --             | --             | --         | --               | --      | --      | 21,536   | --             | -- | 2,154   | 19,382  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| WS-WB-45  | 246,814     | 21             | 3.71           | 28,199     | --               | 50,525  | --      | 23,651   | --             | -- | 153,851 | 195,338 | 400            | 0.013          | 1              | 1.12           | 720            | 0.011          | 2              | 2.11           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-EB-46  | --          | --             | --             | --         | --               | --      | --      | 22,331   | --             | -- | 2,233   | 20,098  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-WB-47  | --          | --             | --             | --         | --               | --      | --      | 17,344   | --             | -- | 1,734   | 15,610  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-EB-48  | --          | --             | --             | --         | --               | --      | --      | 20,260   | --             | -- | 2,026   | 18,234  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-WB-49  | 538,130     | 21             | 1.70           | 26,550     | --               | 108,740 | --      | 32,492   | --             | -- | 241,769 | 464,143 | 400            | 0.013          | 1              | 1.12           | 2,000          | 0.016          | 2              | 2.49           | --             | --             | --             | 0.00           | 0.32           | 0.215          |  |  |
| OS-EB-50  | --          | --             | --             | --         | --               | --      | --      | 22,271   | --             | -- | 2,227   | 20,044  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-WB-51  | 91,318      | 6              | 2.86           | 34,766     | --               | --      | --      | 22,528   | --             | -- | 36,052  | 112,560 | 400            | 0.010          | 1              | 1.00           | 300            | 0.020          | 2              | 2.83           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-EB-52  | --          | --             | --             | 29,887     | --               | --      | --      | 42,255   | --             | -- | 7,214   | 64,928  | 400            | 0.030          | 1              | 1.73           | 230            | 0.022          | 3              | 4.42           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-WB-53  | 58,675      | 3              | 2.23           | 38,288     | --               | --      | --      | 20,612   | --             | -- | 22,368  | 95,207  | 400            | 0.023          | 1              | 1.50           | 130            | 0.031          | 2              | 3.51           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-EB-54  | --          | --             | --             | --         | --               | --      | --      | 24,244   | --             | -- | 2,424   | 21,820  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-WB-55  | 87,598      | 4              | 1.99           | 27,508     | --               | --      | --      | 33,627   | --             | -- | 28,976  | 119,757 | 400            | 0.015          | 1              | 1.22           | 300            | 0.023          | 2              | 3.06           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-EB-56  | --          | --             | --             | --         | --               | --      | --      | 67,378   | --             | -- | 6,738   | 60,640  | 400            | 0.015          | 1              | 1.22           | 480            | 0.008          | 3              | 2.74           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-WB-57  | 276,963     | 11             | 1.73           | 98,022     | --               | --      | --      | 23,015   | --             | -- | 78,258  | 319,742 | 400            | 0.015          | 1              | 1.22           | 1,000          | 0.018          | 2              | 2.68           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-EB-58a | --          | --             | --             | 319,135    | 345,317          | --      | --      | 33,755   | --             | -- | 138,884 | 559,323 | 400            | 0.015          | 1              | 1.22           | 865            | 0.016          | 2              | 2.54           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-EB-58b | --          | --             | --             | --         | --               | --      | --      | 31,350   | --             | -- | 3,135   | 28,215  | 395            | 0.015          | 1              | 1.23           | --             | --             | --             | 0.00           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-WB-59  | --          | --             | --             | 140,172    | --               | --      | --      | 32,739   | --             | -- | 17,291  | 155,620 | 400            | 0.020          | 1              | 1.41           | 250            | 0.032          | 2              | 3.58           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-EB-60  | --          | --             | --             | 31,358     | --               | --      | --      | 104,364  | --             | -- | 13,572  | 122,150 | 400            | 0.005          | 1              | 0.71           | 860            | 0.012          | 3              | 3.23           | --             | --             | --             | 0.00           | 0.23           | 0.154          |  |  |
| OS-WB-61  | --          | --             | --             | --         | --               | --      | --      | 21,071   | --             | -- | 2,107   | 18,964  | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | --             | 0.20           | 0.133          |  |  |
| OS-WB-63  | --          | --             | --             | --         | --               | --      | --      | 44,462   | --             | -- | 4,446   | 40,016  | 400            | 0.010          | 1              | 1.00           | 170            | 0.024          | 3              | 4.60           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| S-1       | --          | --             | --             | 278,895    | --               | --      | 163,019 | --       | --             | -- | 190,909 | 251,006 | 400            | 0.009          | 1              | 0.94           | 170            | 0.012          | 2              | 2.17           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-WB-65a | --          | --             | --             | --         | --               | --      | --      | 43,253   | --             | -- | 4,325   | 38,928  | 400            | 0.013          | 1              | 1.12           | 90             | 0.022          | 3              | 4.47           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-WB-65b | --          | --             | --             | --         | --               | --      | --      | 69,930   | --             | -- | 6,993   | 62,937  | 400            | 0.013          | 1              | 1.12           | 580            | 0.017          | 3              | 3.94           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |
| OS-WB-65c | --          | --             | --             | --         | --               | --      | --      | 23,460   | --             | -- | 2,346   | 21,114  | 420            | 0.007          | 1              | 0.85           | --             | --             | --             | 0.00           | --             | --             | --             | 0.00           | 0.20           | 0.133          |  |  |



## **Exhibit 2 - Land Use Map**

# LAND USE MAP



TYPE C Land Treatment (Roads)

TYPE D Land Treatment (Residential)

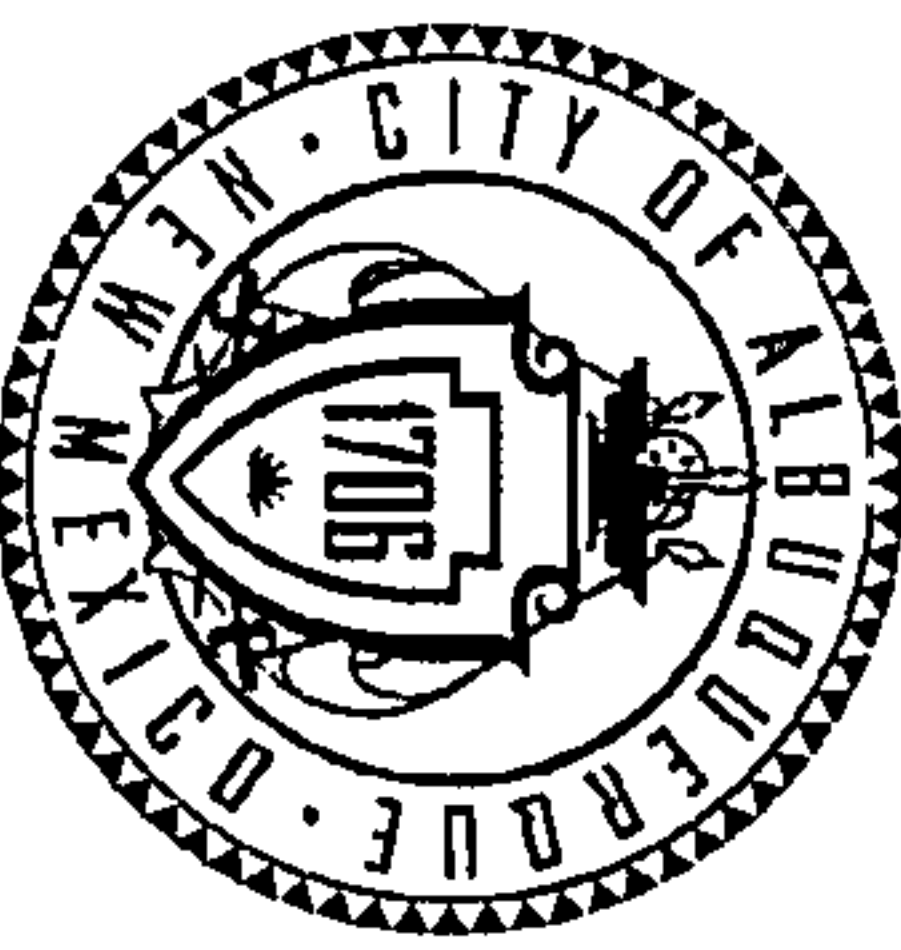
TYPE D Land Treatment (Commercial)

TYPE D Land Treatment (Nursery)

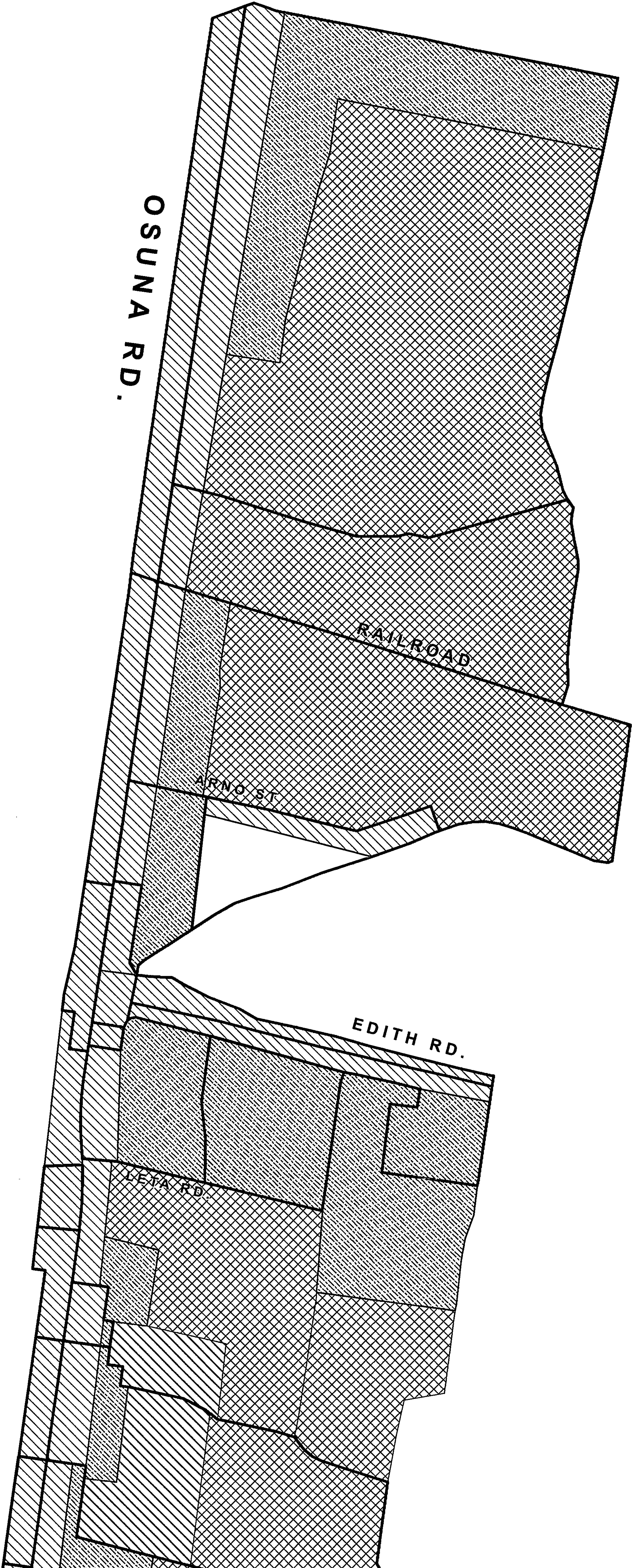
TYPE D Land Treatment (Industrial)

Subbasin Boundaries

Legend

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |             |      |    |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-------------|------|----|-------------|
| REVISIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |    |             |      |    |             |
| DATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |             |      |    |             |
| <div><div><div>T.Y.LIN INTERNATIONAL</div><div>engineers   planners   scientist</div><div>60 East Rio Salado Parkway</div><div>Suite 501</div><div>Tempe, Arizona. 85281</div><div>Tel: (480) 968-8814</div></div><div><div>CITY OF ALBUQUERQUE</div><div>ROAD NO. OSUNA</div><div>COUNTY BERNALILLO</div><div>CITY PROJECT ID 5575.91</div></div><div><div>OSUNA ROAD WIDENING</div><div>LAND USE MAP</div><div>EXHIBIT 2</div><div>SCALE: 0 6,250 12,500 25,000 Miles</div></div><div><div></div><div>Sheet No. 1 OF 2</div></div></div> |    |             |      |    |             |

# LAND USE MAP



OSUNA RD.

RAILROAD

ARMO ST.

EDITH RD.

LEPA RD.

## Legend

- |  |                                     |  |                                    |
|--|-------------------------------------|--|------------------------------------|
|  | TYPE C Land Treatment (Roads)       |  | TYPE D Land Treatment (Nursery)    |
|  | TYPE D Land Treatment (Residential) |  | TYPE D Land Treatment (Industrial) |
|  | TYPE D Land Treatment (Commercial)  |  | Subbasin Boundaries                |

### REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|------|----|-------------|------|----|-------------|
|------|----|-------------|------|----|-------------|

**T.Y.LIN INTERNATIONAL**

engineers | planners | scientist  
60 East Rio Salado Parkway  
Suite 501  
Tempe, Arizona. 85281  
Tel: (480) 968-8814

**CITY OF ALBUQUERQUE**

ROAD NO.

COUNTY

CITY PROJECT ID

OSUNA

BERNALILLO

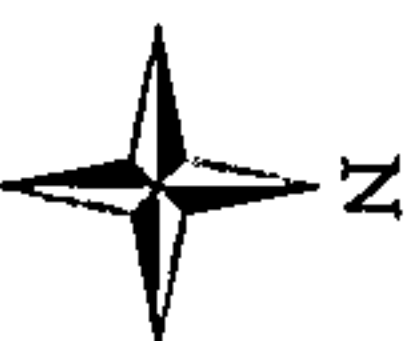
5575.91

**OSUNA ROAD WIDENING**

LAND USE MAP  
EXHIBIT 2

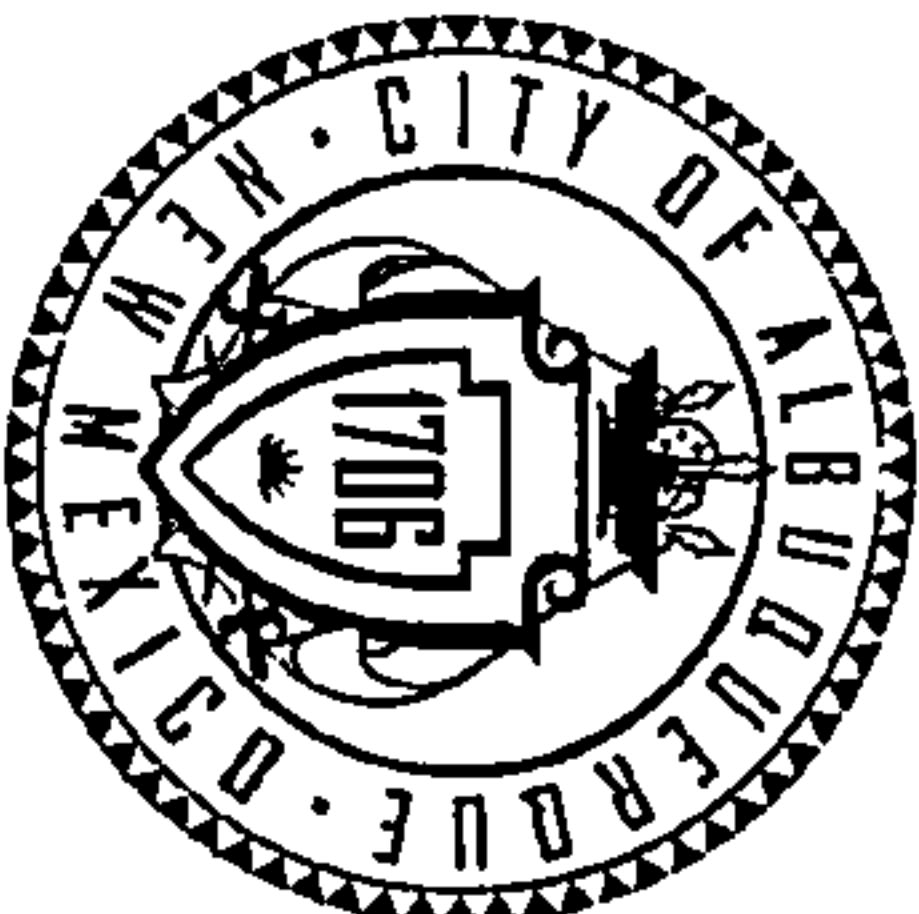
SCALE:

0 6,250 12,500 25,000  
Miles



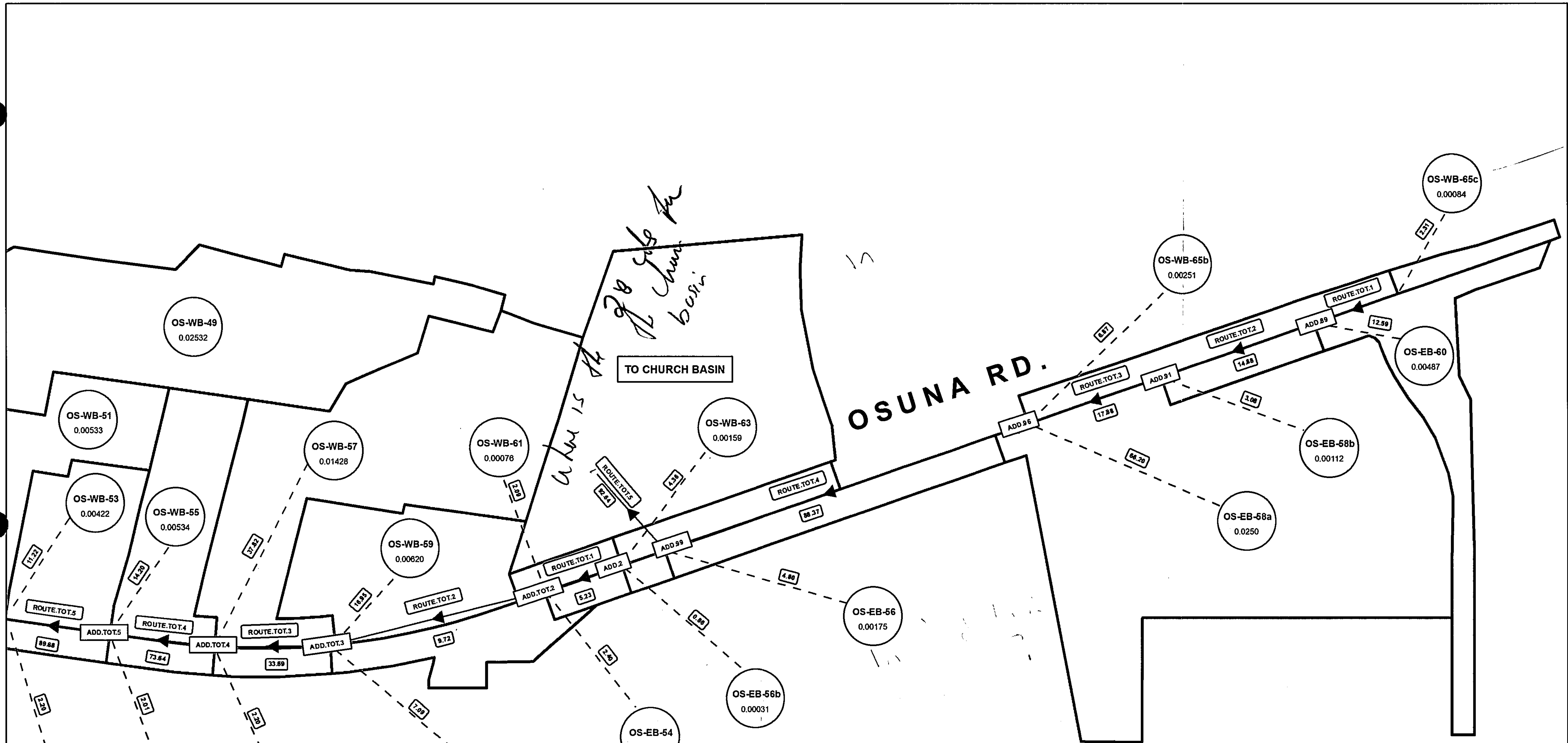
Sheet No

2 OF 2





## **Exhibit 3 - AHYMO Schematic Map 100-year, 6-hour Storm**



**Legend**

 Direction of Stormwater Flow

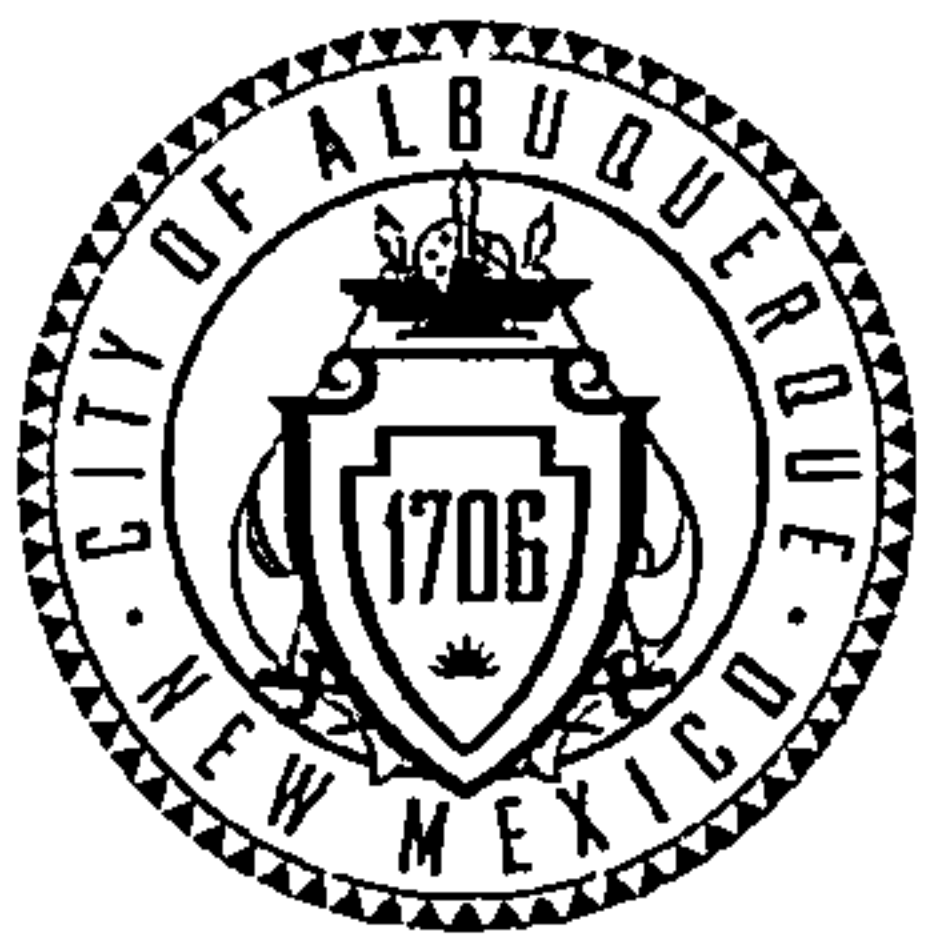
 Route Hydrograph

 Add Hydrograph

 100-YR, 6-HR Peak Discharge

 Basin ID  
Basin Area (sq.mi.)

 Subbasin Boundaries



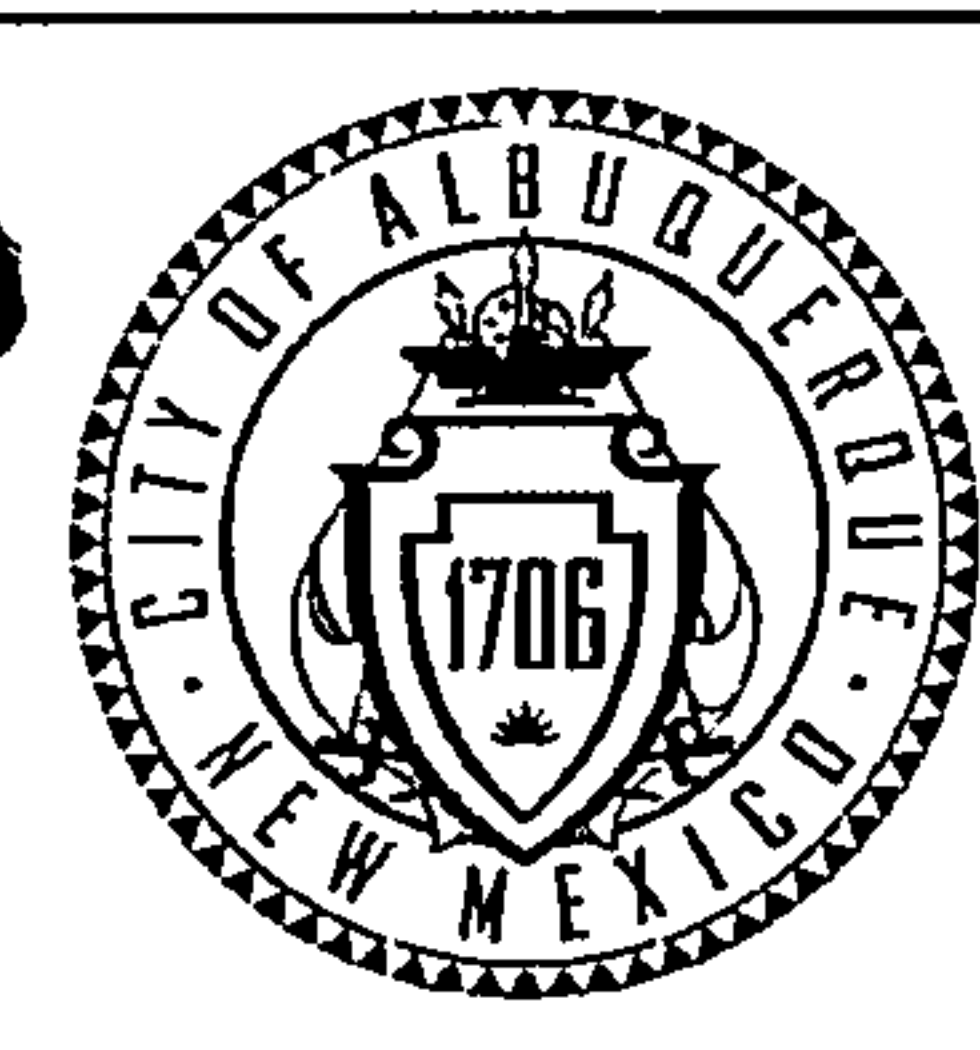
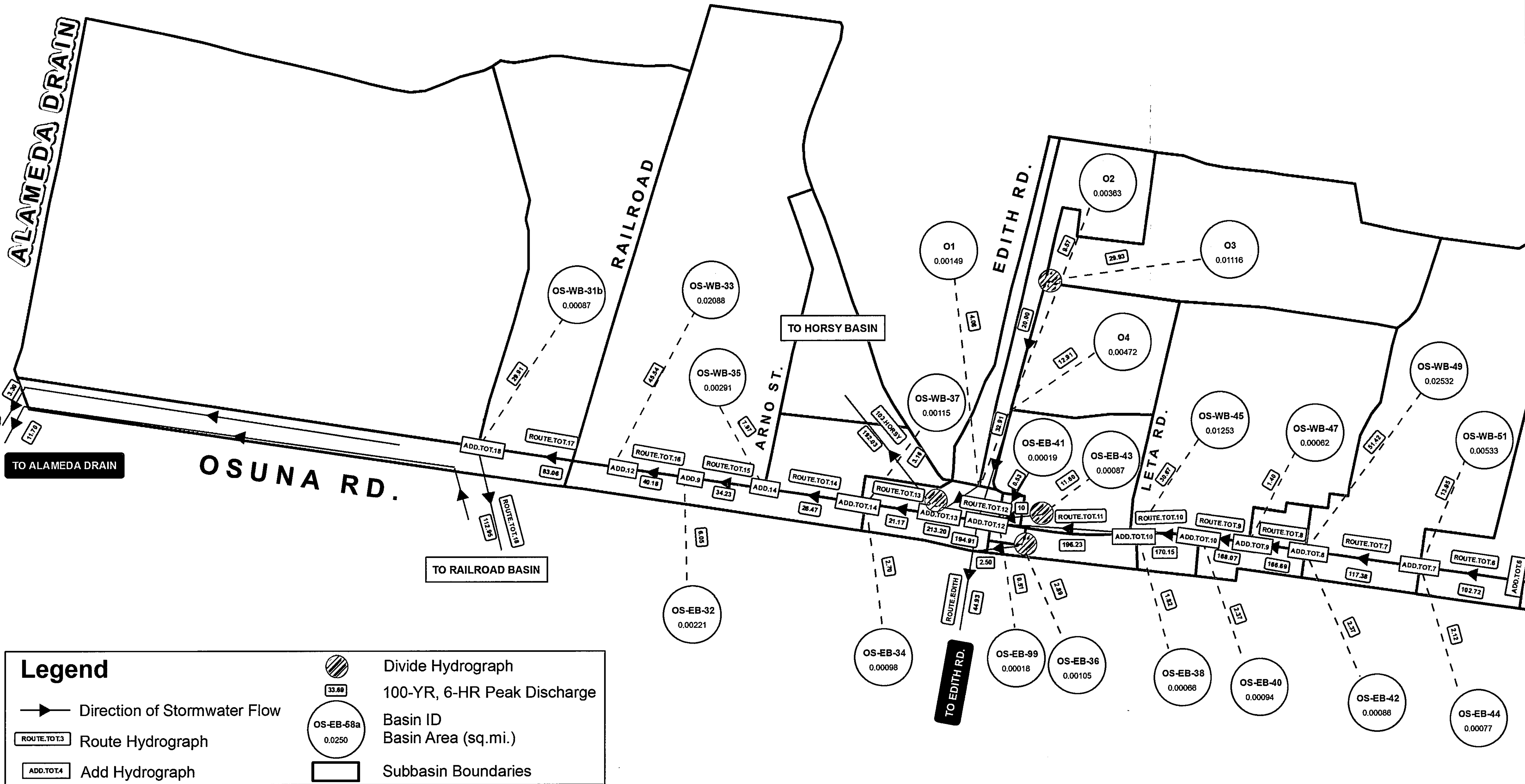
| REVISIONS |    |             |      |    |             |
|-----------|----|-------------|------|----|-------------|
| DATE      | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|           |    |             |      |    |             |

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| CITY OF ALBUQUERQUE |            |                 |
|---------------------|------------|-----------------|
| ROAD NO.            | COUNTY     | CITY PROJECT ID |
| OSUNA               | BERNALILLO | 5575.91         |

**OSUNA ROAD WIDENING**  
**AHYMO SCHEMATIC MAP**  
**EXHIBIT 3**

SCALE: 0 6,250 12,500 25,000  
Miles



| REVISIONS |    |             |      |    |             |
|-----------|----|-------------|------|----|-------------|
| DATE      | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|           |    |             |      |    |             |
|           |    |             |      |    |             |
|           |    |             |      |    |             |

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| CITY OF ALBUQUERQUE |            |                 |
|---------------------|------------|-----------------|
| ROAD NO.            | COUNTY     | CITY PROJECT ID |
| OSUNA               | BERNALILLO | 5575.91         |

**OSUNA ROAD WIDENING**  
**AHYMO SCHEMATIC MAP**  
**EXHIBIT 3**

SCALE: 0 6,250 12,500 25,000 Miles

Sheet No  
**2 OF 2**



# **AHYMO Model Input and Summary Output 100-year, 6-hour Storm**

# 100YR\_Combine.HYM

\*S AHYMO FILE FOR OSUNA ROAD STORM DRAIN FROM CHURCH BASIN TO RAILROAD BASIN  
 \*S PROPOSED CONDITIONS, 6HR, 100YR.  
 \*S  
 \*S FILE: 100YR.HYM  
 \*S DATE REVISED: 09/14/10

\*\*\*\*\*  
 \*\*\*\*\*

\*S MODEL DEVELOPED TO REFLECT EXISTING DRAINAGE CONDITIONS FOR THE OSUNA STORM  
 DRAIN PROJECT  
 \*S ANALYSIS POINTS TAKEN AT BASIN INFLOW POINTS AND CRITICAL ADD POINTS ALONG OSUNA  
 ROAD  
 \*S RAINFALL VALUES TAKING FROM NOAA PRECIPITATION FREQUENCY DATA SERVER FROM NOAA  
 ATLAS 14Fj  
 \*S MODEL REFLECTS 6-HOUR RAINFALL DISTRIBUTION FOR 100-YR STORM EVENT

\*  
 \*  
 \*S ASSUMPTIONS:  
 \*S 1. ALL VSC ROUTING MUSKINGUM-CUNGE ROUTING.  
 \*S 2. LAND TREATMENTS REFLECT EXISTING LAND CONDITIONS

\*S  
 \*S  
 \* 10 YEAR RAINFALL TABLE

\*RAINFALL TYPE=1 RAIN QUARTER=0.66  
 \* RAIN ONE=1.11 IN RAIN SIX=1.53 IN  
 \* RAIN DAY=1.81 IN DT=0.01 HRS  
 \*S 100 YEAR RAINFALL TABLE

RAINFALL TYPE=1 RAIN QUARTER=1.06  
 RAIN ONE=1.77 IN RAIN SIX=2.37 IN  
 RAIN DAY=2.69 IN DT=0.01 HRS

\*S

\*S SEDIMENT BULKING FACTOR 2% for Existing Conditions  
 SEDIMENT BULK CODE=1 BULK FACTOR=1.02

\*S  
 \*S

\*\*\*\*\* UPSTREAM \*\*\*\*\*  
 \*\*\*\*\* MH-7 \*\*\*\*\*

\*S BASIN OS.WB.65C  
 COMPUTE NM HYD ID=65 HYD NO=OS.WB.65C AREA=0.00084 SQ MI  
 PER A=0 PER B=0 PER C=10 PER D=90  
 TP=0.133 HR MASS RAIN=-1

\*S  
 \*\*\*\*\* ROUTE.TOT.1 \*\*\*\*\*

\*S

\*S ROUTE OS.WB.65C THROUGH PIPE LENGTH MH-7 TO MH-6  
 COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=0.013  
 DIA=2 FT N=.013

ROUTE MCUNGE ID=88 HYD NO=ROUTE.TOT.1 INFLOW ID=65  
 DT=0.0 LENGTH=265

\*S

\*\*\*\*\* MH-6 \*\*\*\*\*

\*S

\*S BASIN OS.EB.60  
 COMPUTE NM HYD ID=60 HYD NO=OS.EB.60 AREA=0.00487 SQ MI  
 PER A=0 PER B=0 PER C=10 PER D=90  
 TP=0.154 HR MASS RAIN=-1

\*\*\*\*\* ADD.TOT.2 \*\*\*\*\*

\*S

\*S ADD OS.EB.60 AND ROUTE.TOT.1

100YR\_Combine.HYM

```

ADD HYD          ID=89  HYD=ADD.89  ID I=60  ID II=88
PRINT HYD        ID=89  CODE=1
PLOT HYD         ID=89
*S
***** ROUTE.TOT.2 *****
*S
*S      ROUTE ADD.89 THROUGH PIPE LENGTH MH-6 TO MH-5
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.021
                      DIA=2 FT  N=.013
ROUTE MCUNGE        ID=90  HYD NO=ROUTE.TOT.2  INFLOW ID=89
                      DT=0.0  LENGTH=350
*S
***** MH-5 *****
*S      BASIN OS.EB.58b
COMPUTE NM HYD      ID=58  HYD NO=OS.EB.58b  AREA=0.00112 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.133 HR  MASS RAIN=-1
*S
***** ADD.TOT.3 *****
*S
*S      ADD OS.EB.58b AND ROUTE.TOT.2
ADD HYD            ID=91  HYD=ADD.91  ID I=58  ID II=90
*S
***** ROUTE.TOT.3 *****
*S
*S      ROUTE ADD.91 THROUGH PIPE LENGTH MH-5 TO MH-4
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.022
                      DIA=2 FT  N=.013
ROUTE MCUNGE        ID=92  HYD NO=ROUTE.TOT.3  INFLOW ID=91
                      DT=0.0  LENGTH=370
*S
***** MH-4 *****
*S      BASIN OS.WB.65b
COMPUTE NM HYD      ID=93  HYD NO=OS.WB.65b  AREA=0.00251 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.133 HR  MASS RAIN=-1
*S
*S      BASIN OS.EB.58a
COMPUTE NM HYD      ID=94  HYD NO=OS.EB.58a  AREA=0.0250 SQ MI
                      PER A=0 PER B=0 PER C=20 PER D=80
                      TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.65b AND OS.EB.58a
ADD HYD            ID=95  HYD=ADD.95  ID I=93  ID II=94
*S
***** ADD.TOT.4 *****
*S
*S      ADD ADD.95 AND ROUTE.TOT.3
ADD HYD            ID=96  HYD=ADD.96  ID I=95  ID II=92
*S
***** ROUTE.TOT.4 *****
*S
*S      ROUTE ADD.96 THROUGH PIPE LENGTH MH-4 TO MH-3
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.007
                      DIA=3.5 FT  N=.013
ROUTE MCUNGE        ID=97  HYD NO=ROUTE.TOT.4  INFLOW ID=96
                      DT=0.0  LENGTH=1000
*S
***** MH-3 *****
*S      BASIN OS.EB.56
COMPUTE NM HYD      ID=12  HYD NO=OS.EB.56  AREA=0.00175 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.133 HR  MASS RAIN=-1

```

100YR\_Combine.HYM

```

*S
***** ADD.TOT.5 *****
*S
*S      ADD OS.EB.56 AND ROUTE.TOT.4
ADD HYD      ID=99  HYD=ADD.99  ID I=12  ID II=97
*S
***** ROUTE.TOT.5 *****
*S
*S      ROUTE ADD.99 THROUGH PIPE LENGTH MH-3 TO MH-1
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.009
                      DIA=3.5 FT  N=.013
ROUTE MCUNGE      ID=11  HYD NO=ROUTE.TOT.5  INFLOW ID=99
                      DT=0.0  LENGTH=125
PRINT HYD      ID=11  CODE=0
PLOT HYD      ID=11
*S
***** DOWNSTREAM *****
***** MH-4 *****
*S      BASIN OS.WB.63
COMPUTE NM HYD      ID=99  HYD NO=OS.WB.63  AREA=0.00159 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.133 HR  MASS RAIN=-1
*S      BASIN OS.EB.56b
COMPUTE NM HYD      ID=1  HYD NO=OS.EB.56b  AREA=0.00031 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.63 AND OS.EB.56b
ADD HYD      ID=2  HYD=ADD.2  ID I=99  ID II=1
*S
***** ROUTE.TOT.1 *****
*S
*S      ROUTE ADD.2 THROUGH PIPE LENGTH MH-4 TO MH-5
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.016
                      DIA=2 FT  N=.013
ROUTE MCUNGE      ID=98  HYD NO=ROUTE.TOT.1  INFLOW ID=2
                      DT=0.0  LENGTH=216
*S
***** MH-5 *****
*S
*S      BASIN OS.WB.61
COMPUTE NM HYD      ID=97  HYD NO=OS.WB.61  AREA=0.00076 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.133 HR  MASS RAIN=-1
*S
*S      BASIN OS.EB.54
COMPUTE NM HYD      ID=96  HYD NO=OS.EB.54  AREA=0.00087 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.61 AND OS.EB.54
ADD HYD      ID=95  HYD=ADD.87  ID I=97  ID II=96
*S
***** ADD.TOT.2 *****
*S
*S      ADD ADD.87 AND ROUTE.TOT.1
ADD HYD      ID=94  HYD=ADD.TOT.2  ID I=95  ID II=98
*S
***** ROUTE.TOT.2 *****
*S
*S      ROUTE ADD.TOT.2 THROUGH PIPE LENGTH MH-5 TO MH-6
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.029
                      DIA=2 FT  N=.013

```

```

                                100YR_Combine.HYM
ROUTE MCUNGE                ID=93  HYD NO=ROUTE.TOT.2  INFLOW ID=94
                             DT=0.0  LENGTH=560
*S
***** MH-6 *****
*S
*S      BASIN OS.WB.59
COMPUTE NM HYD              ID=92  HYD NO=OS.WB.59  AREA=0.00620 SQ MI
                             PER A=0 PER B=0 PER C=10 PER D=90
                             TP=0.133 HR  MASS RAIN=-1
*S
*S      BASIN OS.EB.52
COMPUTE NM HYD              ID=91  HYD NO=OS.EB.52  AREA=0.00259 SQ MI
                             PER A=0 PER B=0 PER C=10 PER D=90
                             TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.59 AND OS.EB.52
ADD HYD                     ID=90  HYD=ADD.84  ID I=92  ID II=91
*S
***** ADD.TOT.3 *****
*S
*S      ADD ADD.84 AND ROUTE.TOT.2
ADD HYD                     ID=89  HYD=ADD.TOT.3  ID I=90  ID II=93
*S
***** ROUTE.TOT.3 *****
*S
*S      ROUTE ADD.TOT.3 THROUGH PIPE LENGTH MH-6 TO MH-7
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.017
                             DIA=2.5 FT  N=.013
ROUTE MCUNGE              ID=88  HYD NO=ROUTE.TOT.3  INFLOW ID=89
                             DT=0.0  LENGTH=316
*S
***** MH-7 *****
*S
*S      BASIN OS.WB.57
COMPUTE NM HYD              ID=87  HYD NO=OS.WB.57  AREA=0.01428 SQ MI
                             PER A=0 PER B=0 PER C=20 PER D=80
                             TP=0.133 HR  MASS RAIN=-1
*S
*S      BASIN OS.EB.50
COMPUTE NM HYD              ID=86  HYD NO=OS.EB.50  AREA=0.00080 SQ MI
                             PER A=0 PER B=0 PER C=10 PER D=90
                             TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.57 AND OS.EB.50
ADD HYD                     ID=85  HYD=ADD.81  ID I=87  ID II=86
*S
***** ADD.TOT.4 *****
*S
*S      ADD ADD.81 AND ROUTE.TOT.3
ADD HYD                     ID=84  HYD=ADD.TOT.4  ID I=85  ID II=88
*S
***** ROUTE.TOT.4 *****
*S
*S      ROUTE ADD.TOT.4 THROUGH PIPE LENGTH MH-7 TO MH-9
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.015
                             DIA=3 FT  N=.013
ROUTE MCUNGE              ID=83  HYD NO=ROUTE.TOT.4  INFLOW ID=84
                             DT=0.0  LENGTH=265
*S
***** MH-9 *****
*S
*S      BASIN OS.WB.55
COMPUTE NM HYD              ID=82  HYD NO=OS.WB.55  AREA=0.00534 SQ MI

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                                100YR_Combine.HYM
                                PER A=0 PER B=0 PER C=19 PER D=81
                                TP=0.133 HR  MASS RAIN=-1

*S
*S      BASIN OS.EB.48
COMPUTE NM HYD      ID=81  HYD NO=OS.EB.48  AREA=0.00073 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1

*S
*S      ADD OS.WB.55 AND OS.EB.48
ADD HYD      ID=80  HYD=ADD.78  ID I=82  ID II=81
*S
***** ADD.TOT.5 *****
*S
*S      ADD ADD.78 AND ROUTE.TOT.4
ADD HYD      ID=79  HYD=ADD.TOT.5  ID I=80  ID II=83
*S
***** ROUTE.TOT.5 *****
*S
*S      ROUTE ADD.TOT.5 THROUGH PIPE LENGTH MH-9 TO MH-10
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.016
                    DIA=3 FT  N=.013
ROUTE MCUNGE      ID=78  HYD NO=ROUTE.TOT.5  INFLOW ID=79
                    DT=0.0  LENGTH=293

*S
***** MH-10 *****
*S
*S      BASIN OS.WB.53
COMPUTE NM HYD      ID=77  HYD NO=OS.WB.53  AREA=0.00422 SQ MI
                    PER A=0 PER B=0 PER C=19 PER D=81
                    TP=0.133 HR  MASS RAIN=-1

*S
*S      BASIN OS.EB.46
COMPUTE NM HYD      ID=76  HYD NO=OS.EB.46  AREA=0.00080 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1

*S
*S      ADD OS.WB.53 AND OS.EB.46
ADD HYD      ID=75  HYD=ADD.75  ID I=77  ID II=76
*S
***** ADD.TOT.6 *****
*S
*S      ADD ADD.75 AND ROUTE.TOT.5
ADD HYD      ID=74  HYD=ADD.TOT.6  ID I=75  ID II=78
*S
***** ROUTE.TOT.6 *****
*S
*S      ROUTE ADD.TOT.6 THROUGH PIPE LENGTH MH-10 TO MH-11
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.010
                    DIA=3.5 FT  N=.013
ROUTE MCUNGE      ID=73  HYD NO=ROUTE.TOT.6  INFLOW ID=74
                    DT=0.0  LENGTH=295

*S
***** MH-11 *****
*S
*S      BASIN OS.WB.51
COMPUTE NM HYD      ID=72  HYD NO=OS.WB.51  AREA=0.00533 SQ MI
                    PER A=0 PER B=0 PER C=24 PER D=76
                    TP=0.133 HR  MASS RAIN=-1

*S
*S      BASIN OS.EB.44
COMPUTE NM HYD      ID=71  HYD NO=OS.EB.44  AREA=0.00077 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1

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## 100YR\_Combine.HYM

```

*S
*S      ADD OS.WB.51 AND OS.EB.44
ADD HYD      ID=70  HYD=ADD.72  ID I=72  ID II=71
*S
***** ADD.TOT.7 *****
*S
*S      ADD ADD.72 AND ROUTE.TOT.6
ADD HYD      ID=69  HYD=ADD.TOT.7  ID I=70  ID II=73
*S
***** ROUTE.TOT.7 *****
*S
*S      ROUTE ADD.TOT.7 THROUGH PIPE LENGTH MH-11 TO MH-12
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.012
                      DIA=3.5 FT  N=.013
ROUTE MCUNGE      ID=68  HYD NO=ROUTE.TOT.7  INFLOW ID=69
                      DT=0.0  LENGTH=323
*S
***** MH-12 *****
*S
*S      BASIN OS.WB.49
COMPUTE NM HYD      ID=67  HYD NO=OS.WB.49  AREA=0.02532 SQ MI
                      PER A=0 PER B=0 PER C=34 PER D=66
                      TP=0.215 HR  MASS RAIN=-1
*S
*S      BASIN OS.EB.42
COMPUTE NM HYD      ID=66  HYD NO=OS.EB.42  AREA=0.00086 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.49 AND OS.EB.42
ADD HYD      ID=65  HYD=ADD.69  ID I=67  ID II=66
*S
***** ADD.TOT.8 *****
*S
*S      ADD ADD.69 AND ROUTE.TOT.7
ADD HYD      ID=64  HYD=ADD.TOT.8  ID I=65  ID II=68
*S
***** ROUTE.TOT.8 *****
*S
*S      ROUTE ADD.TOT.8 THROUGH PIPE LENGTH MH-12 TO MH-13
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.010
                      DIA=4 FT  N=.013
ROUTE MCUNGE      ID=63  HYD NO=ROUTE.TOT.8  INFLOW ID=64
                      DT=0.0  LENGTH=149
*S
***** MH-13 *****
*S
*S      BASIN OS.WB.47
COMPUTE NM HYD      ID=62  HYD NO=OS.WB.47  AREA=0.00062 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.215 HR  MASS RAIN=-1
***** ADD.TOT.9 *****
*S
*S      ADD OS.WB.47 AND ROUTE.TOT.8
ADD HYD      ID=61  HYD=ADD.TOT.9  ID I=62  ID II=63
*S
***** ROUTE.TOT.9 *****
*S
*S      ROUTE ADD.TOT.9 THROUGH PIPE LENGTH MH-13 TO MH-14
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.013
                      DIA=4 FT  N=.013
ROUTE MCUNGE      ID=60  HYD NO=ROUTE.TOT.9  INFLOW ID=61
                      DT=0.0  LENGTH=120

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# 100YR\_Combine.HYM

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*S
***** MH-14 *****
*S
*S      BASIN OS.EB.40
COMPUTE NM HYD      ID=59  HYD NO=OS.EB.40  AREA=0.00094 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1
***** ADD.TOT.10 *****
*S
*S      ADD OS.EB.40 AND ROUTE.TOT.9
ADD HYD      ID=58  HYD=ADD.TOT.10  ID I=59  ID II=60
*S
***** ROUTE.TOT.10 *****
*S
*S      ROUTE ADD.TOT.10 THROUGH PIPE LENGTH MH-14 TO MH-15
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.014
                    DIA=4 FT  N=.013
ROUTE MCUNGE      ID=57  HYD NO=ROUTE.TOT.10  INFLOW ID=58
                    DT=0.0  LENGTH=159
*S
***** MH-15 *****
*S
*S      BASIN OS.WB.45
COMPUTE NM HYD      ID=56  HYD NO=OS.WB.45  AREA=0.01253 SQ MI
                    PER A=0 PER B=0 PER C=44 PER D=56
                    TP=0.133 HR  MASS RAIN=-1
*S
*S      BASIN OS.EB.38
COMPUTE NM HYD      ID=55  HYD NO=OS.EB.38  AREA=0.00066 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.45 AND OS.EB.38
ADD HYD      ID=54  HYD=ADD.27  ID I=56  ID II=55
*S
***** ADD.TOT.11 *****
*S
*S      ADD ADD.27 AND ROUTE.TOT.10
ADD HYD      ID=53  HYD=ADD.TOT.11  ID I=54  ID II=57
*S
***** ROUTE.TOT.11 *****
*S
*S      ROUTE ADD.TOT.11 THROUGH PIPE LENGTH MH-15 TO MH-16
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.013
                    DIA=4 FT  N=.013
ROUTE MCUNGE      ID=52  HYD NO=ROUTE.TOT.11  INFLOW ID=53
                    DT=0.0  LENGTH=336
*S
***** Edith *****
*S
*S      BASIN O3
COMPUTE NM HYD      ID=46  HYD NO=O3  AREA=0.01116 SQ MI
                    PER A=0 PER B=0 PER C=16 PER D=84
                    TP=0.133 HR  MASS RAIN=-1
***** Split Hydrograph AT BASIN O3*****
*S
DIVIDE HYD      ID=46  CODE=999  ID I=45  HYD NO=105.EDITH.BEAR.PE
                    ID II=44  HYD NO=106.EDITH.BEAR.O2
TOTAL FLOW      DIVIDED FLOW
0              0
8              8
10            10
12            12

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                                100YR_Combine.HYM
                                14      14
                                16      16
                                18      18
                                20      20
                                22      20
                                24      20
                                26      20
                                28      20
                                30      20
PRINT HYD      ID=45  CODE=0
PLOT HYD      ID=45
PRINT HYD      ID=44  CODE=0
PLOT HYD      ID=44
*S
***** ROUTE.TOT.02 *****
*S
*S      ROUTE 105.EDITH.BEAR.Pipe THROUGH PIPE LENGTH MH.EDITH.BEAR TO
MH.EDITH.FORTKX
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.02
                        DIA=2.5 FT  N=.013
ROUTE MCUNGE      ID=43  HYD NO=ROUTE.REM.03  INFLOW ID=45
                        DT=0.0  LENGTH=400
*S
***** ADD.04 *****
*S
*S      BASIN 04
COMPUTE NM HYD      ID=42  HYD NO=04  AREA=0.00472 SQ MI
                        PER A=0 PER B=0 PER C=10 PER D=90
                        TP=0.133 HR  MASS RAIN=-1
***** Split Hydrograph AT BASIN 04*****
*S
DIVIDE HYD      ID=42 CODE=999 ID I=41 HYD NO=105.EDITH.FORTKX.Pipe
                        ID II=40 HYD NO=106.EDITH.FORTKX.02
TOTAL FLOW  DIVIDED FLOW
      0      0
      2      2
      4      4
      6      6
      8      8
     10     10
     12     12
     15     15
PRINT HYD      ID=41  CODE=0
PLOT HYD      ID=41
PRINT HYD      ID=40  CODE=0
PLOT HYD      ID=40
*S
*S      ADD 105.EDITH.FORTKX.Pipe AND ROUTE.REM.03
ADD HYD      ID=39  HYD=ADD.62  ID I=41  ID II=43
*S
***** ROUTE.TOT.04 *****
*S
*S      ROUTE ADD.62 THROUGH PIPE LENGTH MH-04 TO Intersection
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.02
                        DIA=2.5 FT  N=.013
ROUTE MCUNGE      ID=38  HYD NO=ROUTE.REM.04  INFLOW ID=39
                        DT=0.0  LENGTH=315
*S
***** MH-16-1 *****
*S
*S      BASIN OS.WB.43
COMPUTE NM HYD      ID=37  HYD NO=OS.WB.43  AREA=0.00424 SQ MI
                        PER A=0 PER B=0 PER C=10 PER D=90

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100YR\_Combine.HYM  
TP=0.133 HR MASS RAIN=-1

\*S  
\*\*\*\*\* split Hydrograph AT OS.WB.43\*\*\*\*\*

\*S  
DIVIDE HYD ID=37 CODE=999 ID I=99 HYD NO=105.OSWB43.EDITH  
ID II=98 HYD NO=106.OSWB43.OSUNA

| TOTAL FLOW | DIVIDED FLOW |
|------------|--------------|
| 0          | 0            |
| 2          | 2            |
| 4          | 4            |
| 6          | 6            |
| 8          | 8            |
| 10         | 10           |
| 12         | 10           |

PRINT HYD ID=99 CODE=0  
PLOT HYD ID=99  
PRINT HYD ID=98 CODE=0  
PLOT HYD ID=98

\*S  
\*S BASIN OS.EB.36  
COMPUTE NM HYD ID=36 HYD NO=OS.EB.36 AREA=0.00105 SQ MI  
PER A=0 PER B=0 PER C=10 PER D=90  
TP=0.133 HR MASS RAIN=-1

\*\*\*\*\* split Hydrograph AT OS.EB.36\*\*\*\*\*

\*S  
DIVIDE HYD ID=36 CODE=999 ID I=97 HYD NO=105.OSEB36.EDITH  
ID II=96 HYD NO=106.OSEB36.OSUNA

| TOTAL FLOW | DIVIDED FLOW |
|------------|--------------|
| 0          | 0            |
| 2.5        | 2.5          |
| 3          | 2.5          |

PRINT HYD ID=97 CODE=0  
PLOT HYD ID=97  
PRINT HYD ID=98 CODE=0  
PLOT HYD ID=98

\*S  
\*S ADD 105.OSWB43.EDITH AND 105.OSEB36.EDITH  
ADD HYD ID=35 HYD=ADD.83 ID I=99 ID II=97

\*S  
\*\*\*\*\* ROUTE.TOT.43.36 \*\*\*\*\*

\*S  
\*S ROUTE ADD.83 THROUGH PIPE LENGTH MH-16-1 TO MH.EDITH  
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=0.007  
DIA=2.5 FT N=.013  
ROUTE MCUNGE ID=34 HYD NO=ROUTE.TOT.43.36 INFLOW ID=35  
DT=0.0 LENGTH=100

\*S  
\*\*\*\*\* ADD EDITH \*\*\*\*\*

\*S  
\*S ADD ROUTE.TOT.43.36 AND ROUTE.REM.04  
ADD HYD ID=33 HYD=ADD.21 ID I=34 ID II=38

\*S  
\*\*\*\*\* ROUTE.EDITH \*\*\*\*\*

\*S  
\*S ROUTE ADD.21 THROUGH PIPE LENGTH MH TO EDITH OUTFLOW  
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=0.007  
DIA=2.5 FT N=.013  
ROUTE MCUNGE ID=32 HYD NO=ROUTE.EDITH INFLOW ID=33  
DT=0.0 LENGTH=100

\*S  
\*\*\*\*\* MH-16 \*\*\*\*\*

\*S  
\*S BASIN OS.WB.41

COMPUTE NM HYD

100YR\_Combine.HYM  
ID=51 HYD NO=OS.WB.41 AREA=0.00019 SQ MI  
PER A=0 PER B=0 PER C=10 PER D=90  
TP=0.133 HR MASS RAIN=-1

\*\*\*\*\* ADD EDITH FROM OS.WB.43 \*\*\*\*\*

\*S  
\*S ADD 106.OSWB43.OSUNA AND OS.WB.41  
ADD HYD ID=50 HYD=ADD.21 ID I=98 ID II=51  
\*S  
\*S  
\*S BASIN OS.EB.99  
COMPUTE NM HYD ID=99 HYD NO=OS.EB.99 AREA=0.00018 SQ MI  
PER A=0 PER B=0 PER C=10 PER D=90  
TP=0.133 HR MASS RAIN=-1

\*S  
\*S ADD 106.OSEB36.OSUNA AND OS.EB.99  
ADD HYD ID=24 HYD=ADD.56 ID I=96 ID II=99  
\*S  
\*S ADD ADD.21 AND ADD.56  
ADD HYD ID=49 HYD=ADD.24 ID I=50 ID II=24  
\*S  
\*\*\*\*\* ADD.TOT.12 \*\*\*\*\*

\*S  
\*S ADD ADD.24 AND ROUTE.TOT.11  
ADD HYD ID=48 HYD=ADD.TOT.12 ID I=49 ID II=52  
\*S  
\*\*\*\*\* ROUTE.TOT.12 \*\*\*\*\*

\*S  
\*S ROUTE ADD.TOT.12 THROUGH PIPE LENGTH MH-16 TO MH-33  
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=0.007  
DIA=4.5 FT N=.013  
ROUTE MCUNGE ID=47 HYD NO=ROUTE.TOT.12 INFLOW ID=48  
DT=0.0 LENGTH=141

\*S  
\*\*\*\*\* Edith TO OSUNA \*\*\*\*\*

\*S  
\*S BASIN 02  
COMPUTE NM HYD ID=31 HYD NO=02 AREA=0.00363 SQ MI  
PER A=0 PER B=0 PER C=10 PER D=90  
TP=0.147 HR MASS RAIN=-1

\*S  
\*S ADD 106.EDITH.BEAR.02 AND 02  
ADD HYD ID=30 HYD=ADD.79 ID I=44 ID II=31  
\*S  
\*\*\*\*\* ROUTE.02-04\*\*\*\*\*

\*S  
\*S ROUTE ADD.79 ALONG EDITH FROM 02 TO 04  
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=0.007  
DIA=2.5 FT N=.013  
ROUTE MCUNGE ID=29 HYD NO=ROUTE.02.04 INFLOW ID=30  
DT=0.0 LENGTH=380

\*S  
\*S ADD 106.EDITH.FORTKX.02 AND ROUTE.02.04  
ADD HYD ID=28 HYD=ADD.78 ID I=40 ID II=29  
\*S  
\*\*\*\*\* ROUTE.04-INT\*\*\*\*\*

\*S  
\*S ROUTE ADD.78 ALONG EDITH FROM 04 TO BEFORE OSUNA INTERSECTION  
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=0.007  
DIA=2.5 FT N=.013  
ROUTE MCUNGE ID=27 HYD NO=ROUTE.04-INT INFLOW ID=28  
DT=0.0 LENGTH=200

100YR\_Combine.HYM

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*S
*S      BASIN 01
COMPUTE NM HYD      ID=26  HYD NO=01  AREA=0.00149 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.134 HR  MASS RAIN=-1

*S
*S      ADD 01 AND ROUTE.04-INT
ADD HYD              ID=25  HYD=ADD.21  ID I=27  ID II=26
*S
***** ADD.TOT.13 *****
*S
*S      ADD ADD.21 AND ROUTE.TOT.12
ADD HYD              ID=23  HYD=ADD.TOT.13  ID I=25  ID II=47
PRINT HYD            ID=23  CODE=0
PLOT HYD             ID=23
*S
***** split Hydrograph *****
*S SPLIT TO HORSY BASIN
DIVIDE HYD            ID=23  CODE=999 ID I=22 HYD NO=103.HORSY
                    ID II=21 HYD NO=104.PIPE
                    TOTAL FLOW  DIVIDED FLOW
                        0         0
                        0.3       0
                        1.5       0
                        5.12      0.28
                        8.13      1.78
                        10.07     2.97
                        11.51     4.05
                        12.84     5.09
                        14.37     6.28
                        16.4       7.87
                        19.22     10.2
                        23.03     13.45
                        28.54     18.22
                        36.86     25.61
                        49.48     37.1
                        70.50     56.6
                        112.63    96.3
                        179.18    159.63
                        206.03    185.22
                        213.28    192.11
PRINT HYD            ID=22  CODE=0
PLOT HYD             ID=22
PRINT HYD            ID=21  CODE=0
PLOT HYD             ID=21
*S
***** ROUTE.TOT.13 *****
*S
*S      ROUTE 104.PIPE THROUGH PIPE LENGTH MH-33 TO MH-18
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=0.024
                    DIA=3 FT  N=.013
ROUTE MCUNGE         ID=20  HYD NO=ROUTE.TOT.13  INFLOW ID=21
                    DT=0.0  LENGTH=245
*S
***** MH-18 *****
*S
*S      BASIN OS.WB.37
COMPUTE NM HYD      ID=19  HYD NO=OS.WB.37  AREA=0.00115 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1

*S
*S      BASIN OS.EB.34

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                                100YR_Combine.HYM
COMPUTE NM HYD                ID=18  HYD NO=OS.EB.34  AREA=0.00098 SQ MI
                                PER A=0 PER B=0 PER C=10 PER D=90
                                TP=0.133 HR  MASS RAIN=-1

*S
*S      ADD OS.WB.37 AND OS.EB.34
ADD HYD                ID=17  HYD=ADD.18  ID I=19  ID II=18
*S
***** ADD.TOT.14 *****
*S
*S      ADD ADD.18 AND ROUTE.TOT.13
ADD HYD                ID=16  HYD=ADD.TOT.14  ID I=17  ID II=20
*S
***** ROUTE.TOT.14 *****
*S
*S      ROUTE ADD.TOT.14 THROUGH PIPE LENGTH MH-18 TO MH-19
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.007
                                DIA=3.5 FT  N=.013
ROUTE MCUNGE          ID=15  HYD NO=ROUTE.TOT.14  INFLOW ID=16
                                DT=0.0  LENGTH=228

*S
***** MH-19 *****
*S
*S      BASIN OS.WB.35
COMPUTE NM HYD                ID=14  HYD NO=OS.WB.35  AREA=0.00291 SQ MI
                                PER A=0 PER B=0 PER C=10 PER D=90
                                TP=0.133 HR  MASS RAIN=-1

*S
*S      ADD OS.WB.35 AND ROUTE.TOT.14
ADD HYD                ID=13  HYD=ADD.14  ID I=14  ID II=15
*S
***** ROUTE.TOT.15 *****
*S
*S      ROUTE ADD.14 THROUGH PIPE LENGTH MH-19 TO MH-34
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.006
                                DIA=3.5 FT  N=.013
ROUTE MCUNGE          ID=12  HYD NO=ROUTE.TOT.15  INFLOW ID=13
                                DT=0.0  LENGTH=200

*S
***** MH-32 *****
*S
*S      BASIN OS.EB.32
COMPUTE NM HYD                ID=8  HYD NO=OS.EB.32  AREA=0.00221 SQ MI
                                PER A=0 PER B=0 PER C=10 PER D=90
                                TP=0.133 HR  MASS RAIN=-1

*S
*S      ADD OS.WB.32 AND ROUTE.TOT.15
ADD HYD                ID=7  HYD=ADD.9  ID I=8  ID II=12
*S
***** ROUTE.TOT.16 *****
*S
*S      ROUTE ADD.9 THROUGH PIPE LENGTH MH-34 TO MH-21
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.006
                                DIA=4 FT  N=.013
ROUTE MCUNGE          ID=9  HYD NO=ROUTE.TOT.16  INFLOW ID=7
                                DT=0.0  LENGTH=110

*S
***** MH-21 *****
*S
*S      BASIN OS.WB.33
COMPUTE NM HYD                ID=11  HYD NO=OS.WB.95  AREA=0.02088 SQ MI
                                PER A=0 PER B=0 PER C=10 PER D=90
                                TP=0.224 HR  MASS RAIN=-1

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100YR\_Combine.HYM

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*S
*S      ADD OS.WB.33 AND ROUTE.TOT.16
ADD HYD      ID=10  HYD=ADD.12  ID I=11  ID II=9
*S

***** ROUTE.TOT.17 *****
*S
*S      ROUTE ADD.12 THROUGH PIPE LENGTH MH-21 TO MH-23
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.014
                        DIA=4 FT  N=.013
ROUTE MCUNGE          ID=6  HYD NO=ROUTE.TOT.17  INFLOW ID=10
                        DT=0.0  LENGTH=470
*S
***** MH-23 *****
*S
*S      BASIN OS.WB.31b
COMPUTE NM HYD      ID=5  HYD NO=OS.WB.93  AREA=0.01310 SQ MI
                        PER A=0 PER B=0 PER C=10 PER D=90
                        TP=0.204 HR  MASS RAIN=-1
*S
***** ADD.TOT.18 *****
*S
*S      ADD OS.WB.31b AND ROUTE.TOT.17
ADD HYD      ID=4  HYD=ADD.TOT.18  ID I=5  ID II=6
PRINT HYD    ID=4  CODE=0
PLOT HYD     ID=4
*S
***** ROUTE.TOT.18 *****
*S
*S      ROUTE ADD.TOT.18 THROUGH PIPE LENGTH MH-23 TO Outlet (RAILROAD BASIN)
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.004
                        DIA=5 FT  N=.013
ROUTE MCUNGE          ID=3  HYD NO=ROUTE.TOT.18  INFLOW ID=4
                        DT=0.0  LENGTH=138
PRINT HYD          ID=5  CODE=1
PLOT HYD           ID=5
*S

FINISH

```

AHYMO PROGRAM SUMMARY TABLE (AHYMO-S4)  
 10/13/2010  
 INPUT FILE = C:\Program Files\AHYMO-S4\100YR\_Combine.HYM  
 T.Y.LinInSingleA10537359

- Ver. S4.01a, Rel: 01a

RUN DATE (MON/DAY/YR) =

USER NO.=

| COMMAND | HYDROGRAPH IDENTIFICATION                                                    | FROM ID NO.  | TO ID NO. | AREA (SQ MI)               | PEAK DISCHARGE (CFS) | RUNOFF VOLUME (AC-FT) | RUNOFF (INCHES) | TIME TO PEAK (HOURS) | CFS PER ACRE | PAGE = 1<br>NOTATION |
|---------|------------------------------------------------------------------------------|--------------|-----------|----------------------------|----------------------|-----------------------|-----------------|----------------------|--------------|----------------------|
| *S      | AHYMO FILE FOR OSUNA ROAD STORM DRAIN FROM CHURCH BASIN TO RAILROAD BASIN    |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | PROPOSED CONDITIONS, 6HR, 100YR.                                             |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | FILE: 100YR.HYM                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | DATE REVISED: 09/14/10                                                       |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | MODEL DEVELOPED TO REFLECT EXISTING DRAINAGE CONDITIONS FOR THE OSUNA STORM  |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | ANALYSIS POINTS TAKEN AT BASIN INFLOW POINTS AND CRITICAL ADD POINTS ALONG O |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | RAINFALL VALUES TAKING FROM NOAA PRECIPITATION FREQUENCY DATA SERVER FROM NO |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | MODEL REFLECTS 6-HOUR RAINFALL DISTRIBUTION FOR 100-YR STORM EVENT           |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | ASSUMPTIONS:                                                                 |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | 1. ALL VSC ROUTING MUSKINGUM-CUNGE ROUTING.                                  |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | 2. LAND TREATMENTS REFLECT EXISTING LAND CONDITIONS                          |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | 100 YEAR RAINFALL TABLE                                                      |              |           |                            |                      |                       |                 |                      |              |                      |
| 2.370   | RAINFALL TYPE= 1 NOAA 14                                                     |              |           |                            |                      |                       |                 |                      |              | RAIN6=               |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | SEDIMENT BULKING FACTOR                                                      |              |           | 2% for Existing Conditions |                      |                       |                 |                      |              |                      |
| 1.02    | SEDIMENT BULK                                                                |              |           |                            |                      |                       |                 |                      |              | PK BF =              |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | BASIN OS.WB.65C                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| 90.00   | COMPUTE NM HYD                                                               | OS.WB.65C    | - 65      | 0.00084                    | 2.31                 | 0.092                 | 2.04537         | 1.520                | 4.303        | PER IMP=             |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | ROUTE OS.WB.65C THROUGH PIPE LENGTH MH-7 TO MH-6                             |              |           |                            |                      |                       |                 |                      |              |                      |
| 0.2     | ROUTE MCUNGE                                                                 | ROUTE.TOT.1  | 65 88     | 0.00084                    | 2.31                 | 0.092                 | 2.04519         | 1.540                | 4.302        | CCODE =              |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | BASIN OS.EB.60                                                               |              |           |                            |                      |                       |                 |                      |              |                      |
| 90.00   | COMPUTE NM HYD                                                               | OS.EB.60     | - 60      | 0.00487                    | 12.59                | 0.531                 | 2.04537         | 1.550                | 4.041        | PER IMP=             |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | ADD OS.EB.60 AND ROUTE.TOT.1                                                 |              |           |                            |                      |                       |                 |                      |              |                      |
| 0.2     | ADD HYD                                                                      | ADD.89 60&88 | 89        | 0.00571                    | 14.89                | 0.623                 | 2.04527         | 1.550                | 4.074        |                      |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |
| *S      | ROUTE ADD.89 THROUGH PIPE LENGTH MH-6 TO MH-5                                |              |           |                            |                      |                       |                 |                      |              |                      |
| 0.2     | ROUTE MCUNGE                                                                 | ROUTE.TOT.2  | 89 90     | 0.00571                    | 14.88                | 0.623                 | 2.04528         | 1.550                | 4.073        | CCODE =              |
| *S      |                                                                              |              |           |                            |                      |                       |                 |                      |              |                      |

|         |                                               | FROM        |       | TO             |         | PEAK  |       | RUNOFF    |       | TIME TO |       | CFS  |  | PAGE =   |  |
|---------|-----------------------------------------------|-------------|-------|----------------|---------|-------|-------|-----------|-------|---------|-------|------|--|----------|--|
| COMMAND |                                               | HYDROGRAPH  |       | IDENTIFICATION |         | ID    |       | DISCHARGE |       | VOLUME  |       | PEAK |  | NOTATION |  |
|         |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      | BASIN OS.EB.58b                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| 90.00   | COMPUTE NM HYD                                | OS.EB.58b   | -     | 58             | 0.00112 | 3.08  | 0.122 | 2.04537   | 1.520 | 4.294   | PER   | IMP= |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      | ADD OS.EB.58b AND ROUTE.TOT.2                 |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| 90.00   | ADD HYD                                       | ADD.91      | 58&90 | 91             | 0.00683 | 17.89 | 0.745 | 2.04524   | 1.550 | 4.092   |       |      |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      | ROUTE ADD.91 THROUGH PIPE LENGTH MH-5 TO MH-4 |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| 0.2     | ROUTE MCUNGE                                  | ROUTE.TOT.3 | 91    | 92             | 0.00683 | 17.88 | 0.745 | 2.04525   | 1.560 | 4.091   | CCODE | =    |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      | BASIN OS.WB.65b                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| 90.00   | COMPUTE NM HYD                                | OS.WB.65b   | -     | 93             | 0.00251 | 6.87  | 0.274 | 2.04537   | 1.520 | 4.279   | PER   | IMP= |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      | BASIN OS.EB.58a                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| 80.00   | COMPUTE NM HYD                                | OS.EB.58a   | -     | 94             | 0.02500 | 66.20 | 2.579 | 1.93462   | 1.530 | 4.137   | PER   | IMP= |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      | ADD OS.WB.65b AND OS.EB.58a                   |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| 90.00   | ADD HYD                                       | ADD.95      | 93&94 | 95             | 0.02751 | 73.07 | 2.853 | 1.94471   | 1.530 | 4.150   |       |      |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      | ADD ADD.95 AND ROUTE.TOT.3                    |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| 80.00   | ADD HYD                                       | ADD.96      | 95&92 | 96             | 0.03434 | 90.43 | 3.598 | 1.96470   | 1.530 | 4.115   |       |      |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      | ROUTE ADD.96 THROUGH PIPE LENGTH MH-4 TO MH-3 |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| 0.2     | ROUTE MCUNGE                                  | ROUTE.TOT.4 | 96    | 97             | 0.03434 | 88.37 | 3.590 | 1.96015   | 1.580 | 4.021   | CCODE | =    |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      | BASIN OS.EB.56                                |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| 90.00   | COMPUTE NM HYD                                | OS.EB.56    | -     | 12             | 0.00175 | 4.80  | 0.191 | 2.04537   | 1.520 | 4.284   | PER   | IMP= |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      | ADD OS.EB.56 AND ROUTE.TOT.4                  |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| 90.00   | ADD HYD                                       | ADD.99      | 12&97 | 99             | 0.03609 | 92.68 | 3.781 | 1.96427   | 1.580 | 4.012   |       |      |  |          |  |
| *S      |                                               |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| *S      | ROUTE ADD.99 THROUGH PIPE LENGTH MH-3 TO MH-1 |             |       |                |         |       |       |           |       |         |       |      |  |          |  |
| 0.2     | ROUTE MCUNGE                                  | ROUTE.TOT.5 | 99    | 11             | 0.03609 | 92.64 | 3.781 | 1.        |       |         |       |      |  |          |  |

|       |                |                                                  |        |        |              |                      |                       |                 |                      |                                |
|-------|----------------|--------------------------------------------------|--------|--------|--------------|----------------------|-----------------------|-----------------|----------------------|--------------------------------|
| 90.00 | COMPUTE NM HYD | OS.EB.56b                                        | -      | 1      | 0.00031      | 0.86                 | 0.034                 | 2.04537         | 1.520                | 4.358 PER IMP=                 |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             | ADD OS.WB.63 AND OS.EB.56b                       |        |        |              |                      |                       |                 |                      |                                |
|       | ADD HYD        | ADD.2 99& 1                                      | 2      |        | 0.00190      | 5.23                 | 0.207                 | 2.04510         | 1.520                | 4.298                          |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             | ROUTE ADD.2 THROUGH PIPE LENGTH MH-4 TO MH-5     |        |        |              |                      |                       |                 |                      |                                |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.1                                      | 2      | 98     | 0.00190      | 5.23                 | 0.207                 | 2.04516         | 1.530                | 4.302 CCODE =                  |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             | BASIN OS.WB.61                                   |        |        |              |                      |                       |                 |                      |                                |
| 90.00 | COMPUTE NM HYD | OS.WB.61                                         | -      | 97     | 0.00076      | 2.09                 | 0.083                 | 2.04537         | 1.520                | 4.307 PER IMP=                 |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             | BASIN OS.EB.54                                   |        |        |              |                      |                       |                 |                      |                                |
| 90.00 | COMPUTE NM HYD | OS.EB.54                                         | -      | 96     | 0.00087      | 2.40                 | 0.095                 | 2.04537         | 1.520                | 4.302 PER IMP=                 |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             | ADD OS.WB.61 AND OS.EB.54                        |        |        |              |                      |                       |                 |                      |                                |
|       | ADD HYD        | ADD.87 97&96                                     | 95     |        | 0.00163      | 4.49                 | 0.178                 | 2.04505         | 1.520                | 4.304                          |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             | ADD ADD.87 AND ROUTE.TOT.1                       |        |        |              |                      |                       |                 |                      |                                |
|       |                |                                                  | FROM   | TO     |              |                      |                       |                 |                      |                                |
|       | COMMAND        | HYDROGRAPH IDENTIFICATION                        | ID NO. | ID NO. | AREA (SQ MI) | PEAK DISCHARGE (CFS) | RUNOFF VOLUME (AC-FT) | RUNOFF (INCHES) | TIME TO PEAK (HOURS) | CFS PER ACRE PAGE = 3 NOTATION |
|       | ADD HYD        | ADD.TOT.2 95&98                                  | 94     |        | 0.00353      | 9.72                 | 0.385                 | 2.04507         | 1.530                | 4.303                          |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             | ROUTE ADD.TOT.2 THROUGH PIPE LENGTH MH-5 TO MH-6 |        |        |              |                      |                       |                 |                      |                                |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.2                                      | 94     | 93     | 0.00353      | 9.72                 | 0.385                 | 2.04510         | 1.540                | 4.304 CCODE =                  |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             | BASIN OS.WB.59                                   |        |        |              |                      |                       |                 |                      |                                |
| 90.00 | COMPUTE NM HYD | OS.WB.59                                         | -      | 92     | 0.00620      | 16.95                | 0.676                 | 2.04537         | 1.520                | 4.272 PER IMP=                 |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             | BASIN OS.EB.52                                   |        |        |              |                      |                       |                 |                      |                                |
| 90.00 | COMPUTE NM HYD | OS.EB.52                                         | -      | 91     | 0.00259      | 7.09                 | 0.283                 | 2.04537         | 1.520                | 4.279 PER IMP=                 |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             | ADD OS.WB.59 AND OS.EB.52                        |        |        |              |                      |                       |                 |                      |                                |
|       | ADD HYD        | ADD.84 92&91                                     | 90     |        | 0.00879      | 24.05                | 0.959                 | 2.04531         | 1.520                | 4.274                          |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             | ADD ADD.84 AND ROUTE.TOT.2                       |        |        |              |                      |                       |                 |                      |                                |
|       | ADD HYD        | ADD.TOT.3 90&93                                  | 89     |        | 0.01232      | 33.73                | 1.344                 | 2.04524         | 1.530                | 4.277                          |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             |                                                  |        |        |              |                      |                       |                 |                      |                                |
|       | *S             | ROUTE ADD.TOT.3 THROUGH PIPE LENGTH MH-6 TO MH-7 |        |        |              |                      |                       |                 |                      |                                |





|       |                |                                                     |         |        |       |         |       |       |          |
|-------|----------------|-----------------------------------------------------|---------|--------|-------|---------|-------|-------|----------|
|       | *S             | ADD ADD.69 AND ROUTE.TOT.7                          |         |        |       |         |       |       |          |
|       | ADD HYD        | ADD.TOT.8 65&68 64                                  | 0.07077 | 168.73 | 7.177 | 1.90162 | 1.580 | 3.725 |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ROUTE ADD.TOT.8 THROUGH PIPE LENGTH MH-12 TO MH-13  |         |        |       |         |       |       |          |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.8 64 63                                   | 0.07077 | 166.69 | 7.168 | 1.89912 | 1.590 | 3.680 | CCODE =  |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | BASIN OS.WB.47                                      |         |        |       |         |       |       |          |
| 90.00 | COMPUTE NM HYD | OS.WB.47 - 62                                       | 0.00062 | 1.40   | 0.068 | 2.04537 | 1.610 | 3.539 | PER IMP= |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ADD OS.WB.47 AND ROUTE.TOT.8                        |         |        |       |         |       |       |          |
|       | ADD HYD        | ADD.TOT.9 62&63 61                                  | 0.07139 | 168.07 | 7.236 | 1.90038 | 1.590 | 3.678 |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ROUTE ADD.TOT.9 THROUGH PIPE LENGTH MH-13 TO MH-14  |         |        |       |         |       |       |          |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.9 61 60                                   | 0.07139 | 168.07 | 7.235 | 1.90034 | 1.590 | 3.679 | CCODE =  |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | BASIN OS.EB.40                                      |         |        |       |         |       |       |          |
| 90.00 | COMPUTE NM HYD | OS.EB.40 - 59                                       | 0.00094 | 2.59   | 0.103 | 2.04537 | 1.520 | 4.299 | PER IMP= |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ADD OS.EB.40 AND ROUTE.TOT.9                        |         |        |       |         |       |       |          |
|       | ADD HYD        | ADD.TOT.10 59&60 58                                 | 0.07233 | 170.31 | 7.338 | 1.90222 | 1.590 | 3.679 |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ROUTE ADD.TOT.10 THROUGH PIPE LENGTH MH-14 TO MH-15 |         |        |       |         |       |       |          |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.10 58 57                                  | 0.07233 | 170.15 | 7.338 | 1.90218 | 1.590 | 3.676 | CCODE =  |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | BASIN OS.WB.45                                      |         |        |       |         |       |       |          |
| 56.00 | COMPUTE NM HYD | OS.WB.45 - 56                                       | 0.01253 | 30.67  | 1.115 | 1.66883 | 1.530 | 3.825 | PER IMP= |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | BASIN OS.EB.38                                      |         |        |       |         |       |       |          |
| 90.00 | COMPUTE NM HYD | OS.EB.38 - 55                                       | 0.00066 | 1.82   | 0.072 | 2.04537 | 1.520 | 4.314 | PER IMP= |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ADD OS.WB.45 AND OS.EB.38                           |         |        |       |         |       |       |          |
|       | ADD HYD        | ADD.27 56&55 54                                     | 0.01319 | 32.50  | 1.187 | 1.68763 | 1.530 | 3.849 |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ADD ADD.27 AND ROUTE.TOT.10                         |         |        |       |         |       |       |          |
|       | ADD HYD        | ADD.TOT.11 54&57 53                                 | 0.08552 | 198.54 | 8.525 | 1.86909 | 1.580 | 3.628 |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ROUTE ADD.TOT.11 THROUGH PIPE LENGTH MH-15 TO MH-16 |         |        |       |         |       |       |          |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.11 53 52                                  | 0.08552 | 196.23 | 8.506 | 1.86494 | 1.610 | 3.585 | CCODE =  |

| BASIN 03 |                           |                                          |               |              |                      |                       |                 |                      |              |          | PAGE = 6 |
|----------|---------------------------|------------------------------------------|---------------|--------------|----------------------|-----------------------|-----------------|----------------------|--------------|----------|----------|
| COMMAND  | HYDROGRAPH IDENTIFICATION | FROM ID NO.                              | TO ID NO.     | AREA (SQ MI) | PEAK DISCHARGE (CFS) | RUNOFF VOLUME (AC-FT) | RUNOFF (INCHES) | TIME TO PEAK (HOURS) | CFS PER ACRE | NOTATION |          |
| 84.00    | COMPUTE NM HYD            | 03                                       | - 46          | 0.01116      | 29.93                | 1.178                 | 1.97892         | 1.530                | 4.191        | PER IMP= |          |
|          | DIVIDE HYD                | 105.EDITH.BE                             | 46 45         | 0.01018      | 20.00                | 1.074                 | 1.97890         | 1.450                | 3.070        |          |          |
|          |                           | 106.EDITH.BE                             | and 44        | 0.00098      | 9.93                 | 0.104                 | 1.97890         | 1.530                | 15.826       |          |          |
| 0.2      | ROUTE MCUNGE              | EAR.PE THROUGH ROUTE.REM.O3              | 45 43         | 0.01018      | 20.19                | 1.074                 | 1.97890         | 1.460                | 3.099        | CCODE =  |          |
| 90.00    | COMPUTE NM HYD            | BASIN 04                                 | 04 - 42       | 0.00472      | 12.91                | 0.515                 | 2.04537         | 1.520                | 4.274        | PER IMP= |          |
|          | DIVIDE HYD                | 105.EDITH.FO                             | 42 41         | 0.00472      | 12.91                | 0.515                 | 2.04531         | 1.520                | 4.274        |          |          |
|          |                           | 106.EDITH.FO                             | and 40        | 0.00000      | 0.00                 | 0.000                 | 0.00000         | -0.010               | 0.000        |          |          |
|          | ADD HYD                   | ADD 105.EDITH.FORTKX.PE AND ADD.62 41&43 | 39            | 0.01490      | 32.91                | 1.589                 | 1.99993         | 1.520                | 3.452        |          |          |
| 0.2      | ROUTE MCUNGE              | ROUTE ADD.62 THROUGH ROUTE.REM.O4        | 39 38         | 0.01490      | 32.91                | 1.589                 | 1.99994         | 1.520                | 3.451        | CCODE =  |          |
| 90.00    | COMPUTE NM HYD            | BASIN OS.WB.43                           | OS.WB.43 - 37 | 0.00424      | 11.60                | 0.463                 | 2.04537         | 1.520                | 4.275        | PER IMP= |          |
|          | DIVIDE HYD                | 105.OSWB43.E                             | 37 99         | 0.00415      | 10.00                | 0.452                 | 2.04531         | 1.480                | 3.768        |          |          |
|          |                           | 106.OSWB43.O                             | and 98        | 0.00009      | 1.60                 | 0.010                 | 2.04531         | 1.520                | 26.708       |          |          |
| 90.00    | COMPUTE NM HYD            | BASIN OS.EB.36                           | OS.EB.36 - 36 | 0.00105      | 2.89                 | 0.115                 | 2.04537         | 1.520                | 4.296        | PER IMP= |          |
|          | DIVIDE HYD                | 105.OSEB36.E                             | 36 97         | 0.00103      | 2.50                 | 0.112                 | 2.04512         | 1.480                | 3.801        |          |          |
|          |                           | 106.OSEB36.O                             | and 96        | 0.00002      | 0.39                 | 0.002                 | 2.04513         | 1.520                | 27.112       |          |          |
|          | ADD HYD                   | ADD 105.OSWB43.EDITH AND ADD.83 99&97    | 35            | 0.00517      | 12.50                | 0.564                 | 2.04527         | 1.480                | 3.775        |          |          |

|       |                |                                                      |        |        |              |                 |                |                 |              |                   |
|-------|----------------|------------------------------------------------------|--------|--------|--------------|-----------------|----------------|-----------------|--------------|-------------------|
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | ROUTE MCUNGE   | ROUTE.TOT.43                                         | 35     | 34     | 0.00517      | 12.51           | 0.564          | 2.04528         | 1.490        | 3.776 CCODE =     |
| 0.2   | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             | ADD ROUTE.TOT.43.36 AND ROUTE.REM.04                 |        |        |              |                 |                |                 |              |                   |
|       | ADD HYD        | ADD.21                                               | 34&38  | 33     | 0.02007      | 45.41           | 2.154          | 2.01161         | 1.520        | 3.535             |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             | ROUTE ADD.21 THROUGH PIPE LENGTH MH TO EDITH OUTFLOW |        |        |              |                 |                |                 |              |                   |
|       | ROUTE MCUNGE   | ROUTE.EDITH                                          | 33     | 32     | 0.02007      | 44.93           | 2.148          | 2.00631         | 1.550        | 3.498 CCODE =     |
| 0.2   | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       |                | FROM                                                 | TO     |        | PEAK         | RUNOFF          |                | TIME TO         | CFS          | PAGE = 7          |
|       | COMMAND        | HYDROGRAPH IDENTIFICATION                            | ID NO. | ID NO. | AREA (SQ MI) | DISCHARGE (CFS) | VOLUME (AC-FT) | RUNOFF (INCHES) | PEAK (HOURS) | PER ACRE NOTATION |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             | BASIN OS.WB.41                                       |        |        |              |                 |                |                 |              |                   |
| 90.00 | COMPUTE NM HYD | OS.WB.41                                             | -      | 51     | 0.00019      | 0.53            | 0.021          | 2.04537         | 1.520        | 4.386 PER IMP=    |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             | ADD 106.OSWB43.OSUNA AND OS.WB.41                    |        |        |              |                 |                |                 |              |                   |
|       | ADD HYD        | ADD.21                                               | 98&51  | 50     | 0.00028      | 2.13            | 0.031          | 2.04461         | 1.520        | 11.752            |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             | BASIN OS.EB.99                                       |        |        |              |                 |                |                 |              |                   |
| 90.00 | COMPUTE NM HYD | OS.EB.99                                             | -      | 99     | 0.00018      | 0.51            | 0.020          | 2.04537         | 1.520        | 4.390 PER IMP=    |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             | ADD 106.OSEB36.OSUNA AND OS.EB.99                    |        |        |              |                 |                |                 |              |                   |
|       | ADD HYD        | ADD.56                                               | 96&99  | 24     | 0.00020      | 0.89            | 0.022          | 2.04431         | 1.520        | 6.894             |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             | ADD ADD.21 AND ADD.56                                |        |        |              |                 |                |                 |              |                   |
|       | ADD HYD        | ADD.24                                               | 50&24  | 49     | 0.00049      | 3.03            | 0.053          | 2.04449         | 1.520        | 9.729             |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             | ADD ADD.24 AND ROUTE.TOT.11                          |        |        |              |                 |                |                 |              |                   |
|       | ADD HYD        | ADD.TOT.12                                           | 49&52  | 48     | 0.08601      | 197.06          | 8.559          | 1.86595         | 1.610        | 3.580             |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             | ROUTE ADD.TOT.12 THROUGH PIPE LENGTH MH-16 TO MH-33  |        |        |              |                 |                |                 |              |                   |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.12                                         | 48     | 47     | 0.08601      | 194.91          | 8.538          | 1.86133         | 1.610        | 3.541 CCODE =     |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             | BASIN O2                                             |        |        |              |                 |                |                 |              |                   |
| 90.00 | COMPUTE NM HYD | O2                                                   | -      | 31     | 0.00363      | 9.57            | 0.396          | 2.04537         | 1.540        | 4.118 PER IMP=    |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |
|       | *S             | ADD 106.EDITH.BEAR.O2 AND O2                         |        |        |              |                 |                |                 |              |                   |
|       | ADD HYD        | ADD.79                                               | 44&31  | 30     | 0.00461      | 19.45           | 0.499          | 2.03117         | 1.530        | 6.592             |
|       | *S             |                                                      |        |        |              |                 |                |                 |              |                   |

```

*S
*S      ROUTE ADD.79 ALONG EDITH FROM 02 TO 04
0.2 ROUTE MCUNGE      ROUTE.02.04  30  29      0.00461      19.44      0.499      2.03098      1.540      6.589 CCODE =
*S
*S      ADD 106.EDITH.FORTKX.02 AND ROUTE.02.04
ADD HYD      ADD.78 40&29  28      0.00461      19.44      0.499      2.03095      1.540      6.589
*S
*S
*S      OUTE ADD.78 ALONG EDITH FROM 04 TO BEFORE OSUNA INTERSECTION
0.2 ROUTE MCUNGE      ROUTE.04-INT  28  27      0.00461      19.40      0.499      2.03086      1.550      6.573 CCODE =
*S
*S      BASIN 01
90.00 COMPUTE NM HYD      01  -  26      0.00149      4.08      0.163      2.04537      1.530      4.276 PER IMP=
*S
*S      ADD 01 AND ROUTE.04-INT
ADD HYD      ADD.21 27&26  25      0.00610      23.44      0.662      2.03434      1.540      6.004
*S
*S***** ADD.TOT.13 *****
*S
      FROM  TO      AREA      PEAK      RUNOFF      TIME TO      CFS      PAGE =
      HYDROGRAPH  ID  ID      (SQ MI)  DISCHARGE  VOLUME      PEAK      PER      8
COMMAND  IDENTIFICATION  NO. NO.      (CFS)      (AC-FT)      (INCHES)  (HOURS)  ACRE  NOTATION

*S      ADD ADD.21 AND ROUTE.TOT.12
ADD HYD      ADD.TOT.13 25&47  23      0.09211      213.20      9.200      1.87279      1.600      3.617
*S
*S SPLIT TO HORSY BASIN
DIVIDE HYD      103.HORSY  23  22      0.06752      192.03      6.744      1.87279      1.600      4.444
      104.PIPE  and  21      0.02459      21.17      2.456      1.87279      1.600      1.345
*S
*S
*S      ROUTE 104.PIPE THROUGH PIPE LENGTH MH-33 TO MH-18
0.2 ROUTE MCUNGE      ROUTE.TOT.13  21  20      0.02459      21.16      2.456      1.87279      1.600      1.345 CCODE =
*S
*S
*S      BASIN OS.WB.37
90.00 COMPUTE NM HYD      OS.WB.37  -  19      0.00115      3.16      0.125      2.04537      1.520      4.293 PER IMP=
*S
*S      BASIN OS.EB.34
90.00 COMPUTE NM HYD      OS.EB.34  -  18      0.00098      2.70      0.107      2.04537      1.520      4.298 PER IMP=
*S
*S      ADD OS.WB.37 AND OS.EB.34
ADD HYD      ADD.18 19&18  17      0.00213      5.86      0.232      2.04512      1.520      4.295
*S
*S
*S      ADD ADD.18 AND ROUTE.TOT.13
ADD HYD      ADD.TOT.14 17&20  16      0.02672      26.47      2.688      1.88652      1.560      1.548
*S

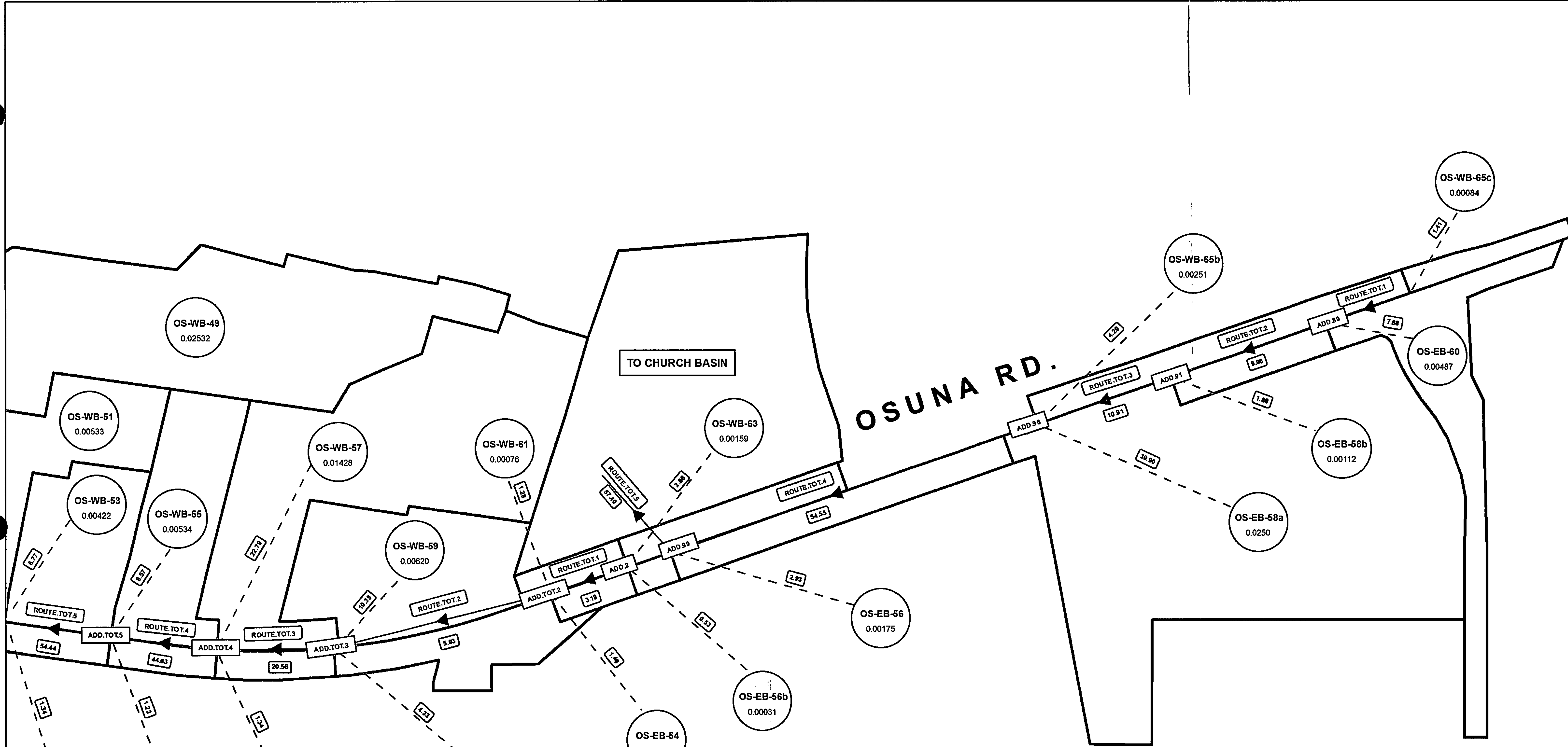
```



\*S ADD OS.WB.31b AND ROUTE.TOT.17  
ADD HYD ADD.TOT.18 5& 6 4 0.06582 112.93 6.953 1.98086 1.600 2.681  
\*S  
\*S  
\*S .TOT.18 THROUGH PIPE LENGTH MH-23 TO Outlet (RAILROAD BASIN)  
ROUTE MCUNGE ROUTE.TOT.18 4 3 0.06582 112.95 6.953 1.98081 1.610 2.681 CCODE =  
0.2  
\*S  
FINISH



## **Exhibit 4 - AHYMO Schematic Map 10-year, 6-hour Storm**



**Legend**

→ Direction of Stormwater Flow

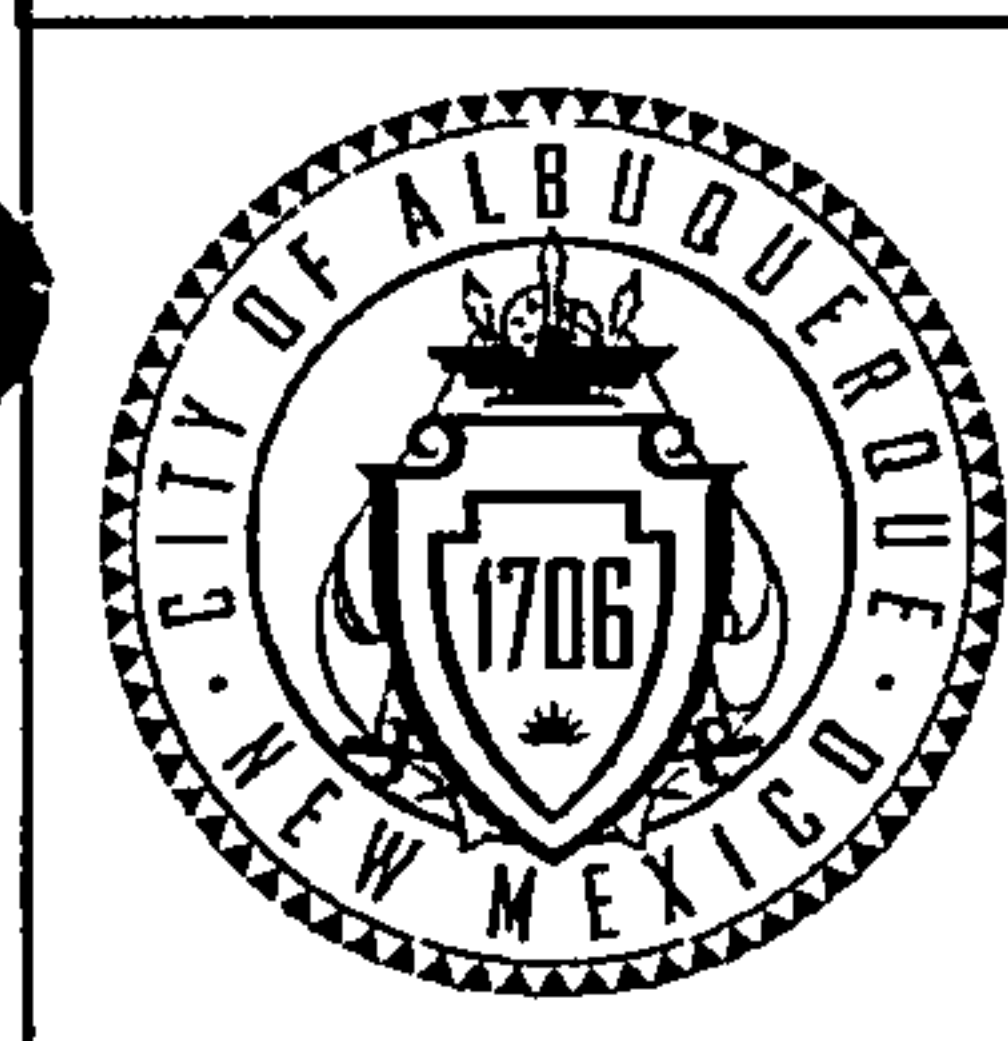
ROUTE.TOT.3 Route Hydrograph

ADD.TOT.4 Add Hydrograph

33.68 10-YR, 6-HR Peak Discharge

OS-EB-58a 0.0250 Basin ID  
Basin Area (sq.mi.)

Subbasin Boundaries



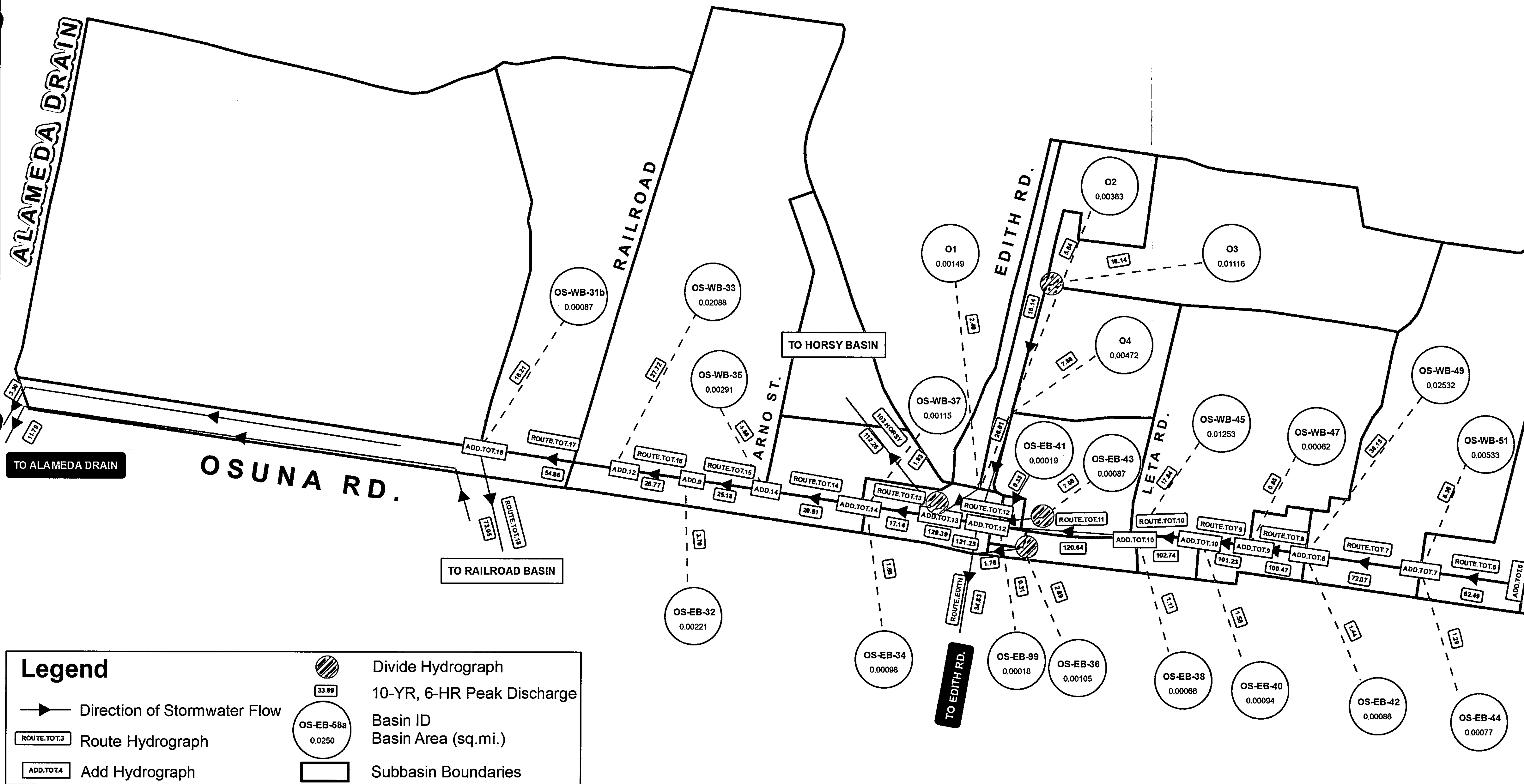
| REVISIONS |    |             |      |    |             |
|-----------|----|-------------|------|----|-------------|
| DATE      | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|           |    |             |      |    |             |
|           |    |             |      |    |             |

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Tel: (480) 968-8814

| CITY OF ALBUQUERQUE |            |                 |
|---------------------|------------|-----------------|
| ROAD NO.            | COUNTY     | CITY PROJECT ID |
| OSUNA               | BERNALILLO | 5575.91         |

**OSUNA ROAD WIDENING**  
**AHYMO SCHEMATIC MAP**  
**EXHIBIT 4**

SCALE: 0 6,250 12,500 25,000 Miles



Legend

→

Direction of Stormwater Flow

ROUTE.TOT.3

Route Hydrograph

ADD.TOT.4

Add Hydrograph

Divide Hydrograph

33.89

10-YR, 6-HR Peak Discharge

OS-WB-58a

0.0250

Basin ID  
Basin Area (sq.mi.)

Subbasin Boundaries



| REVISIONS |    |             |      |    |             |
|-----------|----|-------------|------|----|-------------|
| DATE      | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|           |    |             |      |    |             |

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| CITY OF ALBUQUERQUE |            |                 |
|---------------------|------------|-----------------|
| ROAD NO.            | COUNTY     | CITY PROJECT ID |
| OSUNA               | BERNALILLO | 5575.91         |

OSUNA ROAD WIDENING

AHYMO SCHEMATIC MAP

EXHIBIT 4

SCALE: 0 6,250 12,500 25,000 Miles



# **AHYMO Model Input and Summary Output 10-year, 6-hour Storm**

10YR\_Combine.HYM

\*S AHYMO FILE FOR OSUNA ROAD STORM DRAIN FROM CHURCH BASIN TO RAILROAD BASIN  
\*S PROPOSED CONDITIONS, 6HR, 100YR.  
\*S  
\*S FILE: 10YR\_Combine.HYM  
\*S DATE REVISED: 09/14/10

\*\*\*\*\*  
\*\*\*\*\*

\*S MODEL DEVELOPED TO REFLECT EXISTING DRAINAGE CONDITIONS FOR THE OSUNA STORM  
DRAIN PROJECT  
\*S ANALYSIS POINTS TAKEN AT BASIN INFLOW POINTS AND CRITICAL ADD POINTS ALONG OSUNA  
ROAD  
\*S RAINFALL VALUES TAKING FROM NOAA PRECIPITATION FREQUENCY DATA SERVER FROM NOAA  
ATLAS 14Fj  
\*S MODEL REFLECTS 6-HOUR RAINFALL DISTRIBUTION FOR 10-YR STORM EVENT  
\*  
\*

\*S ASSUMPTIONS:  
\*S 1. ALL VSC ROUTING MUSKINGUM-CUNGE ROUTING.  
\*S 2. LAND TREATMENTS REFLECT EXISTING LAND CONDITIONS  
\*S  
\*S

\* 10 YEAR RAINFALL TABLE

RAINFALL TYPE=1 RAIN QUARTER=0.66  
RAIN ONE=1.10 IN RAIN SIX=1.52 IN  
RAIN DAY=1.78 IN DT=0.01 HRS

\*S 100 YEAR RAINFALL TABLE

\*RAINFALL TYPE=1 RAIN QUARTER=1.06  
\* RAIN ONE=1.77 IN RAIN SIX=2.37 IN  
\* RAIN DAY=2.69 IN DT=0.01 HRS  
\*S

\*S SEDIMENT BULKING FACTOR 2% for Existing Conditions  
SEDIMENT BULK CODE=1 BULK FACTOR=1.02  
\*S  
\*S

\*\*\*\*\* UPSTREAM \*\*\*\*\*  
\*\*\*\*\* MH-7 \*\*\*\*\*

\*S BASIN OS.WB.65C  
COMPUTE NM HYD ID=65 HYD NO=OS.WB.65C AREA=0.00084 SQ MI  
PER A=0 PER B=0 PER C=10 PER D=90  
TP=0.133 HR MASS RAIN=-1

\*S  
\*\*\*\*\* ROUTE.TOT.1 \*\*\*\*\*

\*S  
\*S ROUTE OS.WB.65C THROUGH PIPE LENGTH MH-7 TO MH-6  
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=0.013  
DIA=2 FT N=.013

ROUTE MCUNGE ID=88 HYD NO=ROUTE.TOT.1 INFLOW ID=65  
DT=0.0 LENGTH=265

\*S  
\*\*\*\*\* MH-6 \*\*\*\*\*

\*S  
\*S BASIN OS.EB.60  
COMPUTE NM HYD ID=60 HYD NO=OS.EB.60 AREA=0.00487 SQ MI  
PER A=0 PER B=0 PER C=10 PER D=90  
TP=0.154 HR MASS RAIN=-1

\*\*\*\*\* ADD.TOT.2 \*\*\*\*\*

\*S  
\*S ADD OS.EB.60 AND ROUTE.TOT.1

10YR\_Combine.HYM

```

ADD HYD          ID=89  HYD=ADD.89  ID I=60  ID II=88
PRINT HYD        ID=89  CODE=1
PLOT HYD         ID=89
*S
***** ROUTE.TOT.2 *****
*S
*S      ROUTE ADD.89 THROUGH PIPE LENGTH MH-6 TO MH-5
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.021
                      DIA=2 FT  N=.013
ROUTE MCUNGE        ID=90  HYD NO=ROUTE.TOT.2  INFLOW ID=89
                      DT=0.0  LENGTH=350
*S
***** MH-5 *****
*S      BASIN OS.EB.58b
COMPUTE NM HYD      ID=58  HYD NO=OS.EB.58b  AREA=0.00112 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.133 HR  MASS RAIN=-1
*S
***** ADD.TOT.3 *****
*S
*S      ADD OS.EB.58b AND ROUTE.TOT.2
ADD HYD            ID=91  HYD=ADD.91  ID I=58  ID II=90
*S
***** ROUTE.TOT.3 *****
*S
*S      ROUTE ADD.91 THROUGH PIPE LENGTH MH-5 TO MH-4
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.022
                      DIA=2 FT  N=.013
ROUTE MCUNGE        ID=92  HYD NO=ROUTE.TOT.3  INFLOW ID=91
                      DT=0.0  LENGTH=370
*S
***** MH-4 *****
*S      BASIN OS.WB.65b
COMPUTE NM HYD      ID=93  HYD NO=OS.WB.65b  AREA=0.00251 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.133 HR  MASS RAIN=-1
*S
*S      BASIN OS.EB.58a
COMPUTE NM HYD      ID=94  HYD NO=OS.EB.58a  AREA=0.0250 SQ MI
                      PER A=0 PER B=0 PER C=20 PER D=80
                      TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.65b AND OS.EB.58a
ADD HYD            ID=95  HYD=ADD.95  ID I=93  ID II=94
*S
***** ADD.TOT.4 *****
*S
*S      ADD ADD.95 AND ROUTE.TOT.3
ADD HYD            ID=96  HYD=ADD.96  ID I=95  ID II=92
*S
***** ROUTE.TOT.4 *****
*S
*S      ROUTE ADD.96 THROUGH PIPE LENGTH MH-4 TO MH-3
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.007
                      DIA=3.5 FT  N=.013
ROUTE MCUNGE        ID=97  HYD NO=ROUTE.TOT.4  INFLOW ID=96
                      DT=0.0  LENGTH=1000
*S
***** MH-3 *****
*S      BASIN OS.EB.56
COMPUTE NM HYD      ID=12  HYD NO=OS.EB.56  AREA=0.00175 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.133 HR  MASS RAIN=-1

```

10YR\_Combine.HYM

```

*S
***** ADD.TOT.5 *****
*S
*S      ADD OS.EB.56 AND ROUTE.TOT.4
ADD HYD      ID=99  HYD=ADD.99  ID I=12  ID II=97
*S
***** ROUTE.TOT.5 *****
*S
*S      ROUTE ADD.99 THROUGH PIPE LENGTH MH-3 TO MH-1
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.009
                        DIA=3.5 FT  N=.013
ROUTE MCUNGE      ID=11  HYD NO=ROUTE.TOT.5  INFLOW ID=99
                        DT=0.0  LENGTH=125
PRINT HYD      ID=11  CODE=0
PLOT HYD      ID=11
*S
***** DOWNSTREAM *****
***** MH-4 *****
*S      BASIN OS.WB.63
COMPUTE NM HYD      ID=99  HYD NO=OS.WB.63  AREA=0.00159 SQ MI
                        PER A=0 PER B=0 PER C=10 PER D=90
                        TP=0.133 HR  MASS RAIN=-1
*S      BASIN OS.EB.56b
COMPUTE NM HYD      ID=1  HYD NO=OS.EB.56b  AREA=0.00031 SQ MI
                        PER A=0 PER B=0 PER C=10 PER D=90
                        TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.63 AND OS.EB.56b
ADD HYD      ID=2  HYD=ADD.2  ID I=99  ID II=1
*S
***** ROUTE.TOT.1 *****
*S
*S      ROUTE ADD.2 THROUGH PIPE LENGTH MH-4 TO MH-5
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.016
                        DIA=2 FT  N=.013
ROUTE MCUNGE      ID=98  HYD NO=ROUTE.TOT.1  INFLOW ID=2
                        DT=0.0  LENGTH=216
*S
***** MH-5 *****
*S
*S      BASIN OS.WB.61
COMPUTE NM HYD      ID=97  HYD NO=OS.WB.61  AREA=0.00076 SQ MI
                        PER A=0 PER B=0 PER C=10 PER D=90
                        TP=0.133 HR  MASS RAIN=-1
*S
*S      BASIN OS.EB.54
COMPUTE NM HYD      ID=96  HYD NO=OS.EB.54  AREA=0.00087 SQ MI
                        PER A=0 PER B=0 PER C=10 PER D=90
                        TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.61 AND OS.EB.54
ADD HYD      ID=95  HYD=ADD.87  ID I=97  ID II=96
*S
***** ADD.TOT.2 *****
*S
*S      ADD ADD.87 AND ROUTE.TOT.1
ADD HYD      ID=94  HYD=ADD.TOT.2  ID I=95  ID II=98
*S
***** ROUTE.TOT.2 *****
*S
*S      ROUTE ADD.TOT.2 THROUGH PIPE LENGTH MH-5 TO MH-6
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.029
                        DIA=2 FT  N=.013

```

```

                                10YR_Combine.HYM
ROUTE MCUNGE                ID=93  HYD NO=ROUTE.TOT.2  INFLOW ID=94
                             DT=0.0  LENGTH=560
*S
***** MH-6 *****
*S
*S      BASIN OS.WB.59
COMPUTE NM HYD              ID=92  HYD NO=OS.WB.59  AREA=0.00620 SQ MI
                             PER A=0 PER B=0 PER C=10 PER D=90
                             TP=0.133 HR  MASS RAIN=-1
*S
*S      BASIN OS.EB.52
COMPUTE NM HYD              ID=91  HYD NO=OS.EB.52  AREA=0.00259 SQ MI
                             PER A=0 PER B=0 PER C=10 PER D=90
                             TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.59 AND OS.EB.52
ADD HYD                      ID=90  HYD=ADD.84  ID I=92  ID II=91
*S
***** ADD.TOT.3 *****
*S
*S      ADD ADD.84 AND ROUTE.TOT.2
ADD HYD                      ID=89  HYD=ADD.TOT.3  ID I=90  ID II=93
*S
***** ROUTE.TOT.3 *****
*S
*S      ROUTE ADD.TOT.3 THROUGH PIPE LENGTH MH-6 TO MH-7
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.017
                             DIA=2.5 FT  N=.013
ROUTE MCUNGE              ID=88  HYD NO=ROUTE.TOT.3  INFLOW ID=89
                             DT=0.0  LENGTH=316
*S
***** MH-7 *****
*S
*S      BASIN OS.WB.57
COMPUTE NM HYD              ID=87  HYD NO=OS.WB.57  AREA=0.01428 SQ MI
                             PER A=0 PER B=0 PER C=20 PER D=80
                             TP=0.133 HR  MASS RAIN=-1
*S
*S      BASIN OS.EB.50
COMPUTE NM HYD              ID=86  HYD NO=OS.EB.50  AREA=0.00080 SQ MI
                             PER A=0 PER B=0 PER C=10 PER D=90
                             TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.57 AND OS.EB.50
ADD HYD                      ID=85  HYD=ADD.81  ID I=87  ID II=86
*S
***** ADD.TOT.4 *****
*S
*S      ADD ADD.81 AND ROUTE.TOT.3
ADD HYD                      ID=84  HYD=ADD.TOT.4  ID I=85  ID II=88
*S
***** ROUTE.TOT.4 *****
*S
*S      ROUTE ADD.TOT.4 THROUGH PIPE LENGTH MH-7 TO MH-9
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.015
                             DIA=3 FT  N=.013
ROUTE MCUNGE              ID=83  HYD NO=ROUTE.TOT.4  INFLOW ID=84
                             DT=0.0  LENGTH=265
*S
***** MH-9 *****
*S
*S      BASIN OS.WB.55
COMPUTE NM HYD              ID=82  HYD NO=OS.WB.55  AREA=0.00534 SQ MI

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10YR\_Combine.HYM  
PER A=0 PER B=0 PER C=19 PER D=81  
TP=0.133 HR MASS RAIN=-1

```
*S
*S      BASIN OS.EB.48
COMPUTE NM HYD      ID=81  HYD NO=OS.EB.48  AREA=0.00073 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1

*S
*S      ADD OS.WB.55 AND OS.EB.48
ADD HYD      ID=80  HYD=ADD.78  ID I=82  ID II=81
*S
***** ADD.TOT.5 *****
*S
*S      ADD ADD.78 AND ROUTE.TOT.4
ADD HYD      ID=79  HYD=ADD.TOT.5  ID I=80  ID II=83
*S
***** ROUTE.TOT.5 *****
*S
*S      ROUTE ADD.TOT.5 THROUGH PIPE LENGTH MH-9 TO MH-10
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.016
                    DIA=3 FT  N=.013
ROUTE MCUNGE      ID=78  HYD NO=ROUTE.TOT.5  INFLOW ID=79
                    DT=0.0  LENGTH=293

*S
***** MH-10 *****
*S
*S      BASIN OS.WB.53
COMPUTE NM HYD      ID=77  HYD NO=OS.WB.53  AREA=0.00422 SQ MI
                    PER A=0 PER B=0 PER C=19 PER D=81
                    TP=0.133 HR  MASS RAIN=-1

*S
*S      BASIN OS.EB.46
COMPUTE NM HYD      ID=76  HYD NO=OS.EB.46  AREA=0.00080 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1

*S
*S      ADD OS.WB.53 AND OS.EB.46
ADD HYD      ID=75  HYD=ADD.75  ID I=77  ID II=76
*S
***** ADD.TOT.6 *****
*S
*S      ADD ADD.75 AND ROUTE.TOT.5
ADD HYD      ID=74  HYD=ADD.TOT.6  ID I=75  ID II=78
*S
***** ROUTE.TOT.6 *****
*S
*S      ROUTE ADD.TOT.6 THROUGH PIPE LENGTH MH-10 TO MH-11
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.010
                    DIA=3.5 FT  N=.013
ROUTE MCUNGE      ID=73  HYD NO=ROUTE.TOT.6  INFLOW ID=74
                    DT=0.0  LENGTH=295

*S
***** MH-11 *****
*S
*S      BASIN OS.WB.51
COMPUTE NM HYD      ID=72  HYD NO=OS.WB.51  AREA=0.00533 SQ MI
                    PER A=0 PER B=0 PER C=24 PER D=76
                    TP=0.133 HR  MASS RAIN=-1

*S
*S      BASIN OS.EB.44
COMPUTE NM HYD      ID=71  HYD NO=OS.EB.44  AREA=0.00077 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1
```

10YR\_Combine.HYM

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*S
*S      ADD OS.WB.51 AND OS.EB.44
ADD HYD      ID=70  HYD=ADD.72  ID I=72  ID II=71
*S
***** ADD.TOT.7 *****
*S
*S      ADD ADD.72 AND ROUTE.TOT.6
ADD HYD      ID=69  HYD=ADD.TOT.7  ID I=70  ID II=73
*S
***** ROUTE.TOT.7 *****
*S
*S      ROUTE ADD.TOT.7 THROUGH PIPE LENGTH MH-11 TO MH-12
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.012
                      DIA=3.5 FT  N=.013
ROUTE MCUNGE      ID=68  HYD NO=ROUTE.TOT.7  INFLOW ID=69
                      DT=0.0  LENGTH=323
*S
***** MH-12 *****
*S
*S      BASIN OS.WB.49
COMPUTE NM HYD      ID=67  HYD NO=OS.WB.49  AREA=0.02532 SQ MI
                      PER A=0 PER B=0 PER C=34 PER D=66
                      TP=0.215 HR  MASS RAIN=-1
*S
*S      BASIN OS.EB.42
COMPUTE NM HYD      ID=66  HYD NO=OS.EB.42  AREA=0.00086 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.49 AND OS.EB.42
ADD HYD      ID=65  HYD=ADD.69  ID I=67  ID II=66
*S
***** ADD.TOT.8 *****
*S
*S      ADD ADD.69 AND ROUTE.TOT.7
ADD HYD      ID=64  HYD=ADD.TOT.8  ID I=65  ID II=68
*S
***** ROUTE.TOT.8 *****
*S
*S      ROUTE ADD.TOT.8 THROUGH PIPE LENGTH MH-12 TO MH-13
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.010
                      DIA=4 FT  N=.013
ROUTE MCUNGE      ID=63  HYD NO=ROUTE.TOT.8  INFLOW ID=64
                      DT=0.0  LENGTH=149
*S
***** MH-13 *****
*S
*S      BASIN OS.WB.47
COMPUTE NM HYD      ID=62  HYD NO=OS.WB.47  AREA=0.00062 SQ MI
                      PER A=0 PER B=0 PER C=10 PER D=90
                      TP=0.215 HR  MASS RAIN=-1
***** ADD.TOT.9 *****
*S
*S      ADD OS.WB.47 AND ROUTE.TOT.8
ADD HYD      ID=61  HYD=ADD.TOT.9  ID I=62  ID II=63
*S
***** ROUTE.TOT.9 *****
*S
*S      ROUTE ADD.TOT.9 THROUGH PIPE LENGTH MH-13 TO MH-14
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.013
                      DIA=4 FT  N=.013
ROUTE MCUNGE      ID=60  HYD NO=ROUTE.TOT.9  INFLOW ID=61
                      DT=0.0  LENGTH=120

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# 10YR\_Combine.HYM

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*S
***** MH-14 *****
*S
*S      BASIN OS.EB.40
COMPUTE NM HYD      ID=59  HYD NO=OS.EB.40  AREA=0.00094 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1
***** ADD.TOT.10 *****
*S
*S      ADD OS.EB.40 AND ROUTE.TOT.9
ADD HYD      ID=58  HYD=ADD.TOT.10  ID I=59  ID II=60
*S
***** ROUTE.TOT.10 *****
*S
*S      ROUTE ADD.TOT.10 THROUGH PIPE LENGTH MH-14 TO MH-15
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.014
                    DIA=4 FT  N=.013
ROUTE MCUNGE      ID=57  HYD NO=ROUTE.TOT.10  INFLOW ID=58
                    DT=0.0  LENGTH=159
*S
***** MH-15 *****
*S
*S      BASIN OS.WB.45
COMPUTE NM HYD      ID=56  HYD NO=OS.WB.45  AREA=0.01253 SQ MI
                    PER A=0 PER B=0 PER C=44 PER D=56
                    TP=0.133 HR  MASS RAIN=-1
*S
*S      BASIN OS.EB.38
COMPUTE NM HYD      ID=55  HYD NO=OS.EB.38  AREA=0.00066 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1
*S
*S      ADD OS.WB.45 AND OS.EB.38
ADD HYD      ID=54  HYD=ADD.27  ID I=56  ID II=55
*S
***** ADD.TOT.11 *****
*S
*S      ADD ADD.27 AND ROUTE.TOT.10
ADD HYD      ID=53  HYD=ADD.TOT.11  ID I=54  ID II=57
*S
***** ROUTE.TOT.11 *****
*S
*S      ROUTE ADD.TOT.11 THROUGH PIPE LENGTH MH-15 TO MH-16
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.013
                    DIA=4 FT  N=.013
ROUTE MCUNGE      ID=52  HYD NO=ROUTE.TOT.11  INFLOW ID=53
                    DT=0.0  LENGTH=336
*S
***** Edith *****
*S
*S      BASIN O3
COMPUTE NM HYD      ID=46  HYD NO=O3  AREA=0.01116 SQ MI
                    PER A=0 PER B=0 PER C=16 PER D=84
                    TP=0.133 HR  MASS RAIN=-1
***** Split Hydrograph AT BASIN O3*****
*S
DIVIDE HYD      ID=46  CODE=999  ID I=45  HYD NO=105.EDITH.BEAR.PIPE
                    ID II=44  HYD NO=106.EDITH.BEAR.O2
TOTAL FLOW      DIVIDED FLOW
0              0
8              8
10            10
12            12

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                                10YR_Combine.HYM
                                14      14
                                16      16
                                18      18
                                20      20
                                22      20
                                24      20
                                26      20
                                28      20
                                30      20
PRINT HYD      ID=45  CODE=0
PLOT HYD       ID=45
PRINT HYD      ID=44  CODE=0
PLOT HYD       ID=44
*S
***** ROUTE.TOT.02 *****
*S
*S      ROUTE 105.EDITH.BEAR.Pipe THROUGH PIPE LENGTH MH.EDITH.BEAR TO
MH.EDITH.FORTKX
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.02
                        DIA=2.5 FT  N=.013
ROUTE MCUNGE      ID=43  HYD NO=ROUTE.REM.03  INFLOW ID=45
                        DT=0.0  LENGTH=400
*S
***** ADD.04 *****
*S
*S      BASIN 04
COMPUTE NM HYD      ID=42  HYD NO=04  AREA=0.00472 SQ MI
                        PER A=0 PER B=0 PER C=10 PER D=90
                        TP=0.133 HR  MASS RAIN=-1
***** Split Hydrograph AT BASIN 04*****
*S
DIVIDE HYD      ID=42 CODE=999 ID I=41 HYD NO=105.EDITH.FORTKX.Pipe
                        ID II=40 HYD NO=106.EDITH.FORTKX.02
TOTAL FLOW  DIVIDED FLOW
0          0
2          2
4          4
6          6
8          8
10         10
12         12
15         15
PRINT HYD      ID=41  CODE=0
PLOT HYD       ID=41
PRINT HYD      ID=40  CODE=0
PLOT HYD       ID=40
*S
*S      ADD 105.EDITH.FORTKX.Pipe AND ROUTE.REM.03
ADD HYD      ID=39  HYD=ADD.62  ID I=41  ID II=43
*S
***** ROUTE.TOT.04 *****
*S
*S      ROUTE ADD.62 THROUGH PIPE LENGTH MH-04 TO Intersection
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.02
                        DIA=2.5 FT  N=.013
ROUTE MCUNGE      ID=38  HYD NO=ROUTE.REM.04  INFLOW ID=39
                        DT=0.0  LENGTH=315
*S
***** MH-16-1 *****
*S
*S      BASIN OS.WB.43
COMPUTE NM HYD      ID=37  HYD NO=OS.WB.43  AREA=0.00424 SQ MI
                        PER A=0 PER B=0 PER C=10 PER D=90

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                                10YR_Combine.HYM
                                TP=0.133 HR  MASS RAIN=-1
*S
***** Split Hydrograph AT OS.WB.43*****
*S
DIVIDE HYD          ID=37 CODE=999 ID I=99 HYD NO=105.OSWB43.EDITH
                    ID II=98 HYD NO=106.OSWB43.OSUNA
                    TOTAL FLOW  DIVIDED FLOW
                        0         0
                        2         2
                        4         4
                        6         6
                        8         8
                       10        10
                       12        10
PRINT HYD          ID=99  CODE=0
PLOT HYD           ID=99
PRINT HYD          ID=98  CODE=0
PLOT HYD           ID=98
*S
*S      BASIN OS.EB.36
COMPUTE NM HYD     ID=36  HYD NO=OS.EB.36  AREA=0.00105 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1
***** Split Hydrograph AT OS.EB.36*****
*S
DIVIDE HYD          ID=36 CODE=999 ID I=97 HYD NO=105.OSEB36.EDITH
                    ID II=96 HYD NO=106.OSEB36.OSUNA
                    TOTAL FLOW  DIVIDED FLOW
                        0         0
                       2.5        2.5
                        3         2.5
PRINT HYD          ID=97  CODE=0
PLOT HYD           ID=97
PRINT HYD          ID=98  CODE=0
PLOT HYD           ID=98
*S
*S      ADD 105.OSWB43.EDITH AND 105.OSEB36.EDITH
ADD HYD            ID=35  HYD=ADD.83  ID I=99  ID II=97
*S
***** ROUTE.TOT.43.36 *****
*S
*S      ROUTE ADD.83 THROUGH PIPE LENGTH MH-16-1 TO MH.EDITH
COMPUTE RATING CURVE  CID=1 VS NO=1 CODE=-1 SLP=0.007
                      DIA=2.5 FT  N=.013
ROUTE MCUNGE          ID=34  HYD NO=ROUTE.TOT.43.36  INFLOW ID=35
                      DT=0.0  LENGTH=100
*S
***** ADD EDITH *****
*S
*S      ADD ROUTE.TOT.43.36 AND ROUTE.REM.04
ADD HYD            ID=33  HYD=ADD.21  ID I=34  ID II=38
*S
***** ROUTE.EDITH *****
*S
*S      ROUTE ADD.21 THROUGH PIPE LENGTH MH TO EDITH OUTFLOW
COMPUTE RATING CURVE  CID=1 VS NO=1 CODE=-1 SLP=0.007
                      DIA=2.5 FT  N=.013
ROUTE MCUNGE          ID=32  HYD NO=ROUTE.EDITH  INFLOW ID=33
                      DT=0.0  LENGTH=100
*S
***** MH-16 *****
*S
*S      BASIN OS.WB.41

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10YR\_Combine.HYM  
COMPUTE NM HYD ID=51 HYD NO=OS.WB.41 AREA=0.00019 SQ MI  
PER A=0 PER B=0 PER C=10 PER D=90  
TP=0.133 HR MASS RAIN=-1

\*\*\*\*\* ADD EDITH FROM OS.WB.43 \*\*\*\*\*

\*S  
\*S ADD 106.OSWB43.OSUNA AND OS.WB.41  
ADD HYD ID=50 HYD=ADD.21 ID I=98 ID II=51  
\*S  
\*S  
\*S

\*S BASIN OS.EB.99  
COMPUTE NM HYD ID=99 HYD NO=OS.EB.99 AREA=0.00018 SQ MI  
PER A=0 PER B=0 PER C=10 PER D=90  
TP=0.133 HR MASS RAIN=-1

\*S  
\*S ADD 106.OSEB36.OSUNA AND OS.EB.99  
ADD HYD ID=24 HYD=ADD.56 ID I=96 ID II=99  
\*S

\*S ADD ADD.21 AND ADD.56  
ADD HYD ID=49 HYD=ADD.24 ID I=50 ID II=24  
\*S

\*\*\*\*\* ADD.TOT.12 \*\*\*\*\*

\*S  
\*S ADD ADD.24 AND ROUTE.TOT.11  
ADD HYD ID=48 HYD=ADD.TOT.12 ID I=49 ID II=52  
\*S

\*\*\*\*\* ROUTE.TOT.12 \*\*\*\*\*

\*S  
\*S ROUTE ADD.TOT.12 THROUGH PIPE LENGTH MH-16 TO MH-33  
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=0.007  
DIA=4.5 FT N=.013  
ROUTE MCUNGE ID=47 HYD NO=ROUTE.TOT.12 INFLOW ID=48  
DT=0.0 LENGTH=141

\*S  
\*\*\*\*\* Edith TO OSUNA \*\*\*\*\*

\*S  
\*S BASIN 02  
COMPUTE NM HYD ID=31 HYD NO=02 AREA=0.00363 SQ MI  
PER A=0 PER B=0 PER C=10 PER D=90  
TP=0.147 HR MASS RAIN=-1

\*S  
\*S ADD 106.EDITH.BEAR.02 AND 02  
ADD HYD ID=30 HYD=ADD.79 ID I=44 ID II=31  
\*S

\*\*\*\*\* ROUTE.02-04\*\*\*\*\*

\*S  
\*S ROUTE ADD.79 ALONG EDITH FROM 02 TO 04  
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=0.007  
DIA=2.5 FT N=.013  
ROUTE MCUNGE ID=29 HYD NO=ROUTE.02.04 INFLOW ID=30  
DT=0.0 LENGTH=380

\*S  
\*S ADD 106.EDITH.FORTKX.02 AND ROUTE.02.04  
ADD HYD ID=28 HYD=ADD.78 ID I=40 ID II=29  
\*S

\*\*\*\*\* ROUTE.04-INT\*\*\*\*\*

\*S  
\*S ROUTE ADD.78 ALONG EDITH FROM 04 TO BEFORE OSUNA INTERSECTION  
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=0.007  
DIA=2.5 FT N=.013  
ROUTE MCUNGE ID=27 HYD NO=ROUTE.04-INT INFLOW ID=28  
DT=0.0 LENGTH=200

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*S
*S      BASIN 01
COMPUTE NM HYD      ID=26  HYD NO=01  AREA=0.00149 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.134 HR  MASS RAIN=-1

*S
*S      ADD 01 AND ROUTE.04-INT
ADD HYD              ID=25  HYD=ADD.21  ID I=27  ID II=26
*S
*S***** ADD.TOT.13 *****
*S
*S      ADD ADD.21 AND ROUTE.TOT.12
ADD HYD              ID=23  HYD=ADD.TOT.13  ID I=25  ID II=47
PRINT HYD            ID=23  CODE=0
PLOT HYD             ID=23
*S
***** Split Hydrograph *****
*S SPLIT TO HORSY BASIN
DIVIDE HYD           ID=23  CODE=999  ID I=22  HYD NO=103.HORSY
                    ID II=21  HYD NO=104.PIPE
                    TOTAL FLOW  DIVIDED FLOW
                    0          0
                    0.3        0
                    1.5        0
                    5.12       0.28
                    8.13       1.78
                    10.07      2.97
                    11.51      4.05
                    12.84      5.09
                    14.37      6.28
                    16.4        7.87
                    19.22      10.2
                    23.03      13.45
                    28.54      18.22
                    36.86      25.61
                    49.48      37.1
                    70.50      56.6
                    112.63     96.3
                    179.18     159.63
                    206.03     185.22
                    213.28     192.11
PRINT HYD            ID=22  CODE=0
PLOT HYD             ID=22
PRINT HYD            ID=21  CODE=0
PLOT HYD             ID=21
*S
***** ROUTE.TOT.13 *****
*S
*S      ROUTE 104.PIPE THROUGH PIPE LENGTH MH-33 TO MH-18
COMPUTE RATING CURVE CID=1  VS NO=1  CODE=-1  SLP=0.024
                    DIA=3 FT  N=.013
ROUTE MCUNGE         ID=20  HYD NO=ROUTE.TOT.13  INFLOW ID=21
                    DT=0.0  LENGTH=245
*S
***** MH-18 *****
*S
*S      BASIN OS.WB.37
COMPUTE NM HYD      ID=19  HYD NO=OS.WB.37  AREA=0.00115 SQ MI
                    PER A=0 PER B=0 PER C=10 PER D=90
                    TP=0.133 HR  MASS RAIN=-1

*S
*S      BASIN OS.EB.34

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                                10YR_Combine.HYM
COMPUTE NM HYD                ID=18  HYD NO=OS.EB.34  AREA=0.00098 SQ MI
                                PER A=0 PER B=0 PER C=10 PER D=90
                                TP=0.133 HR  MASS RAIN=-1

*S
*S      ADD OS.WB.37 AND OS.EB.34
ADD HYD                ID=17  HYD=ADD.18  ID I=19  ID II=18
*S
***** ADD.TOT.14 *****
*S
*S      ADD ADD.18 AND ROUTE.TOT.13
ADD HYD                ID=16  HYD=ADD.TOT.14  ID I=17  ID II=20
*S
***** ROUTE.TOT.14 *****
*S
*S      ROUTE ADD.TOT.14 THROUGH PIPE LENGTH MH-18 TO MH-19
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.007
                                DIA=3.5 FT  N=.013
ROUTE MCUNGE          ID=15  HYD NO=ROUTE.TOT.14  INFLOW ID=16
                                DT=0.0  LENGTH=228
*S
***** MH-19 *****
*S
*S      BASIN OS.WB.35
COMPUTE NM HYD                ID=14  HYD NO=OS.WB.35  AREA=0.00291 SQ MI
                                PER A=0 PER B=0 PER C=10 PER D=90
                                TP=0.133 HR  MASS RAIN=-1

*S
*S      ADD OS.WB.35 AND ROUTE.TOT.14
ADD HYD                ID=13  HYD=ADD.14  ID I=14  ID II=15
*S
***** ROUTE.TOT.15 *****
*S
*S      ROUTE ADD.14 THROUGH PIPE LENGTH MH-19 TO MH-34
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.006
                                DIA=3.5 FT  N=.013
ROUTE MCUNGE          ID=12  HYD NO=ROUTE.TOT.15  INFLOW ID=13
                                DT=0.0  LENGTH=200

*S
***** MH-32 *****
*S
*S      BASIN OS.EB.32
COMPUTE NM HYD                ID=8  HYD NO=OS.EB.32  AREA=0.00221 SQ MI
                                PER A=0 PER B=0 PER C=10 PER D=90
                                TP=0.133 HR  MASS RAIN=-1

*S
*S      ADD OS.WB.32 AND ROUTE.TOT.15
ADD HYD                ID=7  HYD=ADD.9  ID I=8  ID II=12
*S
***** ROUTE.TOT.16 *****
*S
*S      ROUTE ADD.9 THROUGH PIPE LENGTH MH-34 TO MH-21
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.006
                                DIA=4 FT  N=.013
ROUTE MCUNGE          ID=9  HYD NO=ROUTE.TOT.16  INFLOW ID=7
                                DT=0.0  LENGTH=110
*S
***** MH-21 *****
*S
*S      BASIN OS.WB.33
COMPUTE NM HYD                ID=11  HYD NO=OS.WB.95  AREA=0.02088 SQ MI
                                PER A=0 PER B=0 PER C=10 PER D=90
                                TP=0.224 HR  MASS RAIN=-1

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10YR\_Combine.HYM

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*S
*S      ADD OS.WB.33 AND ROUTE.TOT.16
ADD HYD      ID=10  HYD=ADD.12  ID I=11  ID II=9
*S

***** ROUTE.TOT.17 *****
*S
*S      ROUTE ADD.12 THROUGH PIPE LENGTH MH-21 TO MH-23
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.014
                        DIA=4 FT  N=.013
ROUTE MCUNGE          ID=6  HYD NO=ROUTE.TOT.17  INFLOW ID=10
                        DT=0.0  LENGTH=470
*S
***** MH-23 *****
*S
*S      BASIN OS.WB.31b
COMPUTE NM HYD      ID=5  HYD NO=OS.WB.93  AREA=0.01310 SQ MI
                        PER A=0 PER B=0 PER C=10 PER D=90
                        TP=0.204 HR  MASS RAIN=-1
*S
***** ADD.TOT.18 *****
*S
*S      ADD OS.WB.31b AND ROUTE.TOT.17
ADD HYD      ID=4  HYD=ADD.TOT.18  ID I=5  ID II=6
PRINT HYD    ID=4  CODE=0
PLOT HYD     ID=4
*S
***** ROUTE.TOT.18 *****
*S
*S      ROUTE ADD.TOT.18 THROUGH PIPE LENGTH MH-23 TO Outlet (RAILROAD BASIN)
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.004
                        DIA=5 FT  N=.013
ROUTE MCUNGE          ID=3  HYD NO=ROUTE.TOT.18  INFLOW ID=4
                        DT=0.0  LENGTH=138
PRINT HYD          ID=5  CODE=1
PLOT HYD           ID=5
*S

FINISH

```

AHYMO PROGRAM SUMMARY TABLE (AHYMO-S4)  
 10/13/2010  
 INPUT FILE = C:\Program Files\AHYMO-S4\10YR\_Combine.HYM  
 T.Y.LinInSingleA10537359

- Ver. S4.01a, Rel: 01a

RUN DATE (MON/DAY/YR) =

USER NO. =

| COMMAND | HYDROGRAPH IDENTIFICATION                                                    | FROM ID NO.                | TO ID NO. | AREA (SQ MI) | PEAK DISCHARGE (CFS) | RUNOFF VOLUME (AC-FT) | RUNOFF (INCHES) | TIME TO PEAK (HOURS) | CFS PER ACRE | PAGE = 1<br>NOTATION |
|---------|------------------------------------------------------------------------------|----------------------------|-----------|--------------|----------------------|-----------------------|-----------------|----------------------|--------------|----------------------|
| *S      | AHYMO FILE FOR OSUNA ROAD STORM DRAIN FROM CHURCH BASIN TO RAILROAD BASIN    |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | PROPOSED CONDITIONS, 6HR, 100YR.                                             |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | FILE: 10YR_Combine.HYM                                                       |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | DATE REVISED: 09/14/10                                                       |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | MODEL DEVELOPED TO REFLECT EXISTING DRAINAGE CONDITIONS FOR THE OSUNA STORM  |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | ANALYSIS POINTS TAKEN AT BASIN INFLOW POINTS AND CRITICAL ADD POINTS ALONG O |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | RAINFALL VALUES TAKING FROM NOAA PRECIPITATION FREQUENCY DATA SERVER FROM NO |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | MODEL REFLECTS 6-HOUR RAINFALL DISTRIBUTION FOR 10-YR STORM EVENT            |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | ASSUMPTIONS:                                                                 |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | 1. ALL VSC ROUTING MUSKINGUM-CUNGE ROUTING.                                  |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | 2. LAND TREATMENTS REFLECT EXISTING LAND CONDITIONS                          |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| 1.520   | RAINFALL TYPE= 1 NOAA 14                                                     |                            |           |              |                      |                       |                 |                      |              | RAIN6=               |
| *S      | 10 YEAR RAINFALL TABLE                                                       |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | SEDIMENT BULKING FACTOR                                                      | 2% for Existing Conditions |           |              |                      |                       |                 |                      |              |                      |
| 1.02    | SEDIMENT BULK                                                                |                            |           |              |                      |                       |                 |                      |              | PK BF =              |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | BASIN OS.WB.65C                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| 90.00   | COMPUTE NM HYD                                                               | OS.WB.65C                  | -         | 65           | 0.00084              | 1.41                  | 0.054           | 1.21361              | 1.520        | 2.626 PER IMP=       |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | ROUTE OS.WB.65C THROUGH PIPE LENGTH MH-7 TO MH-6                             |                            |           |              |                      |                       |                 |                      |              |                      |
| 0.2     | ROUTE MCUNGE                                                                 | ROUTE.TOT.1                | 65        | 88           | 0.00084              | 1.41                  | 0.054           | 1.21342              | 1.540        | 2.627 CCODE =        |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | BASIN OS.EB.60                                                               |                            |           |              |                      |                       |                 |                      |              |                      |
| 90.00   | COMPUTE NM HYD                                                               | OS.EB.60                   | -         | 60           | 0.00487              | 7.68                  | 0.315           | 1.21361              | 1.550        | 2.465 PER IMP=       |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | ADD OS.EB.60 AND ROUTE.TOT.1                                                 |                            |           |              |                      |                       |                 |                      |              |                      |
| 0.2     | ADD HYD                                                                      | ADD.89 60&88               | 89        |              | 0.00571              | 9.08                  | 0.370           | 1.21350              | 1.550        | 2.486                |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |
| *S      | ROUTE ADD.89 THROUGH PIPE LENGTH MH-6 TO MH-5                                |                            |           |              |                      |                       |                 |                      |              |                      |
| 0.2     | ROUTE MCUNGE                                                                 | ROUTE.TOT.2                | 89        | 90           | 0.00571              | 9.08                  | 0.370           | 1.21352              | 1.560        | 2.484 CCODE =        |
| *S      |                                                                              |                            |           |              |                      |                       |                 |                      |              |                      |

[illegible]







|       |                |                                                     |         |        |       |         |       |       |          |
|-------|----------------|-----------------------------------------------------|---------|--------|-------|---------|-------|-------|----------|
|       | *S             | ADD ADD.69 AND ROUTE.TOT.7                          |         |        |       |         |       |       |          |
|       | ADD HYD        | ADD.TOT.8 65&68 64                                  | 0.07077 | 100.47 | 4.187 | 1.10930 | 1.560 | 2.218 |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ROUTE ADD.TOT.8 THROUGH PIPE LENGTH MH-12 TO MH-13  |         |        |       |         |       |       |          |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.8 64 63                                   | 0.07077 | 100.41 | 4.187 | 1.10929 | 1.560 | 2.217 | CCODE =  |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | BASIN OS.WB.47                                      |         |        |       |         |       |       |          |
| 90.00 | COMPUTE NM HYD | OS.WB.47 - 62                                       | 0.00062 | 0.85   | 0.040 | 1.21361 | 1.610 | 2.152 | PER IMP= |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ADD OS.WB.47 AND ROUTE.TOT.8                        |         |        |       |         |       |       |          |
|       | ADD HYD        | ADD.TOT.9 62&63 61                                  | 0.07139 | 101.19 | 4.227 | 1.11019 | 1.560 | 2.215 |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ROUTE ADD.TOT.9 THROUGH PIPE LENGTH MH-13 TO MH-14  |         |        |       |         |       |       |          |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.9 61 60                                   | 0.07139 | 101.23 | 4.227 | 1.11019 | 1.570 | 2.216 | CCODE =  |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | BASIN OS.EB.40                                      |         |        |       |         |       |       |          |
| 90.00 | COMPUTE NM HYD | OS.EB.40 - 59                                       | 0.00094 | 1.58   | 0.061 | 1.21361 | 1.520 | 2.624 | PER IMP= |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ADD OS.EB.40 AND ROUTE.TOT.9                        |         |        |       |         |       |       |          |
|       | ADD HYD        | ADD.TOT.10 59&60 58                                 | 0.07233 | 102.70 | 4.288 | 1.11153 | 1.570 | 2.219 |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ROUTE ADD.TOT.10 THROUGH PIPE LENGTH MH-14 TO MH-15 |         |        |       |         |       |       |          |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.10 58 57                                  | 0.07233 | 102.74 | 4.288 | 1.11153 | 1.570 | 2.219 | CCODE =  |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | BASIN OS.WB.45                                      |         |        |       |         |       |       |          |
| 56.00 | COMPUTE NM HYD | OS.WB.45 - 56                                       | 0.01253 | 17.84  | 0.627 | 0.93839 | 1.530 | 2.225 | PER IMP= |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | BASIN OS.EB.38                                      |         |        |       |         |       |       |          |
| 90.00 | COMPUTE NM HYD | OS.EB.38 - 55                                       | 0.00066 | 1.11   | 0.043 | 1.21361 | 1.520 | 2.632 | PER IMP= |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ADD OS.WB.45 AND OS.EB.38                           |         |        |       |         |       |       |          |
|       | ADD HYD        | ADD.27 56&55 54                                     | 0.01319 | 18.95  | 0.670 | 0.95211 | 1.530 | 2.245 |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ADD ADD.27 AND ROUTE.TOT.10                         |         |        |       |         |       |       |          |
|       | ADD HYD        | ADD.TOT.11 54&57 53                                 | 0.08552 | 120.66 | 4.958 | 1.08694 | 1.560 | 2.204 |          |
|       | *S             |                                                     |         |        |       |         |       |       |          |
|       | *S             | ROUTE ADD.TOT.11 THROUGH PIPE LENGTH MH-15 TO MH-16 |         |        |       |         |       |       |          |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.11 53 52                                  | 0.08552 | 120.64 | 4.958 | 1.08693 | 1.570 | 2.204 | CCODE =  |

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BASIN 03

| COMMAND | HYDROGRAPH IDENTIFICATION | FROM ID NO. | TO ID NO. | AREA (SQ MI) | PEAK DISCHARGE (CFS) | RUNOFF VOLUME (AC-FT) | RUNOFF (INCHES) | TIME TO PEAK (HOURS) | CFS PER ACRE | PAGE = 6<br>NOTATION |
|---------|---------------------------|-------------|-----------|--------------|----------------------|-----------------------|-----------------|----------------------|--------------|----------------------|
|---------|---------------------------|-------------|-----------|--------------|----------------------|-----------------------|-----------------|----------------------|--------------|----------------------|

|       |                |              |        |         |       |       |         |        |       |          |
|-------|----------------|--------------|--------|---------|-------|-------|---------|--------|-------|----------|
| 84.00 | COMPUTE NM HYD | 03           | - 46   | 0.01116 | 18.14 | 0.693 | 1.16504 | 1.530  | 2.539 | PER IMP= |
|       | DIVIDE HYD     | 105.EDITH.BE | 46 45  | 0.01116 | 18.14 | 0.693 | 1.16501 | 1.530  | 2.539 |          |
|       |                | 106.EDITH.BE | and 44 | 0.00000 | 0.00  | 0.000 | 0.00000 | -0.010 | 0.000 |          |

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|     |              |                                                            |              |       |         |       |       |         |       |               |
|-----|--------------|------------------------------------------------------------|--------------|-------|---------|-------|-------|---------|-------|---------------|
| 0.2 | ROUTE MCUNGE | EAR.PE THROUGH PIPE LENGTH MH.EDITH.BEAR TO MH.EDITH.FORTK | ROUTE.REM.03 | 45 43 | 0.01116 | 18.15 | 0.693 | 1.16502 | 1.530 | 2.541 CCODE = |
|-----|--------------|------------------------------------------------------------|--------------|-------|---------|-------|-------|---------|-------|---------------|

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BASIN 04

|       |                |              |        |         |      |       |         |        |       |          |
|-------|----------------|--------------|--------|---------|------|-------|---------|--------|-------|----------|
| 90.00 | COMPUTE NM HYD | 04           | - 42   | 0.00472 | 7.88 | 0.306 | 1.21361 | 1.520  | 2.609 | PER IMP= |
|       | DIVIDE HYD     | 105.EDITH.FO | 42 41  | 0.00472 | 7.88 | 0.305 | 1.21355 | 1.520  | 2.609 |          |
|       |                | 106.EDITH.FO | and 40 | 0.00000 | 0.00 | 0.000 | 0.00000 | -0.010 | 0.000 |          |

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|  |         |                                            |              |    |         |       |       |         |       |       |
|--|---------|--------------------------------------------|--------------|----|---------|-------|-------|---------|-------|-------|
|  | ADD HYD | ADD 105.EDITH.FORTKX.PIPE AND ROUTE.REM.03 | ADD.62 41&43 | 39 | 0.01588 | 26.03 | 0.999 | 1.17944 | 1.530 | 2.561 |
|--|---------|--------------------------------------------|--------------|----|---------|-------|-------|---------|-------|-------|

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|     |              |                                                        |              |       |         |       |       |         |       |               |
|-----|--------------|--------------------------------------------------------|--------------|-------|---------|-------|-------|---------|-------|---------------|
| 0.2 | ROUTE MCUNGE | ROUTE ADD.62 THROUGH PIPE LENGTH MH-04 TO Intersection | ROUTE.REM.04 | 39 38 | 0.01588 | 26.01 | 0.999 | 1.17944 | 1.540 | 2.559 CCODE = |
|-----|--------------|--------------------------------------------------------|--------------|-------|---------|-------|-------|---------|-------|---------------|

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BASIN OS.WB.43

|       |                |          |      |         |      |       |         |       |       |          |
|-------|----------------|----------|------|---------|------|-------|---------|-------|-------|----------|
| 90.00 | COMPUTE NM HYD | OS.WB.43 | - 37 | 0.00424 | 7.08 | 0.274 | 1.21361 | 1.520 | 2.609 | PER IMP= |
|-------|----------------|----------|------|---------|------|-------|---------|-------|-------|----------|

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|  |            |              |        |         |      |       |         |        |       |  |
|--|------------|--------------|--------|---------|------|-------|---------|--------|-------|--|
|  | DIVIDE HYD | 105.OSWB43.E | 37 99  | 0.00424 | 7.08 | 0.274 | 1.21354 | 1.520  | 2.609 |  |
|  |            | 106.OSWB43.O | and 98 | 0.00000 | 0.00 | 0.000 | 0.00000 | -0.010 | 0.000 |  |

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BASIN OS.EB.36

|       |                |          |      |         |      |       |         |       |       |          |
|-------|----------------|----------|------|---------|------|-------|---------|-------|-------|----------|
| 90.00 | COMPUTE NM HYD | OS.EB.36 | - 36 | 0.00105 | 1.76 | 0.068 | 1.21361 | 1.520 | 2.622 | PER IMP= |
|-------|----------------|----------|------|---------|------|-------|---------|-------|-------|----------|

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|  |            |              |        |         |      |       |         |       |       |  |
|--|------------|--------------|--------|---------|------|-------|---------|-------|-------|--|
|  | DIVIDE HYD | 105.OSEB36.E | 36 97  | 0.00105 | 1.76 | 0.068 | 1.21334 | 1.520 | 2.622 |  |
|  |            | 106.OSEB36.O | and 96 | 0.00000 | 0.00 | 0.000 | 0.05254 | 1.530 | 1.863 |  |

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|  |         |                                           |              |    |         |      |       |         |       |       |
|--|---------|-------------------------------------------|--------------|----|---------|------|-------|---------|-------|-------|
|  | ADD HYD | ADD 105.OSWB43.EDITH AND 105.OSEB36.EDITH | ADD.83 99&97 | 35 | 0.00529 | 8.84 | 0.342 | 1.21350 | 1.520 | 2.612 |
|--|---------|-------------------------------------------|--------------|----|---------|------|-------|---------|-------|-------|

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|       |                |                                                      |             |           |              |                      |                       |                 |                      |                                   |
|-------|----------------|------------------------------------------------------|-------------|-----------|--------------|----------------------|-----------------------|-----------------|----------------------|-----------------------------------|
| *S    |                | ROUTE ADD.83 THROUGH PIPE LENGTH MH-16-1 TO MH.EDITH |             |           |              |                      |                       |                 |                      |                                   |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.43                                         | 35          | 34        | 0.00529      | 8.85                 | 0.342                 | 1.21352         | 1.530                | 2.614 CCODE =                     |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              | ADD ROUTE.TOT.43.36 AND ROUTE.REM.O4                 |             |           |              |                      |                       |                 |                      |                                   |
|       | ADD HYD        | ADD.21 34&38                                         | 33          |           | 0.02117      | 34.83                | 1.341                 | 1.18794         | 1.530                | 2.571                             |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              | ROUTE ADD.21 THROUGH PIPE LENGTH MH TO EDITH OUTFLOW |             |           |              |                      |                       |                 |                      |                                   |
| 0.2   | ROUTE MCUNGE   | ROUTE.EDITH                                          | 33          | 32        | 0.02117      | 34.83                | 1.341                 | 1.18784         | 1.540                | 2.570 CCODE =                     |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
|       | COMMAND        | HYDROGRAPH IDENTIFICATION                            | FROM ID NO. | TO ID NO. | AREA (SQ MI) | PEAK DISCHARGE (CFS) | RUNOFF VOLUME (AC-Ft) | RUNOFF (INCHES) | TIME TO PEAK (HOURS) | CFS PER ACRE PAGE = 7<br>NOTATION |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              | BASIN OS.WB.41                                       |             |           |              |                      |                       |                 |                      |                                   |
| 90.00 | COMPUTE NM HYD | OS.WB.41 -                                           | 51          |           | 0.00019      | 0.33                 | 0.012                 | 1.21361         | 1.520                | 2.676 PER IMP=                    |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              | ADD 106.OSWB43.OSUNA AND OS.WB.41                    |             |           |              |                      |                       |                 |                      |                                   |
|       | ADD HYD        | ADD.21 98&51                                         | 50          |           | 0.00019      | 0.33                 | 0.012                 | 1.21258         | 1.520                | 2.676                             |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              | BASIN OS.EB.99                                       |             |           |              |                      |                       |                 |                      |                                   |
| 90.00 | COMPUTE NM HYD | OS.EB.99 -                                           | 99          |           | 0.00018      | 0.31                 | 0.012                 | 1.21361         | 1.520                | 2.678 PER IMP=                    |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              | ADD 106.OSEB36.OSUNA AND OS.EB.99                    |             |           |              |                      |                       |                 |                      |                                   |
|       | ADD HYD        | ADD.56 96&99                                         | 24          |           | 0.00018      | 0.31                 | 0.012                 | 1.21259         | 1.520                | 2.678                             |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              | ADD ADD.21 AND ADD.56                                |             |           |              |                      |                       |                 |                      |                                   |
|       | ADD HYD        | ADD.24 50&24                                         | 49          |           | 0.00037      | 0.63                 | 0.024                 | 1.21258         | 1.520                | 2.677                             |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              | ADD ADD.24 AND ROUTE.TOT.11                          |             |           |              |                      |                       |                 |                      |                                   |
|       | ADD HYD        | ADD.TOT.12 49&52                                     | 48          |           | 0.08589      | 121.23               | 4.981                 | 1.08747         | 1.570                | 2.205                             |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              | ROUTE ADD.TOT.12 THROUGH PIPE LENGTH MH-16 TO MH-33  |             |           |              |                      |                       |                 |                      |                                   |
| 0.2   | ROUTE MCUNGE   | ROUTE.TOT.12                                         | 48          | 47        | 0.08589      | 121.25               | 4.981                 | 1.08745         | 1.570                | 2.206 CCODE =                     |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              | BASIN O2                                             |             |           |              |                      |                       |                 |                      |                                   |
| 90.00 | COMPUTE NM HYD | O2 -                                                 | 31          |           | 0.00363      | 5.84                 | 0.235                 | 1.21361         | 1.540                | 2.513 PER IMP=                    |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |
| *     | S              | ADD 106.EDITH.BEAR.O2 AND O2                         |             |           |              |                      |                       |                 |                      |                                   |
|       | ADD HYD        | ADD.79 44&31                                         | 30          |           | 0.00363      | 5.84                 | 0.235                 | 1.21352         | 1.540                | 2.513                             |
| *     | S              |                                                      |             |           |              |                      |                       |                 |                      |                                   |

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*S
*S      ROUTE ADD.79 ALONG EDITH FROM O2 TO O4
ROUTE MCUNGE  ROUTE.O2.O4  30  29      0.00363      5.83      0.235      1.21353      1.560      2.510 CCODE =
0.2
*S
*S      ADD 106.EDITH.FORTKX.O2 AND ROUTE.O2.O4
ADD HYD      ADD.78 40&29  28      0.00363      5.83      0.235      1.21349      1.560      2.510
*S
*S
*S      OUTE ADD.78 ALONG EDITH FROM O4 TO BEFORE OSUNA INTERSECTION
ROUTE MCUNGE  ROUTE.O4-INT  28  27      0.00363      5.83      0.235      1.21351      1.560      2.511 CCODE =
0.2
*S
*S      BASIN O1
COMPUTE NM HYD      O1  -   26      0.00149      2.49      0.096      1.21361      1.530      2.610 PER IMP=
90.00
*S
*S      ADD O1 AND ROUTE.O4-INT
ADD HYD      ADD.21 27&26  25      0.00512      8.23      0.331      1.21346      1.550      2.510
*S
*S***** ADD.TOT.13 *****
*S
      FROM TO
      HYDROGRAPH ID ID      AREA      PEAK      RUNOFF      TIME TO      CFS      PAGE =
COMMAND IDENTIFICATION NO. NO. (SQ MI) DISCHARGE VOLUME RUNOFF PEAK PER 8
      (INCHES) (HOURS) ACRE NOTATION

*S      ADD ADD.21 AND ROUTE.TOT.12
ADD HYD      ADD.TOT.13 25&47  23      0.09101      129.39      5.313      1.09454      1.570      2.221
*S
*S SPLIT TO HORSY BASIN
DIVIDE HYD      103.HORSY  23  22      0.06052      112.25      3.533      1.09454      1.570      2.898
      104.PIPE and  21      0.03049      17.14      1.780      1.09454      1.570      0.879
*S
*S
*S      ROUTE 104.PIPE THROUGH PIPE LENGTH MH-33 TO MH-18
ROUTE MCUNGE  ROUTE.TOT.13  21  20      0.03049      17.14      1.780      1.09454      1.570      0.878 CCODE =
0.2
*S
*S
*S      BASIN OS.WB.37
COMPUTE NM HYD      OS.WB.37  -   19      0.00115      1.93      0.074      1.21361      1.520      2.620 PER IMP=
90.00
*S
*S      BASIN OS.EB.34
COMPUTE NM HYD      OS.EB.34  -   18      0.00098      1.65      0.063      1.21361      1.520      2.623 PER IMP=
90.00
*S
*S      ADD OS.WB.37 AND OS.EB.34
ADD HYD      ADD.18 19&18  17      0.00213      3.57      0.138      1.21335      1.520      2.621
*S
*S
*S      ADD ADD.18 AND ROUTE.TOT.13
ADD HYD      ADD.TOT.14 17&20  16      0.03262      20.51      1.917      1.10230      1.560      0.983
*S

```

\*S  
 \*S ROUTE ADD.TOT.14 THROUGH PIPE LENGTH MH-18 TO MH-19  
 0.2 ROUTE MCUNGE ROUTE.TOT.14 16 15 0.03262 20.51 1.917 1.10230 1.560 0.983 CCODE =

\*S  
 \*S  
 \*S  
 90.00 COMPUTE NM HYD BASIN OS.WB.35  
 OS.WB.35 - 14 0.00291 4.86 0.188 1.21361 1.520 2.611 PER IMP=

\*S  
 \*S ADD OS.WB.35 AND ROUTE.TOT.14  
 ADD HYD ADD.14 14&15 13 0.03553 25.19 2.106 1.11140 1.550 1.108  
 \*S

\*S  
 \*S ROUTE ADD.14 THROUGH PIPE LENGTH MH-19 TO MH-34  
 0.2 ROUTE MCUNGE ROUTE.TOT.15 13 12 0.03553 25.18 2.106 1.11140 1.560 1.107 CCODE =

\*S  
 \*S  
 \*S  
 90.00 COMPUTE NM HYD BASIN OS.EB.32  
 OS.EB.32 - 8 0.00221 3.70 0.143 1.21361 1.520 2.613 PER IMP=

\*S  
 \*S ADD OS.WB.32 AND ROUTE.TOT.15  
 ADD HYD ADD.9 8&12 7 0.03774 28.77 2.249 1.11738 1.550 1.191  
 \*S

\*S  
 \*S ROUTE ADD.9 THROUGH PIPE LENGTH MH-34 TO MH-21  
 0.2 ROUTE MCUNGE ROUTE.TOT.16 7 9 0.03774 28.77 2.249 1.11738 1.550 1.191 CCODE =

\*S  
 \*S  
 FROM TO  
 HYDROGRAPH ID ID AREA PEAK RUNOFF TIME TO CFS PAGE = 9  
 COMMAND IDENTIFICATION NO. NO. (SQ MI) DISCHARGE VOLUME RUNOFF PEAK PER NOTATION  
 (INCHES) (HOURS) ACRE

\*S  
 90.00 COMPUTE NM HYD BASIN OS.WB.33  
 OS.WB.95 - 11 0.02088 27.72 1.351 1.21361 1.620 2.074 PER IMP=

\*S  
 \*S ADD OS.WB.33 AND ROUTE.TOT.16  
 ADD HYD ADD.12 11& 9 10 0.05862 54.84 3.600 1.15165 1.590 1.462  
 \*S

\*S  
 \*S ROUTE ADD.12 THROUGH PIPE LENGTH MH-21 TO MH-23  
 0.2 ROUTE MCUNGE ROUTE.TOT.17 10 6 0.05862 54.86 3.600 1.15165 1.600 1.462 CCODE =

\*S  
 \*S  
 \*S  
 90.00 COMPUTE NM HYD BASIN OS.WB.31b  
 OS.WB.93 - 5 0.01310 18.21 0.848 1.21361 1.600 2.173 PER IMP=

\*S  
 \*S

\*S ADD OS.WB.31b AND ROUTE.TOT.17  
ADD HYD ADD.TOT.18 5& 6 4 0.07172 73.07 4.448 1.16296 1.600 1.592  
\*S  
\*S  
\*S .TOT.18 THROUGH PIPE LENGTH MH-23 TO Outlet (RAILROAD BASIN)  
ROUTE MCUNGE ROUTE.TOT.18 4 3 0.07172 73.05 4.448 1.16294 1.610 1.592 CCODE =  
0.2  
\*S  
FINISH



## **AHYMO Flow Splits**

---

## Worksheet for flow split for basin OS-WB-43

---

### Project Description

Solve For                      Efficiency

### Input Data

|                        |                                |       |
|------------------------|--------------------------------|-------|
| Discharge              | 10.78                          | ft³/s |
| Slope                  | 0.02000                        | ft/ft |
| Gutter Width           | 2.00                           | ft    |
| Gutter Cross Slope     | 0.06                           | ft/ft |
| Road Cross Slope       | 0.02                           | ft/ft |
| Roughness Coefficient  | 0.017                          |       |
| Local Depression       | 2.75                           | in    |
| Local Depression Width | 30                             | in    |
| Grate Width            | 2.00                           | ft    |
| Grate Length           | 27.00                          | ft    |
| Grate Type             | P-50 mm x 100 mm (P-1-7/8"-4") |       |
| Clogging               | 50.00                          | %     |
| Curb Opening Length    | 0.00                           | ft    |

### Options

|                    |              |
|--------------------|--------------|
| Calculation Option | Use Both     |
| Grate Flow Option  | Exclude None |

### Results

|                           |         |       |
|---------------------------|---------|-------|
| Efficiency                | 88.20   | %     |
| Intercepted Flow          | 9.51    | ft³/s |
| Bypass Flow               | 1.27    | ft³/s |
| Spread                    | 15.35   | ft    |
| Depth                     | 0.39    | ft    |
| Flow Area                 | 2.44    | ft²   |
| Gutter Depression         | 0.09    | ft    |
| Total Depression          | 0.32    | ft    |
| Velocity                  | 4.42    | ft/s  |
| Splash Over Velocity      | 29.15   | ft/s  |
| Frontal Flow Factor       | 1.00    |       |
| Side Flow Factor          | 0.79    |       |
| Grate Flow Ratio          | 0.45    |       |
| Equivalent Cross Slope    | 0.06591 | ft/ft |
| Active Grate Length       | 13.50   | ft    |
| Length Factor             | 0.00    |       |
| Total Interception Length | 29.68   | ft    |

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## Worksheet for flow split for basin OS-EB-36

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### Project Description

Solve For

Efficiency

### Input Data

|                        |                                |                    |
|------------------------|--------------------------------|--------------------|
| Discharge              | 2.66                           | ft <sup>3</sup> /s |
| Slope                  | 0.02000                        | ft/ft              |
| Gutter Width           | 2.00                           | ft                 |
| Gutter Cross Slope     | 0.06                           | ft/ft              |
| Road Cross Slope       | 0.02                           | ft/ft              |
| Roughness Coefficient  | 0.017                          |                    |
| Local Depression       | 2.75                           | in                 |
| Local Depression Width | 30                             | in                 |
| Grate Width            | 2.00                           | ft                 |
| Grate Length           | 12.00                          | ft                 |
| Grate Type             | P-50 mm x 100 mm (P-1-7/8"-4") |                    |
| Clogging               | 50.00                          | %                  |
| Curb Opening Length    | 0.00                           | ft                 |

### Options

Calculation Option

Use Both

Grate Flow Option

Exclude None

### Results

|                           |         |                    |
|---------------------------|---------|--------------------|
| Efficiency                | 86.04   | %                  |
| Intercepted Flow          | 2.29    | ft <sup>3</sup> /s |
| Bypass Flow               | 0.37    | ft <sup>3</sup> /s |
| Spread                    | 8.54    | ft                 |
| Depth                     | 0.26    | ft                 |
| Flow Area                 | 0.82    | ft <sup>2</sup>    |
| Gutter Depression         | 0.09    | ft                 |
| Total Depression          | 0.32    | ft                 |
| Velocity                  | 3.26    | ft/s               |
| Splash Over Velocity      | 9.66    | ft/s               |
| Frontal Flow Factor       | 1.00    |                    |
| Side Flow Factor          | 0.49    |                    |
| Grate Flow Ratio          | 0.72    |                    |
| Equivalent Cross Slope    | 0.09757 | ft/ft              |
| Active Grate Length       | 6.00    | ft                 |
| Length Factor             | 0.00    |                    |
| Total Interception Length | 13.03   | ft                 |

---

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## ***Worksheet for Ditch Inlet in Sag at intersection of Bear and Edith***

---

### Project Description

Solve For

Spread

### Input Data

|                        |                                |                    |
|------------------------|--------------------------------|--------------------|
| Discharge              | 14.00                          | ft <sup>3</sup> /s |
| Left Side Slope        | 4.00                           | ft/ft (H:V)        |
| Right Side Slope       | 4.00                           | ft/ft (H:V)        |
| Bottom Width           | 3.00                           | ft                 |
| Grate Width            | 3.00                           | ft                 |
| Grate Length           | 4.00                           | ft                 |
| Local Depression       | 0.00                           | in                 |
| Local Depression Width | 0                              | in                 |
| Grate Type             | P-50 mm x 100 mm (P-1-7/8"-4") |                    |
| Clogging               | 50.00                          | %                  |

### Results

|                          |       |                 |
|--------------------------|-------|-----------------|
| Spread                   | 7.52  | ft              |
| Depth                    | 0.56  | ft              |
| Wetted Perimeter         | 7.66  | ft              |
| Top Width                | 7.52  | ft              |
| Open Grate Area          | 4.80  | ft <sup>2</sup> |
| Active Grate Weir Length | 11.00 | ft              |

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## **Worksheet for Flow Split at CB-145 (Near Basin O-4)**

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### Project Description

Solve For

Spread

### Input Data

|                        |                                |                    |
|------------------------|--------------------------------|--------------------|
| Discharge              | 12.00                          | ft <sup>3</sup> /s |
| Left Side Slope        | 4.00                           | ft/ft (H:V)        |
| Right Side Slope       | 4.00                           | ft/ft (H:V)        |
| Bottom Width           | 3.00                           | ft                 |
| Grate Width            | 3.00                           | ft                 |
| Grate Length           | 4.00                           | ft                 |
| Local Depression       | 0.00                           | in                 |
| Local Depression Width | 0                              | in                 |
| Grate Type             | P-50 mm x 100 mm (P-1-7/8"-4") |                    |
| Clogging               | 50.00                          | %                  |

### Results

|                          |       |                 |
|--------------------------|-------|-----------------|
| Spread                   | 7.08  | ft              |
| Depth                    | 0.51  | ft              |
| Wetted Perimeter         | 7.20  | ft              |
| Top Width                | 7.08  | ft              |
| Open Grate Area          | 4.80  | ft <sup>2</sup> |
| Active Grate Weir Length | 11.00 | ft              |



## **Appendix B: Hydraulics**



## **Exhibit 5 - Basin Layout**