FLOODING STUDY

FOR THE

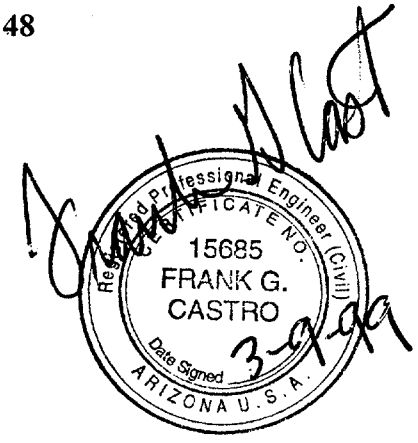
EARP WASH

AT

T15S R14E

Sections 9 and 10

Prepared By:
DJA ENGINEERING CORP.
1870 West Prince Road, Suite 48
Tucson, AZ 85705
(520) 293-2550
(520) 293-2115 fax



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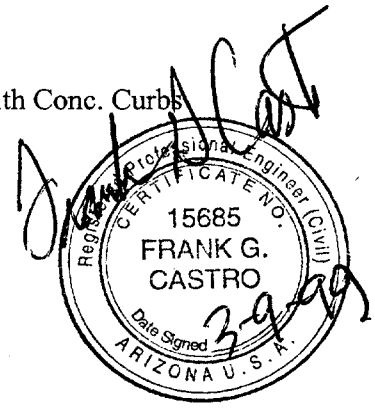

I. *INTRODUCTION*

1.1 Introduction & Project Location:

The Pima County Department of Transportation & Flood Control District (PCDT&FCD) has determined the need for a Flooding Study to evaluate the apparent flooding hazards that exist along the Earp Wash; located within Sections 9 & 10 of Township 15S, Range 14E, Gila and Salt River Base Line and Meridian.

As a result, the PCDT&FCD has retained the serviced of DJA Engineering under the District as-needed contract #1604-c-124549-0598 to study the Earp Wash throughout this area and recommend a 'best' set of flood-control improvements to solve these flooding hazards.

This flood-control alternatives formulation report pertains to the approximately two mile long reach of wash that is generally bounded on the east by Benson Highway, on the south by Valencia Road, on the west by Palo Verde Road, and on the north by Drexel Road. This portion of wash reach passes from Pima County, into the City of Tucson, and back into Pima County.

Historically, Pima County has recorded several residential concerns within this sector, detailing this area as a reach of wash with severe flooding problems prior to upstream developments (see Drainage Complaints in Appendix D). As a result, a detention basin and interception channel south of Valencia Road was constructed by Pima County which alleviated a major portion of this problem by diverting half of the Earp Wash's historic Q100 discharge into the Rodeo Basin.

1.2 Purpose & Objectives:

The purpose of this report is to present the engineering analyses of four alternative remedial flood-control measures, and to support the recommendations of a 'best' set of flood control improvements along this reach of the Earp Wash. The major drainage related objectives of this study were to:

1. Calculate the current and fully developed discharge values for the Earp Wash at Alvernon Way, Alvord Road and Palo Verde Road.

2. Calculate detailed floodplain information for the Earp Wash from Alvernon Way to Palo Verde Road.

3. Make Floodplain Management recommendations for addressing developments upstream of Alvord Road.

4. Determine permit requirements for properties located downstream of Alvord Road and Upstream of Palo Verde Road.

5. Provide conceptual recommendations on how to reduce the flood damage potential within the Earp Wash floodplain throughout this area.

II *ANALYSIS & RESULTS*

2.1 Historic Floodplain Analysis:

Historically, prior to major improvements within the area, the Earp Wash watershed extended east, beyond I-10, as shown on Figure 1 (FIRM, Community-Panel 040073 2245 C). This FEMA SFHA floodplain designation shows how the Earp Wash east of I-10 was a diversion from the Julian Wash, which continued northwesterly along the west side of Tucson Benson Highway (approximately 1000 feet upstream) until it reached Earp Boulevard where the flow was contained. As can be approximated from this map, the floodplain had an average width of about 900 feet, was defined by FEMA as a Zone A, and the floodplain limits were defined prior to the Rodeo Detention Basin improvements.

In order to alleviate as much of the flooding problems as possible within this area, immediately south of Valencia Road, a diversion channel and detention basin was constructed by Pima County (Figure 2 - Aerial Photo June 22, 1995). The Final Design Report for the Rodeo Detention basin was performed by Johnson, Brittain & Associates, Inc (August 1983) and determined that 1250 cfs from the Earp Wash during the 100-year event will be diverted to the Rodeo Detention Basin. This major improvement reduced the Earp Wash drainage basin by 357 acres, revising the upstream basin limits to be the north edge of Valencia Road and Benson Highway.

Figure 3 is a delineation of the existing basin limits showings the watershed basin for the Earp Wash after the construction of the diversion channel and Rodeo Detention Basin. As can be seen from this figure, Alvernon Way divides the new Earp Wash watershed in half. The easterly basin

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is sub-divided into three sub-basins:

1. Sub-basin A with concentration point 1 (C.P.#1) and an area of 172.76 acres. The Earp Wash main channel is located in Sub-basin A.
2. Sub-basin B with concentration point 2 (C.P.#2) and an area of 47.44 acres is located along the north side of Benson Highway.
3. Sub-basin C with concentration point 3 (C.P.#3) and an area of 2.53 acres is located between sub-basin A and B.

The soils characteristics were determined using the SCS Tucson Quadrangle map (Figure 4). The soils are mostly 7A (about 60%) which is Cave Gravelly Fine Sandy Loam and is classified 100%D, which has a high runoff potential. The remaining 40% of the soils are 21 A, which is Yaqui Fine Sandy Loam and is classified as 100%B. The watershed is moderately vegetated at approximately 35%.

Using the Pima County Hydrology Program, the rainfall intensity and runoff for the 100-year storm event were calculated for each sub-basin (See Appendix A - pages A1 through A6) and are shown on Table #1.

TABLE #1

SUB-BASIN	Area [Acres]	Q_{100} [cfs]
A	172.76	501
B	47.44	218
C	2.53	16

In order to determine the discharge values of the 100-year flow event at Alvord Road, the basins

west of Alvernon Way were sub-divided into two sub-basins. The first, sub-basin D, consists of any flow affecting Alvord Road (C.P.#4), with the majority of this sub-basin located south of Alvord Road with an area of 74.65 acres.

Sub-basin E, with concentration point #5 (C.P.#5) located at Palo Verde Road, had an area of 41.41 acres. The soils characteristics were determined using the SCS Tucson Quadrangle map (Figure 4). The soils are mostly 7A (about 55%) which is Cave Gravelly Fine Sandy Loam and is classified 100%D. The rest of the soils are 21 A (About 45%) which is Yaqui Fine Sandy Loam and is classified as 100%B. The watershed is moderately vegetated (approximately 35%). Using the Pima County Hydrology Program, the rainfall intensity and runoff for the 100-year storm event were calculated for each sub-basin (See Appendix A - pages A7 through A9) and are shown on Table #2.

TABLE #2

SUB-BASIN	Area [Acres]	Q_{100} [cfs]
D	74.65	293
E	41.41	189

All basins but E combine at Concentration Point 4 (Alvord Road). Using the Pima County Hydrology Program (PCP) the rainfall intensity and runoff for the 2, 10 and 100-year storm events at Alvord Road (C.P.# 4) were calculated (See Appendix A - pages A10 and A11). The 100-year storm event is shown on Table #3.

TABLE #3

SUB-BASIN	Area [Acres]	Q_{100} [cfs]
ABCD	297.38	716

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Ultimately, all basins combine at Concentration Point 5 (at Palo Verde Road). Using the PCP program the rainfall intensity and runoff for the 2, 10 and 100-year storm events at Palo Verde Road were calculated (See pages A12 and A13). The 100-year storm event is shown on Table 4:

TABLE 4

SUB-BASIN	Area [Acres]	Q_{100} [cfs]
ABCDE	338.79	767

Using the FlowMaster software program a hydraulic analysis was performed for the conditions in 1989 for the 100-year storm event. A total of 10 cross-sections were analyzed to determine the floodplain limits between Alvernon Way and Palo Verde Road. Q100 discharges of 716 cfs were used for cross-sections 10 to 70 and discharges of 767 cfs were used for cross-sections 80 to 110. The resulting 100-year floodplain limits can be seen on Figure 3, with the hydraulic analytical results confirmed by the input/output data of Appendix B (pages B1 through B20).

Important to note from a field visit is that weir flow overtops the upstream portion of the existing berm located at 3600 E. Milton Road. This property is also affected by a significant runoff form a portion of watershed E. The historic drainage pattern of this flow was towards the east portion of the Triple K motor-homes. At the present time significant ponding occurs at this area because the flow is obstructed by the berm and the does no have an appropriate daylight point.

2.2 Existing Floodplain Analysis:

With recent field investigation, a new subdivision with drainage improvements was determined east of Alvernon Way, called the Desert Vista subdivision. Streets and channel improvements were completed, with all vegetation cleared and proposed finished lot grades established. Drainage structures including a minor improved channel for the Earp Wash and local onsite sidewalk scuppers have been installed. Figure 5, which overlays on Figure 3, shows the proposed Desert Vista improvements as shown on the final plat number C-12-91-05 from Rogers Civil

Engineering. These improvement plans detail the channel cross-section chosen for the Earp Wash runoff, which is a compound channel with a 25 foot pilot channel within a 70 foot overbank channel. This cross-section was originally determined and approved by Jerry R. Jones & Associates, Inc., on the Drainage Masterplan for Valencia/Alvernon Commerce Center dated October, 1991 (after the diversion channel improvements). The Earp Wash runoff for the 100-year event was determined to be contained in the improved channel. Downstream, the watershed is still undeveloped and the existing conditions are similar to the conditions shown on Figure 3.

Furthermore, the basin upstream of Alvernon Way is defined as a balanced basin by the City of Tucson, this means that existing and future runoff discharges must be alike. Therefore no increase in discharge should be expected when the sub-division is totally developed. At this point in time, a detention/retention basin was constructed to comply with the C.O.T. requirements, the channel was constructed and no detention outlet structure was installed; thus, during the interim construction period prior to the subdivisions completion, decreased times of concentrations and increased sedimentation may appear to affect and compound downstream flooding conditions.

2.3 Future Floodplain Analysis:

In addition Figure 5 also shows two additional proposed sub-divisions located upstream of Alvord Road. One is the Valencia/Alvernon Center which is located in Pima County on the east side of Alvernon Way. The other is the Desert View subdivision, located immediately west of Alvernon Way, just downstream of Desert Vista subdivision.

As previously mentioned, a Master Drainage Report was prepared for this area by Jerry R. Jones & Associates, Inc. This report details the specific areas calculated to comply with detention requirements for a balanced and critical basin depending if the future development is located in a designated Pima County Critical Basin, or a C.O.T. Balanced Basin.

A drainage report for Desert View, Lots 1-127, was prepared by Walbert-Baker Associates, Inc. In this report two detention basins are proposed in order to comply with the requirements of a C.O.T. balanced basin. In addition the report proposed an 80 foot channel designed to contain and convey the 100-year discharge from the Earp Wash across the site. This drainage channel starts at the four 8'x3' concrete box culverts located under Alvernon Way and will continue to the northwest corner of the property at C.P.#4 (Alvord Road). The 100-year discharge affecting the subdivision was determined from the new City of Tucson Method TSMS (Tucson Stormwater Management System).

The future 100-year event discharges determined for both proposed subdivisions are as shown on Table 5.

TABLE #5

SUB-DIVISION	C.P.#	Q_{100} [cfs]
ALVERNON/VALENCIA	1 - Alvernon Way	772
DESERT VIEW(TSMS)	1 - Alvernon Way	523
DESERT VIEW(TSMS)	4 - Alvord Road	602

Note the difference between the two runoffs at Alvernon Way, a result of the new contributing area factor (CAF) used by the TSMS methodology, which takes into consideration the watershed's contributing area drainage characteristics; in this case a factor of 0.70 for a moderately urban area.

For this report's floodplain analysis, the most conservative 100-year runoff calculated was used; as

shown on Table #6:

TABLE #6

	C.P. #	Q_{100} [cfs]
TSMS	1	523
PCP	4	716

Due to the proposed subdivision drainage improvements in the area, in the future, the Earp Wash will be contained in a minor improved channel; which will begin at the upstream limits of the Alvernon/Valencia Commerce Center, and end at the northwest corner of the Desert Vista subdivision at Alvord Road (C.P.#4). As previously noted, with these upstream basin areas designed as Balanced and/or Critical Basins, the future upstream conditions will remain, at a minimum, the same to the historic conditions floodplain limits for the wash reach downstream of Alvord Road, C.P.#4. Therefore the floodplain limits downstream of C.P.#4 will at a conservative minimum, remain the same.

2.4 Summary of Identified Flooding Problems:

As can be seen from Figure 3, the future 100-year floodplain limits clearly details that the area between Alvord Road (C.P. #4) and Palo Verde Road (C.P. #5) has serious flooding problems; experiencing average 100-year depths of flow of at least two feet.

As a result of field investigations, it was determined that this flooding condition has been compounded due to the local residents attempts of keeping their houses and properties dry from the 100-year runoff. This can be seen clearly by all of the individual berms which are scattered

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throughout this residential area. The blocking, diversion and reduction of overall conveyance area within the determined 100-year floodplain limits causes serious additional backwater problems, which only tends to increase the overall flooding conditions within the residential community.

III *FLOOD CONTROL MEASURES*

In an attempt to alleviate the residential flooding situation, several alternatives are described in this report. They have been divided into non-structural recommendations and structural recommendations.

3.1 Non-Structural Recommendations:

It is recommended that:

1. Figure 3 of this report be adopted by Pima County as a tool for determination of minimum finished floor elevations for any future residential construction within the 100-year floodplain limits located between Alvord Road and Palo Verde Road;

2. The C.O.T. change the upstream basin designation from a Balanced Basin to a Critical Basin and require that the future developed 100-year discharge be less than the existing 100-year discharge; ie Desert Vista be made to conform its proposed development to a Critical Basin designation.

3. Pima County change the Critical Basin detention aspects to an even greater degree than what was determined within the Master Drainage Report. Future developments like Alvernon/Valencia Commerce Center should be required to comply with a more stringent Critical Basin policy.

4. Public awareness of the repercussions associated with the individual berms located throughout the residential community should be performed; providing the education and incentive for removal of such obstructions and diversions of flow, allowing the 100-year discharge to pass as quickly as possible through the area, obstructed as little as possible. Pima County should require the restoration of historic drainage patterns if structures were built or altered after the floodplain ordinance was put in place.

5. Pima County should document all existing flow obstructions throughout the residential community, providing a stronger control over any future illegal private fills, berms and drainage diversions done on private properties; and eliminating any located within public right-of-ways.

3.2 Structural Recommendations:

Two distinct hydrologic/hydraulic objectives can be utilized in order to alleviate the flooding conditions within the residential area; each with the potential of being implemented to some degree. These are:

1. Decrease the 100-year discharge to a level which will minimize/remove the downstream flooding potential:

One means of decreasing the 100-year discharge of the Earp Wash is to purchase specific parcels of land; either upstream and/or downstream of the box culvert crossing located on Alvernon Way. Detention basins can be constructed within either of the properties, both of which are located within Pima County. As an example of the potential reduction within the Q100 which could be achieved with a detention basin, half of the upstream 10 acre land was used, and a potential detention basin was analyzed within HEC-1. As can be seen within the output (Appendix C1), one basin could attenuate the flow along the main channel of the Earp Wash enough to increase the remaining offsite watersheds' Q100 peak discharge by only approximately 20 cfs.

2. Install a hydraulic system to pass the water through the residential community:

Beginning from the proposed detention basin's outflow at Alvord Road (C.P.#4), a system of drainage channels, and/or street improvements, and culverts could be used to route the Q100 through the residential area. On pages 17 through 20, three different hydraulic conveyance systems are described (2a, 2b, and 2C). These systems were analyzed with varying degrees of decreased flooding potential determined for the residential community. The analyses, calculations and results for the three systems are shown in appendix C.

To summarize:

Alternative 2a utilizes 4 box culverts systems and 3 channels with about 1,000 feet of roadway improvements to route all of the discharge within the hydraulic conveyance system from Alvord Road (C.P.#4) to Milton Road. The proposed hydraulic conveyance from Milton Palo to Verde Road (C.P.#5) has the capacity to handle the majority of the runoff (418 cfs) and the remainder runoff (349 cfs) is overland flow in the community with a depth of 0.73'.

Within the same reach of wash (C.P.#4 to C.P. 5), alternative 2b utilizes 2 channels with 2000 feet of roadway improvements. The upstream system routes 510 cfs of discharge within the hydraulic conveyance system, with a depth of flow of 1.16 feet still crossing over the residential houses. The proposed hydraulic conveyance from Milton Palo to Verde Road (C.P.#5) is similar to alternative 2a and has the capacity to handle the majority of the runoff (418 cfs) and the remainder runoff (349 cfs) is overland flow in the community with a depth of 0.73'.

Finally, within the same reach of wash, alternative 2c utilizes 2 channels and 2000 feet of roadway improvements. The upstream systems routes 616 of discharge within the hydraulic conveyance system, with 0.9' depth of flow still crossing over the residential houses. The proposed hydraulic conveyance from Milton Palo to Verde Road (C.P.#5) is similar to alternative 2a and has the capacity to handle the majority of the runoff (418 cfs) and the remainder runoff (459 cfs) is overland flow in the community with a depth of 0.67'.

IV *RESULTS & CONCLUSIONS*

4.1 Summary of Results:

Based upon the information and calculations previously presented in this report, the following general observations were made relative to the concept design of flood-control alternatives:

1. Significant flooding problems exist within the residential community located between Alvord Road, and Palo Verde Road, which is compounded by backwater affects due to private blockage and diversion of the 100-year flow.

2. Opening up of these private fill and berm areas, and paving some key roadways could significantly increase the conveyance time of this discharge, reducing the flooding conditions within the reach at an extremely minimal cost.

3. Imposing more stringent Critical Basin criterion for proposed upstream developments could also reduce the flooding conditions within the residential area.

4. As can be seen with the projected cost estimates on pages 21 through 24 the most cost effective means to decrease/eliminate the flooding problems along this reach of Earp Wash are to purchase an upstream piece of land for a detention basin.

5. Varying degrees of hydraulic improvements can be performed downstream of Alvord Road to decrease/eliminate the flooding problems along this reach of Earp Wash.

4.2 Conclusions & Recommendations:

The most efficient means at decreasing the flooding hazards within the residential area located between Alvord Road and Palo Verde Road is to purchase a piece of land, construct a detention basin, and significantly decrease the upstream Q100 discharge to a level which would allow the existing roadway hydraulics within the residential area to convey the remaining Q100 safely to Palo Verde Roadway (C.P.#5).

However, should the purchasing of the land be difficult or impossible, other means at reducing the Q100 and/or increasing the conveyance capacity of the roadways between Alvord Road and Palo Verde Road can be achieved, each with varying degrees of decreased flooding potential and increased cost potential.

At a minimum, the existing berms & fill areas located within the main flow conveyance area of the Earp Wash floodplain limits should be removed to a degree that backwatering affects are eliminated, and a faster conveyance of the discharge can be accomplished within and through the residential area.

Important to consider is that after the discharge leaves C.P.#5, the flooding hazards continue to the west of Palo Verde Road. Thus, within the decision of the 'best' alternative, one should consider that a solution within this area of the project, could also provide solutions to downstream flooded areas as well.

Finally, all major drainage related objectives of this study were accomplished within this report, thus completing the scope of work for this project.

Structural Alternatives #2A, B & C:

The runoff could be routed with a clean dirt channel (with a 0.4% slope) from C.P. 4 to the existing box culverts located about 150' south of the intersection of Drexel Road and Palo Verde Road (C.P. 5). The route could be accomplished by installing the following drainage structures.

2A As shown on figure 5, a 1 foot high berm is proposed to concentrate the runoff on C. P. #4. From here a new collector system is installed at the north side of the Chaparral school with 3:1 bank slopes. The collection system may go under the school access road lanes with a box culvert system which consist of two 8x5 barrels (about 30 LF long). Using the HYDRAIN software a conveyance analysis was done for this system. The culverts capacity is 631 cfs with an overtopping runoff of 85 cfs. With an 8" concrete curb on the northerly edge of Alvord Road, the overflow is routed west by Alvord Road and the school access lane. The geometry of the barrels was dependent on the maximum space available between Alvord Road and School lanes (19 LF). The maximum height was dependent on the maximum change in elevation possible to daylight at concentration point 5 (About 5.5 Feet). The concrete curb is to safeguard the northern neighbors (Currently most of them have some kind of drainage obstruction on their properties) and contain the maximum runoff possible on the street. The barrels discharge into a new proposed 5-foot earthen ditch between the school access lane and Alvord Road. The ditch has a bottom width of 10 feet and 1:1 protected slopes. In addition to these improvements, the existing concrete curbs at the school PAAL's are depressed as shown on figure 5 to increase the conveyance capacity of Alvord Road and also to increase the interception capacity of the collection system. In order to route the majority of the runoff westerly along the front side of the

Chaparral school the northerly extruded curb adjacent to the parking lot should not be removed. In this manner the runoff would have a limited opening (about 25 feet) between the berm and the existing curb to discharge into Alvord Road. The remainder of the runoff would be directed westerly into the collection system. The conveyance capacity is increased by providing a 2" asphalt on the landscape areas as shown on figure 5. Also, a similar box culvert system is proposed to go under Alvord Road. A drainage easement is proposed to continue the routing because the culvert system discharges on private property at 3600 East Milton Road. At the proposed drainage easement a new 5- foot dirt channel (about 620 LF) with a 10-Foot bottom width and 3:1 bank slopes may replace the existing berm located on the eastern portion of 3600 East Milton (Triple K Motor-homes). The channel continues westerly along the south portion of Milton's R.O.W. (for about 200 LF). Then the route direction changes northerly across Milton Road (about 30 LF) using a culvert system. Because the head available at this location is less than four feet, the culvert system is proposed to be a set of four 8x3 barrels. With a conveyance capacity of 613 cfs, these culverts carry most of the flow. Milton Road has the conveyance capacity to carry the remainder of the runoff, which is about 109 cfs, with less than one foot depth. The runoff from the culverts is collected on the northern side of Milton road by a dirt channel. This channel will require that Pima County acquires a 16 feet wide (along Milton Road) drainage easement to carry most of the discharge from the barrels. In addition, the acquisition of R.O.W. for the drainage easement continues on the easterly side of Palo Verde. The route for the runoff turns north (About 250 LF) at the intersection of Milton Road with Palo Verde Road towards the existing set of barrels about 500 feet North of Drexel Road which is C.P. 5. From here Earp Wash may continues its existing

northwesterly route under Palo Verde Road, with a northwest weir flow across Palo Verde Road. The hydraulic system calculations and analyses for alternative 2a are in appendix C-2.

2B For this alternative the runoff is routed from C.P. 4 to C.P. 5 using the existing street net work with some proposed improvements to increase the conveyance capacity of the streets. On a field visit it was noted that after the runoff crosses Alvord Road it becomes a split flow because of the private improvements located at the edge of the property lines in this community (berms and fills). The runoff is divided into three major directions; it continues westerly along Alvord Road, northerly along Garret Avenue, and the remainder overtops the private drainage structures to become overland flow. Following this pattern the runoff is routed from C.P. 4 to C.P. 5. Using Alvord Road and the PAAL from the Chaparral School the runoff is directed westerly. The conveyance capacity is increased by depressing the concrete curbs located on the school PAAL's; in addition to a concrete curb on the northerly edge of the pavement; which would enable the proposed improved cross-section (50) to have a conveyance capacity of about 412 cfs. Garret Avenue is the second drainage route, with similar improvements. With a proposed concrete curb on both sides of the street, the conveyance capacity of Garret Avenue is calculated to be 99 cfs. The overland flow is about 206 cfs with a depth of 1.16'. Similar to recommendation #2a, the existing berm at 3600 East Milton Road is replaced by a 4-foot dirt channel with a 10 bottom width and 3:1 slopes in order to safely convey the runoff to Milton Road. In addition, to convey the runoff from Garret Avenue to the new proposed channel the earthen Ray Street is proposed to be paved with an inverted crown. The conveyance capacity of the proposed

Ray Street is about 90 cfs with 1 foot. The maximum conveyance capacity calculated for Milton road is about 109 cfs. Similar to the previous alternative a 4-foot dirt channel is proposed on the northerly portion of Milton road. The remainder of the flow (about 349 cfs) overflows the land with less than one foot of depth. The Milton Road runoff is directed towards Palo Verde at the existing barrels 500 feet south of Drexel Road (C.P. 5). From here Earp Wash may continues its existing northwesterly route under Palo Verde Road, with a northwest weir flow across Palo Verde Road. The hydraulic system calculations and analyses for alternative 2b are in appendix C-3.

2C Following the same flow pattern from recommendation #2b, another alternative is to route the runoff using the existing street network starting at C.P. 4. In their current conditions, the streets have a small conveyance capacity. Therefore, in addition to the street improvements proposed in the previous recommendation the conveyance geometry is extended to the edge of the R.O.W. This is achieve by installing the concrete curb at the R.O.W. lines and paving the extra stretch as a multiple service lane. The routing starts westerly by depressing the concrete curbs located on the school PAAL's. In addition, a concrete curb on the northerly edge of the pavement is proposed to safeguard the northerly community. Thus the proposed cross-section (50) has a conveyance capacity of about 451 cfs. The fully improved Garret Avenue, with a concrete curb on both sides of the street, has a conveyance capacity calculated to be 164 cfs. This time the overland flow is 100 cfs. Similar to recommendation #2a and #2b, the existing berm at 3600 East Millton Road is replaced by a 4-foot dirt channel with a 10-foot bottom width and 3:1 slopes. Also, to safely convey the runoff from Garret Avenue to the new proposed channel, the earthen Ray Street is proposed to be paved with an inverted

crown. The conveyance capacity for Ray Street is calculated to be 164 cfs. The maximum conveyance capacity for Milton Road (fully improved) is calculated to be 150 cfs. Therefore Pima County needs to acquire a portion of R.O.W. for a drainage easement to accommodate a 4-foot earthen ditch channel with 3:1 slopes. The conveyance capacity of the channel is about 309 cfs . The remainder of the flow (about 308 cfs) will overflow the land with less than a one foot depth. The Milton Road runoff is directed towards Palo Verde at the existing barrels 500 feet south of Drexel Road (C.P. 5) as previously described on recommendation #2a. From here Earp Wash may continues its existing northwesterly route under Palo Verde Road, with northwest weir flow across Palo Verde Road. The hydraulic system calculations and analyses for alternative 2c are in appendix C-4.

The proposed hydraulic conveyance from Milton Palo to Verde Road (C.P.#5) is similar to alternative 2a and has the capacity to handle the majority of the runoff (418 cfs) and the remainder runoff (349 cfs) is overland flow in the community with a depth of 0.73'.

PRELIMINARY COST ESTIMATE

ALTERNATIVE 1 - 5 ACRE DETENTION BASIN (4' DEEP)

ITEM #	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1050001	Construction Staking & As-Built Drawings	L. Sum	1	5,000.00	$5,000
xxxxxxx	Land Acquisition	Acre	5	30,000.00	$150,000
2030300	Roadway Excavation	C.Y.	16,133	5.00	$80,665
2031001	Export Cut	C.Y.	8,542	2.50	$21,355
9010001	Mobilization	L. Sum	1	5,000.00	$5,000
9300002	Incidental Items (Force Account)	F.A.	1	5,000.00	$5,000
					$267,020
	Contingency			15%	$40,053
					$307,073

PREPARED BY:_____ FOR:_____

PRELIMINARY COST ESTIMATE

ALTERNATIVE 2A - DRAINAGE VIA EARTHEN CHANNEL AND DRAINAGE STRUCTURES

ITEM #	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1050001	Construction Staking & As-Built Drawings	L. Sum	1	10,000.00	$10,000
6017101	8' x 3' x 30' Concrete Box Culvert	L. Sum	3	20,000.00	$60,000
6017101	8' x 3' x 120' Concrete Box Culvert	L. Sum	3	60,000.00	$180,000
6017101	8' x 5' x 30' Concrete Box Culvert	L. Sum	4	30,000.00	$120,000
2020029	Remove Asphaltic Concrete Pavement	S.Y.	550	4.50	$2,475
9320059	Replace Exist. Pavement (for culverts)	S.F.	4,950	0.75	$3,713
9320059	New Pavement (Ray St. - 2-12' lanes)	S.F.	7,200	0.75	$5,400
2020020	Remove Exist. Curb	L.F.	1,280	0.50	$640
9120051	4" Thick Concrete Bank Protection (w/ wwf)	C.F.	147	7.00	$1,029
2030402	Channel Excavation	C.Y.	3,380	5.00	$16,900
2031001	Export Cut	C.Y.	500	2.50	$1,250
9080002	Concrete Curb with 10" Reveal	L.F.	1,610	8.00	$12,880
xxxxxxx	Land Acquisition for Drainage Easement	Acre	0.84	29,761.90	$25,000
9010001	Mobilization	L. Sum	1	10,000.00	$10,000
9240109	Miscellaneous Utility Relocation	L. Sum	1	5,000.00	$5,000
9300002	Incidental Items (Force Account)	F.A.	1	5,000.00	$5,000
					$459,286
	Contingency			15%	$68,893
					$528,179

PREPARED BY:_____ FOR:_____

PRELIMINARY COST ESTIMATE

ALTERNATIVE 2B - DRAINAGE VIA SURFACE FLOW

ITEM #	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1050001	Construction Staking & As-Built Drawings	L. Sum	1	10,000.00	$10,000
9320059	New Pavement (Ray St. - 2-12' lanes)	S.F.	7,200	0.75	$5,400
2020020	Remove Exist. Curb	L.F.	1,580	0.50	$790
9320059	New Pavement (Alvord Road)	S.F.	18,000	0.75	$13,500
2030402	Channel Excavation	C.Y.	2,535	5.00	$12,675
9080002	Concrete Curb with 10" Reveal	L.F.	1,000	8.00	$8,000
xxxxxxx	Land Acquisition for Drainage Easement	Acre	0.84	29,761.90	$25,000
9010001	Mobilization	L. Sum	1	10,000.00	$10,000
9240109	Miscellaneous Utility Relocation	L. Sum	1	5,000.00	$5,000
9300002	Incidental Items (Force Account)	F.A.	1	5,000.00	$5,000
					$95,365
	Contingency			15%	$14,304.75
					$109,670

PREPARED BY:_____ FOR:_____

25

PRELIMINARY COST ESTIMATE

ALTERNATIVE 2C - DRAINAGE VIA SURFACE FLW AND ADDITIONAL 5' OF PAVING

ITEM #	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1050001	Construction Staking & As-Built Drawings	L. Sum	1	10,000.00	$10,000
9320059	New Pavement (Ray St. - 2-12' lanes)	S.F.	7,200	0.75	$5,400
2020020	Remove Exist. Curb	L.F.	1,580	0.50	$790
9320059	New Pavement (Alvord Road + Milton Road)	S.F.	22,500	0.75	$16,875
2030402	Channel Excavation	C.Y.	2,535	5.00	$12,675
9080002	Concrete Curb with 10" Reveal	L.F.	1,000	8.00	$8,000
xxxxxxx	Land Acquisition for Drainage Easement	Acre	0.84	29,761.90	$25,000
9010001	Mobilization	L. Sum	1	10,000.00	$10,000
9240109	Miscellaneous Utility Relocation	L. Sum	1	5,000.00	$5,000
9300002	Incidental Items (Force Account)	F.A.	1	5,000.00	$5,000
					$98,740
	Contingency			15%	$14,811.00
					$113,551

PREPARED BY:_____ FOR:_____

V REFERENCES:

1. "Hydrology Manual for Engineering Design and Floodplain Management within Pima Coutny, Arizona", Pima County Department of Transportation Flood Control Distric, September 1979.

2. "Stormwater Detention/retention Manual", Pima County Department of Transportation and Flood Control District & City of Tucson Arizona, Simons, Li and Associates, July 1987.

3. "Standards Manual for Drainage Design and Floodplain Management in Tucson, Arizona", City of Tucson Department of Transportation Engineering Division, December 1989.

4. "Drainage Masterplan for Valencia/Alvernon Commerce Center Lots 1-86" Jerry R. Jones & Associates Inc. October 1991.

5. "Final Design Report for Rodeo Wash Detention Facility" Johnson Brittain & Associates August 1983.

6. "Drainage Report for Desert View Lots 1-127" Walbert Baker Associates Inc. June 1998.

FIGURES & MAPS


SC 1"=200'
C.I. = 2'
DREXEL ROAD
LESLIE AVENUE
EARP BOULEVARD
DRAINAGE AREA LIMITS
MILTON ROAD
GARRETT AVENUE
FLOODPLAIN LIMITS
RAY ST
ALVORD ROAD
BASIN E
AREA=41.41 AC
Q100 = 188 CFS
Sc =0.007 FT/FT
CHAPARRAL
JHS
BASIN D
AREA=74.65 AC
Q100 = 293 CFS
Sc = 0.004 FT/FT
(6) ∅=36"
(Existing)
(2) ∅=24"
(Existing)
EARP WASH
PALO VERDE ROAD
VALENCIA ROAD
ALVERNON WAY
LEGEND:
FLOODPLAIN LIMITS
DRAINAGE AREA LIMITS
CROSS-SECTION LOCATIONS
PROPOSED DETENTION BASIN LIMITS

NATIONAL FLOOD INSURANCE PROGRA

FIRM

FLOOD INSURANCE RATE MAP

PIMA COUNTY, ARIZONA
(UNINCORPORATED AREAS)

PANEL 2245 OF 4700
(SEE MAP INDEX FOR PANELS NOT PRINTED

COMMUNITY-PANEL NUMBER
040073 2245 C

MAP REVISED:
SEPTEMBER 6, 1989

Federal Emergency Management Agency

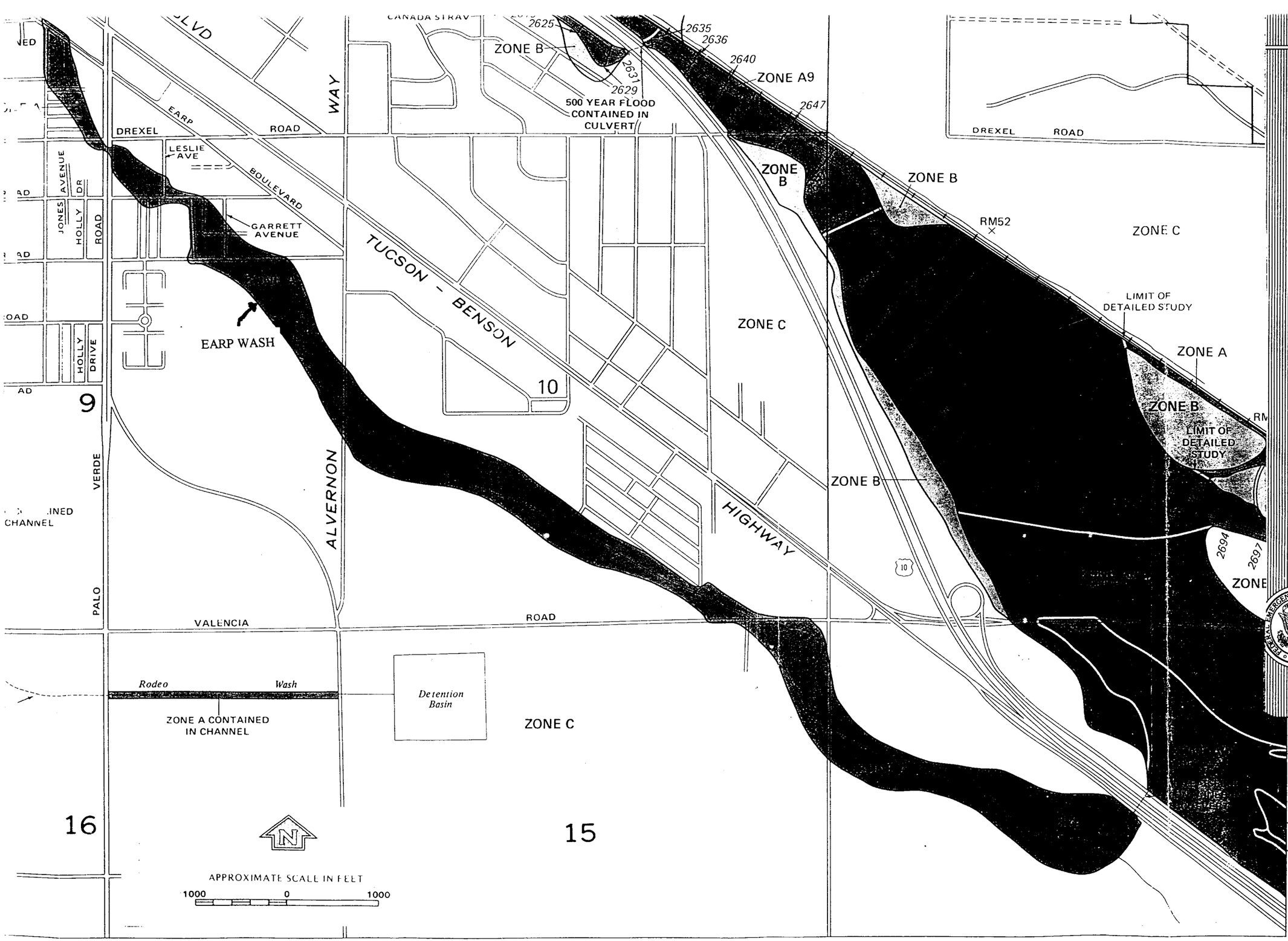

FIGURE 1
EARP WASH

NATIONAL FLOOD INSURANCE PROGRA

FIRM

FLOOD INSURANCE RATE MAP

PIMA COUNTY, ARIZONA
(UNINCORPORATED AREAS)

PANEL 2245 OF 4700
(SEE MAP INDEX FOR PANELS NOT PRINTED

COMMUNITY-PANEL NUMBER
040073 2245 C

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Federal Emergency Management Agenc

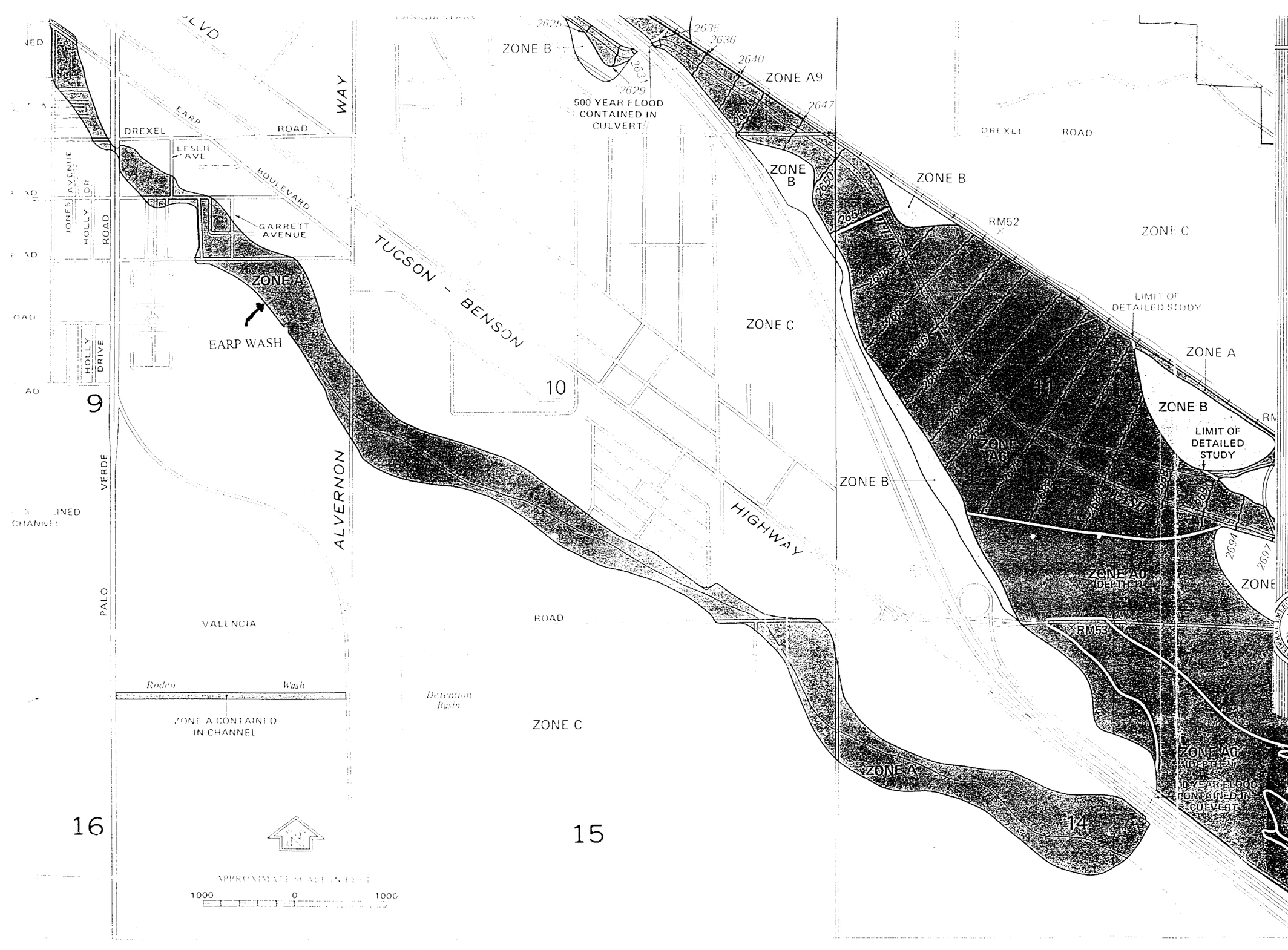


FIGURE 1
EARP WASH

WAY

SC 1"=400'

EARP WASH

VALENCIA ROAD

ALVERNON

RODEO DETENTION

BASIN

DIVERSION CHANNEL

FIGURE 2

RODEO DETENTION BASIN

DIVERSION CHANNEL

SCALE 1"=400'

JUNE 22 1995

Structural recommendation #1
Detention basin
Book-Map-Parcel: 140-32-001C
Current Owner: School District No 12
Land Measure: 9.39 Acres
Current Limited Value: $93,000

BASIN C
AREA= 2.58 AC
Q100 = 6 CFS
V = 0.015 FT/FT

BASIN B
AREA= 17.44 AC
Q100=2.86 CFS
V = 0.01 FT/FT

BASIN A
AREA= 172.76 AC
Q100 = 501 CFS
V = 0.005 FT/FT

(4) 8 SY
(Existing)

C.P. 2

DESERT VIEW HIGH SCHOOL

BRANSON HIGHWAY

COLUMBUS BLVD.

FIGURE 3
AERIAL PHOTO W/
T15S, R14E, S9 & 10
SCALE 1"=200'
C.I. = 2'

T15, R14
SEC. 10

28-29

MAY 12, 1989

CITY OF TUCSON

DEPARTMENT OF TRANSPORTATION, ENGINEERING DIVISION

1"=200'

CONTOURS AT
2' INTERVALS

Cooper Aerial Survey Co.
TUCSON, ARIZONA

32

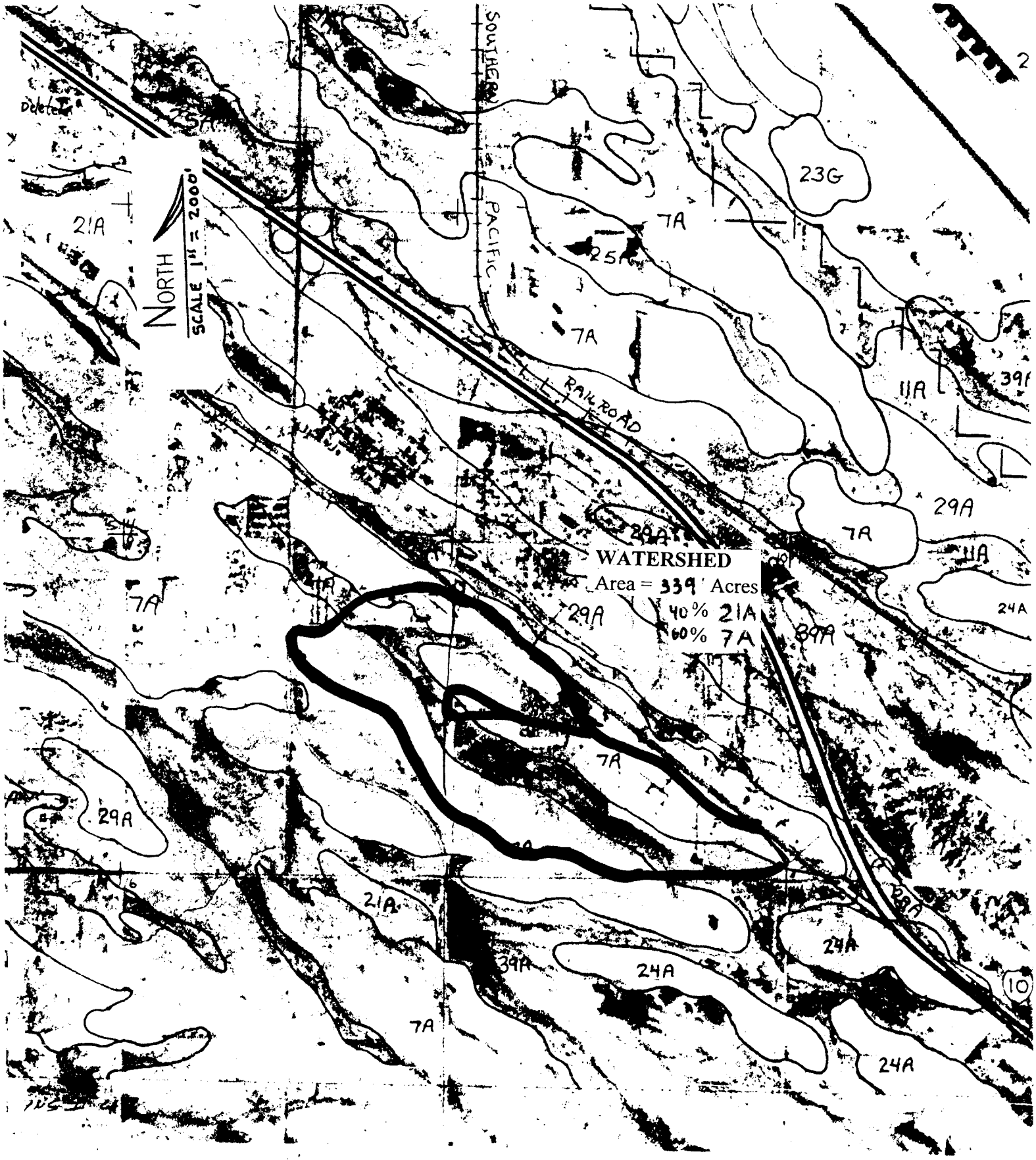


FIGURE 4

SCS QUADRANGLE MAP

Scale 1"= 2000'

FIGURE 5
AERIAL PHOTO W/
T15S, R14E, S9 & 10
SCALE 1"=200'
C.I.=2'

CITY OF TUCSON
DEPARTMENT OF TRANSPORTATION, ENGINEERING DIVISION

1"=200'
CONTOURS AT
2' INTERVALS

MAY 12, 1989

28-29

34

T15, R14
SEC. 10

DREXEL ROAD

LESLIE AVENUE

BENSON HIGHWAY

EARP BOULEVARD

MILTON ROAD

GARRETT AVENUE

RAY ST

PALO VERDE ROAD

ALVORD ROAD

ALVERNON WAY

EARP WASH

CHAPARRAL JHS

SC 1"=200'

Q= 767 CFS
CP. 5

(4) 8x3 barrels

New drainage easement

Replace existing berm
Drainage easement
New dirt channel (about 620 LF)

New 2" asphalt

10" Concrete curb

Dirt channel
Sc=0.004 FT/FT

Depress concrete curbs

(2) 8x5 barrels
L= 30 LF

Q= 716 CFS
CP. 4

1' New Berm
3:1 slopes

Triple K Motor-homes
3600 East Milton Road
Owner: Kocis John Sr.
Telephone #: 294-7156
Parcel Code 140-30-0180

LEGEND

- New 2" asphalt
- New 10" Conc. Curb
- New Drainage easement
- New Box Culver System
- New 1' Berm

Figure 6

Structural Alternative 2a
Earthen Channel with Concrete Culverts

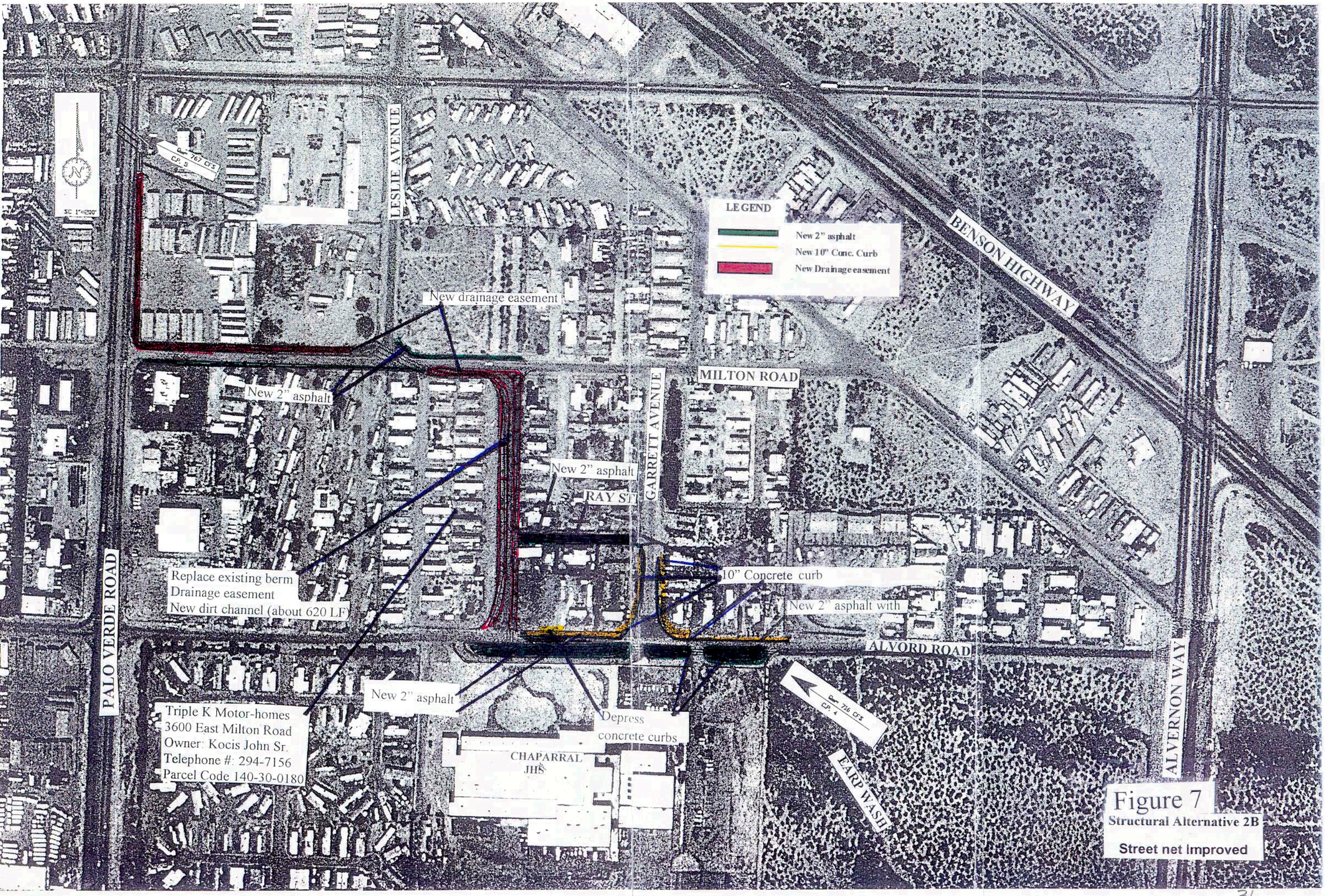


Figure 7
Structural Alternative 2B
Street net improved

DREXEL ROAD

LESLIE AVENUE

BENSON HIGHWAY

SC 1"=200'

Q = 767 CFS
CP. 5

New drainage easement

New 2" asphalt

MILTON ROAD

GARRETT AVENUE

LEGEND

New 2" asphalt

New 10" Conc. Curb

New Drainage easement

New 2" asphalt

RAY ST

Replace existing berm
Drainage easement
New dirt channel (about 620 LF)

10" Concrete curb

New 2" asphalt with

ALVORD ROAD

PALO VERDE ROAD

New 2" asphalt

Triple K Motor-homes
3600 East Milton Road
Owner: Kocis John Sr.
Telephone #: 294-7156
Parcel Code 140-30-0180

Depress
concrete curbs

CHAPARRAL
JHS

Q = 716 CFS
CP. 4

EARP WASH

New Berm
3:1 slopes

ALVERNON WAY

Figure 8

Structural Alternatives 2C

Street net Fully Improved

(Including R.O.W.)

APPENDIX A

Historic Hydrology Data Sheets

SUB-BASIN A

RAINFALL DATA SHEET
PCP.PAS Ver 1.2

EARP WASH T15 R14 S9
CP1 @ ALVERNON WAY

Return Period (Years)	Precipitation Values (inches)			
	6-Hour Duration		24-Hour Duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.50	1.51	1.80	1.73
5	2.00	2.02	2.40	2.41
10	2.40	2.36	2.80	2.87
25	2.80	2.81	3.40	3.46
50	3.20	3.21	4.00	4.00
100	3.60	3.60	4.60	4.53

Watershed Area= 172.76 acres
Length of Watercourse (Lc): 6000 ft.
Length to Center of Gravity (Lca): 3000 ft.

Incremental Change in Length (Li)-ft.
L(1)= 1600
L(2)= 2400
L(3)= 2000

Incremental Change in Elevation (Hi)-ft.
H(1)= 16.0
H(2)= 16.0
H(3)= 14.0

Mean Slope (Sc): 0.0075 ft/ft
Basin Factor (Nbw): 0.036
Impervious Cover = 20.0 %
Cover Type = Desert Brush
Cover Density = 40.0 %
Soil Group: B
% of Pervious Area = 40.0
Soil Group: D
% of Pervious Area = 60.0
CN= 89.00
CN* = 86.99
Cover Density = 40.0 %

FLOOD FREQUENCY: 2-Year
Soil Group: B
CN= 81.00
CN* = 78.34
Soil Group: D
CN= 89.00
CN* = 86.99
P24 = 1.73
P6 = 1.51
P1 = 1.23
P2 = 1.32
P3 = 1.39
Time of Concentration (Tc) = 66.0 min
Intensity = 1.12 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.35
Runoff Supply Rate at Tc = 0.40
PEAK DISCHARGE: 69.4 cfs

FLOOD FREQUENCY: 10-Year
P24 = 2.87
P6 = 2.36
P1 = 1.81
P2 = 2.00
P3 = 2.13
Soil Group: B
CN= 81.00
CN* = 82.75
Soil Group: D
CN= 89.00
CN* = 89.97
Time of Concentration (Tc) = 41.8 min
Intensity = 2.30 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.53
Runoff Supply Rate at Tc = 1.23
PEAK DISCHARGE: 213.8 cfs

SUB-BASIN A

FLOOD FREQUENCY: 100-Year
P24 = 4.53
P6 = 3.60
P1 = 2.66
P2 = 2.98
P3 = 3.19
Soil Group: B
CN= 81.00
CN* = 85.69
Soil Group: D
CN= 89.00
CN* = 91.96
Time of Concentration (Tc) = 29.5 min
Intensity = 4.20 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.69
Runoff Supply Rate at Tc = 2.88
PEAK DISCHARGE: 501.1 cfs

SUB-BASIN B

RAINFALL DATA SHEET
PCP.PAS Ver 1.2

EARP WASH T15 R14 S9
CP2 @ ALVERNON WAY

Return Period (Years)	Precipitation Values (inches)			
	6-Hour Duration		24-Hour Duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.50	1.51	1.80	1.73
5	2.00	2.02	2.40	2.41
10	2.40	2.36	2.80	2.87
25	2.80	2.81	3.40	3.46
50	3.20	3.21	4.00	4.00
100	3.60	3.60	4.60	4.53

Watershed Area= 47.44 acres
Length of Watercourse (Lc): 2860 ft.
Length to Center of Gravity (Lca): 1430 ft.

Incremental Change in Length (Li)-ft.	Incremental Change in Elevation (Hi)-ft.
L(1)= 810	H(1)= 8.0
L(2)= 650	H(2)= 10.0
L(3)= 1400	H(3)= 12.0

Mean Slope (Sc): 0.0101 ft/ft
Basin Factor (Nbw): 0.036
Impervious Cover = 17.0 %
Soil Group: B
Cover Type = Desert Brush
% of Pervious Area = 10.0
Cover Density = 38.0 %
Soil Group: D
Cover Type = Desert Brush
% of Pervious Area = 90.0
Cover Density = 38.0 %

FLOOD FREQUENCY: 2-Year
P24 = 1.73
P6 = 1.51
P1 = 1.23
P2 = 1.32
P3 = 1.39
Soil Group: B
CN= 81.00
CN* = 78.48
Soil Group: D
CN= 89.00
CN* = 87.17
Time of Concentration (Tc) = 28.7 min
Intensity = 1.97 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.38
Runoff Supply Rate at Tc = 0.76
PEAK DISCHARGE: 36.2 cfs

FLOOD FREQUENCY: 10-Year
P24 = 2.87
P6 = 2.36
P1 = 1.81
P2 = 2.00
P3 = 2.13
Soil Group: B
CN= 81.00
CN* = 82.87
Soil Group: D
CN= 89.00
CN* = 90.13
Time of Concentration (Tc) = 18.9 min
Intensity = 3.70 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.57
Runoff Supply Rate at Tc = 2.12
PEAK DISCHARGE: 101.5 cfs

SUB-BASIN B

FLOOD FREQUENCY: 100-Year
P24 = 4.53
P6 = 3.60
P1 = 2.66
P2 = 2.98
P3 = 3.19
Soil Group: B
CN= 81.00
CN* = 85.80
Soil Group: D
CN= 89.00
CN* = 92.10
Time of Concentration (Tc) = 14.0 min
Intensity = 6.30 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.72
Runoff Supply Rate at Tc = 4.56
PEAK DISCHARGE: 218.1 cfs

SUB-BASIN C

RAINFALL DATA SHEET
PCP.PAS Ver 1.2

EARP WASH T15 R14 S9
CP3 @ ALVERNON WAY

Return Period (Years)	Precipitation Values (inches)			
	6-Hour Duration		24-Hour Duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.50	1.51	1.80	1.73
5	2.00	2.02	2.40	2.41
10	2.40	2.36	2.80	2.87
25	2.80	2.81	3.40	3.46
50	3.20	3.21	4.00	4.00
100	3.60	3.60	4.60	4.53

Watershed Area= 2.53 acres
Length of Watercourse (Lc): 600 ft.
Length to Center of Gravity (Lca): 300 ft.
Incremental Change in Length (Li)-ft. Incremental Change in Elevation (Hi)-ft.
L(1)= 600 H(1)= 9.0
Mean Slope (Sc): 0.0150 ft/ft
Basin Factor (Nbw): 0.038
Impervious Cover = 0.0 %
Soil Group: B
Cover Type = Desert Brush
% of Pervious Area = 10.0
Cover Density = 38.0 %
Soil Group: D
Cover Type = Desert Brush
% of Pervious Area = 90.0
Cover Density = 38.0 %

FLOOD FREQUENCY: 2-Year
P24 = 1.73
P6 = 1.51
P1 = 1.23
P2 = 1.32
P3 = 1.39
Soil Group: B
CN= 81.00
CN* = 78.48
Soil Group: D
CN= 89.00
CN* = 87.17
Time of Concentration (Tc) = 9.4 min
Intensity = 3.48 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.28
Runoff Supply Rate at Tc = 0.96
PEAK DISCHARGE: 2.5 cfs

FLOOD FREQUENCY: 10-Year
P24 = 2.87
P6 = 2.36
P1 = 1.81
P2 = 2.00
P3 = 2.13
Soil Group: B
CN= 81.00
CN* = 82.87
Soil Group: D
CN= 89.00
CN* = 90.13
Time of Concentration (Tc) = 6.3 min
Intensity = 6.02 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.50
Runoff Supply Rate at Tc = 3.01
PEAK DISCHARGE: 7.7 cfs

SUB-BASIN C

FLOOD FREQUENCY: 100-Year

P24 = 4.53
P6 = 3.60
P1 = 2.66
P2 = 2.98
P3 = 3.19
Soil Group: B
CN= 81.00
CN* = 85.80
Soil Group: D
CN= 89.00
CN* = 92.10
Time of Concentration (Tc) = 5.0 min
Intensity = 9.24 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.68
Runoff Supply Rate at Tc = 6.26
PEAK DISCHARGE: 16.0 cfs

SUB-BASIN D

RAINFALL DATA SHEET
PCP.PAS Ver 1.2

EARP WASH T15 R14 S9
CP 4 @ ALVORD

Return Period (Years)	Precipitation Values (inches)			
	6-Hour Duration		24-Hour Duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.50	1.51	1.80	1.73
5	2.00	2.02	2.40	2.41
10	2.40	2.36	2.80	2.87
25	2.80	2.81	3.40	3.46
50	3.20	3.21	4.00	4.00
100	3.60	3.60	4.60	4.53

Drainage Concentration Point: CP 4 @ ALVORD
Watershed Area= 74.65 acres
Length of Watercourse (Lc): 2000 ft.
Length to Center of Gravity (Lca): 1000 ft.
Incremental Change in Length (Li)-ft. Incremental Change in Elevation (Hi)-ft.
L(1)= 2000 H(1)= 8.0
Mean Slope (Sc): 0.0040 ft/ft
Basin Factor (Nbw): 0.033
Impervious Cover = 10.0 %
Soil Group: B
Cover Type = Desert Brush
% of Pervious Area = 40.0
Cover Density = 35.0 %
Soil Group: D
Cover Type = Desert Brush
% of Pervious Area = 60.0

FLOOD FREQUENCY: 2-Year
P24 = 1.73
P6 = 1.51
P1 = 1.23
P2 = 1.32
P3 = 1.39
Soil Group: B
CN= 81.00
CN* = 78.70
Soil Group: D
CN= 89.00
CN* = 87.46
Time of Concentration (Tc) = 36.3 min
Intensity = 1.73 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.30
Runoff Supply Rate at Tc = 0.51
PEAK DISCHARGE: 38.4 cfs

FLOOD FREQUENCY: 10-Year
P24 = 2.87
P6 = 2.36
P1 = 1.81
P2 = 2.00
P3 = 2.13
Soil Group: B
CN= 81.00
CN* = 83.06
Soil Group: D
CN= 89.00
CN* = 90.36
Time of Concentration (Tc) = 22.3 min
Intensity = 3.42 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.49
Runoff Supply Rate at Tc = 1.69
PEAK DISCHARGE: 127.1 cfs

SUB-BASIN D

FLOOD FREQUENCY: 100-Year

P24 = 4.53
P6 = 3.60
P1 = 2.66
P2 = 2.98
P3 = 3.19
Soil Group: B
CN= 81.00
CN* = 85.96
Soil Group: D
CN= 89.00
CN* = 92.29
Time of Concentration (Tc) = 15.9 min
Intensity = 5.90 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.66
Runoff Supply Rate at Tc = 3.89
PEAK DISCHARGE: 292.9 cfs

SUB-BASIN E

RAINFALL DATA SHEET
PCP.PAS Ver 1.2

EARP WASH T15 R14 S9
CP 5 @ COUNTRY CLUB

Return Period (Years)	Precipitation Values (inches)			
	6-Hour Duration		24-Hour Duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.50	1.51	1.80	1.73
5	2.00	2.02	2.40	2.41
10	2.40	2.36	2.80	2.87
25	2.80	2.81	3.40	3.46
50	3.20	3.21	4.00	4.00
100	3.60	3.60	4.60	4.53

Watershed Area= 41.41 acres
Length of Watercourse (Lc): 2400 ft.
Length to Center of Gravity (Lca): 1200 ft.
Incremental Change in Length (Li)-ft. Incremental Change in Elevation (Hi)-ft.
L(1)= 2400 H(1)= 16.0
Mean Slope (Sc): 0.0067 ft/ft
Basin Factor (Nbw): 0.034
Impervious Cover = 35.0 %
Soil Group: B
Cover Type = Desert Brush
% of Pervious Area = 60.0
CN= 81.00
CN* = 78.70
Cover Density = 35.0 %
Soil Group: D
Cover Type = Desert Brush
% of Pervious Area = 40.0
CN= 89.00
CN* = 87.46
Cover Density = 35.0 %

FLOOD FREQUENCY: 2-Year
Time of Concentration (Tc) = 26.7 min
Intensity = 2.06 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.44
Runoff Supply Rate at Tc = 0.91
PEAK DISCHARGE: 37.9 cfs

FLOOD FREQUENCY: 5-Year
Time of Concentration (Tc) = 21.1 min
Intensity = 3.04 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.54
Runoff Supply Rate at Tc = 1.63
PEAK DISCHARGE: 67.9 cfs

FLOOD FREQUENCY: 10-Year
Time of Concentration (Tc) = 18.7 min
Intensity = 3.70 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.59
Runoff Supply Rate at Tc = 2.18
PEAK DISCHARGE: 90.8 cfs

FLOOD FREQUENCY: 100-Year
Time of Concentration (Tc) = 14.1 min
Intensity = 6.30 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.72
Runoff Supply Rate at Tc = 4.52
PEAK DISCHARGE: 188.7 cfs

PCP.PAS Ver 1.2

EARP WASH T15 R14 S9
CP4 @ ALVORD ROAD

Return Period (Years)	Precipitation Values (inches)			
	6-Hour Duration		24-Hour Duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.50	1.51	1.80	1.73
5	2.00	2.02	2.40	2.41
10	2.40	2.36	2.80	2.87
25	2.80	2.81	3.40	3.46
50	3.20	3.21	4.00	4.00
100	3.60	3.60	4.60	4.53

Watershed Area= 297.38 acres
Length of Watercourse (Lc): 8000 ft.
Length to Center of Gravity (Lca): 4000 ft.

Incremental Change in Length (Li)-ft.	Incremental Change in Elevation (Hi)-ft.
L(1)= 1600	H(1)= 16.0
L(2)= 2400	H(2)= 16.0
L(3)= 2000	H(3)= 14.0
L(4)= 2000	H(4)= 8.0

Mean Slope (Sc): 0.0063 ft/ft
Basin Factor (Nbw): 0.035
Impervious Cover = 18.0 %
Cover Density = 35.0 %
Cover Type = Desert Brush
Soil Group: B
% of Pervious Area = 40.0
Soil Group: D
% of Pervious Area = 60.0

FLOOD FREQUENCY: 2-Year

P24 = 1.73
P6 = 1.51
P1 = 1.23
P2 = 1.32
P3 = 1.39
Soil Group: B
CN= 81.00
CN* = 78.70
Soil Group: D
CN= 89.00
CN* = 87.46
Time of Concentration (Tc) = 91.4 min
Intensity = 0.81 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.35
Runoff Supply Rate at Tc = 0.28
PEAK DISCHARGE: 85.2 cfs

FLOOD FREQUENCY: 10-Year

P24 = 2.87
P6 = 2.36
P1 = 1.81
P2 = 2.00
P3 = 2.13
Soil Group: B
CN= 81.00
CN* = 83.06
Soil Group: D
CN= 89.00
CN* = 90.36
Time of Concentration (Tc) = 56.9 min
Intensity = 1.88 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.53
Runoff Supply Rate at Tc = 1.00
PEAK DISCHARGE: 300.8 cfs

FLOOD FREQUENCY: 100-Year

P24 = 4.53
P6 = 3.60
P1 = 2.66
P2 = 2.98
P3 = 3.19
Soil Group: B
CN= 81.00
CN* = 85.96
Soil Group: D
CN= 89.00
CN* = 92.29
Time of Concentration (Tc) = 39.6 min
Intensity = 3.48 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.69
Runoff Supply Rate at Tc = 2.39
PEAK DISCHARGE: 716.1 cfs

RAINFALL DATA SHEET
PCP.PAS Ver 1.2

EARP WASH T15 R14 S9
CP5 @ COUNTRY CLUB RD

Return Period (Years)	Precipitation Values (inches)			
	6-Hour Duration		24-Hour Duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.50	1.51	1.80	1.73
5	2.00	2.02	2.40	2.41
10	2.40	2.36	2.80	2.87
25	2.80	2.81	3.40	3.46
50	3.20	3.21	4.00	4.00
100	3.60	3.60	4.60	4.53

Watershed Area= 338.79 acres
Length of Watercourse (Lc): 10400 ft.
Length to Center of Gravity (Lca): 5200 ft.

Incremental Change in Length (Li)-ft.	Incremental Change in Elevation (Hi)-ft.
L(1)= 1600	H(1)= 16.0
L(2)= 2400	H(2)= 16.0
L(3)= 2000	H(3)= 14.0
L(4)= 2000	H(4)= 8.0
L(5)= 2400	H(5)= 16.0

Mean Slope (Sc): 0.0064 ft/ft
Basin Factor (Nbw): 0.033
Impervious Cover = 20.0 %
Cover Type = Desert Brush
Cover Density = 35.0 %
Soil Group: B % of Pervious Area = 40.0
Soil Group: D % of Pervious Area = 60.0

FLOOD FREQUENCY: 2-Year
P24 = 1.73
P6 = 1.51
P1 = 1.23
P2 = 1.32
P3 = 1.39
Soil Group: B
CN= 81.00
CN* = 78.70
Soil Group: D
CN= 89.00
CN* = 87.46
Time of Concentration (Tc) = 102.6 min
Intensity = 0.72 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.36
Runoff Supply Rate at Tc = 0.26
PEAK DISCHARGE: 89.8 cfs

FLOOD FREQUENCY: 10-Year
P24 = 2.87
P6 = 2.36
P1 = 1.81
P2 = 2.00
P3 = 2.13
Soil Group: B
CN= 81.00
CN* = 83.06
Soil Group: D
CN= 89.00
CN* = 90.36
Time of Concentration (Tc) = 64.4 min
Intensity = 1.71 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.54
Runoff Supply Rate at Tc = 0.93
PEAK DISCHARGE: 316.1 cfs

FLOOD FREQUENCY: 100-Year

P24 = 4.53
P6 = 3.60
P1 = 2.66
P2 = 2.98
P3 = 3.19
Soil Group: B
CN= 81.00
CN* = 85.96
Soil Group: D
CN= 89.00
CN* = 92.29
Time of Concentration (Tc) = 44.9 min
Intensity = 3.24 in./hr.
Weighted Runoff to Rainfall Ratio (Cw) = 0.69
Runoff Supply Rate at Tc = 2.25
PEAK DISCHARGE: 767.0 cfs

APPENDIX B
Floodplain Analysis and Cross-sections

X-SECTION 20
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	EARP WASH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.005000	ft/ft
Elevation range: 20.00 ft to 22.00 ft.		
Discharge	716.00	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
100.00	22.00	100.00	480.00	0.040
260.00	20.00			
480.00	22.00			

Results		
Wtd. Mannings Coefficient	0.040	
Water Surface Elevation	21.77	ft
Flow Area	296.20	ft^2
Wetted Perimeter	335.51	ft
Top Width	335.49	ft
Height	1.77	ft
Critical Depth	21.29	ft
Critical Slope	0.027008	ft/ft
Velocity	2.42	ft/s
Velocity Head	0.09	ft
Specific Energy	21.86	ft
Froude Number	0.45	
Flow is subcritical.		

$WSEL_{100} = 2621.77'$

X-SECTION 30
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	EARP 30
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.005700	ft/ft
Elevation range: 17.50 ft to 20.00 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
150.00	20.00	150.00	650.00	0.040
250.00	18.00			
350.00	17.50			
470.00	18.00			
650.00	20.00			

Discharge	716.00	cfs

Results		
Wtd. Mannings Coefficient	0.040	
Water Surface Elevation	18.83	ft
Flow Area	284.88	ft^2
Wetted Perimeter	335.82	ft
Top Width	335.81	ft
Height	1.33	ft
Critical Depth	18.44	ft
Critical Slope	0.027861	ft/ft
Velocity	2.51	ft/s
Velocity Head	0.10	ft
Specific Energy	18.93	ft
Froude Number	0.48	
Flow is subcritical.		

$WSEL_{100} = 2618.83$

X-SECTION 40
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	EARPH 40
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.005000	ft/ft
Elevation range: 15.50 ft to 18.00 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
200.00	18.00	200.00	920.00	0.045
210.00	16.00			
400.00	16.00			
600.00	15.50			
780.00	16.00			
920.00	18.00			

Discharge	716.00	cfs

Results		
Wtd. Mannings Coefficient	0.045	
Water Surface Elevation	16.52	ft
Flow Area	403.57	ft^2
Wetted Perimeter	609.31	ft
Top Width	609.25	ft
Height	1.02	ft
Critical Depth	16.20	ft
Critical Slope	0.041493	ft/ft
Velocity	1.77	ft/s
Velocity Head	0.05	ft
Specific Energy	16.57	ft
Froude Number	0.38	
Flow is subcritical.		

$WSEL_{100} = 2616.52'$

X-SECTION 50
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSSECTION 50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.006000	ft/ft
Elevation range: 12.00 ft to 14.00 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
60.00	14.00	60.00	590.00	0.060
230.00	13.00			
460.00	12.00			
500.00	12.00			
590.00	14.00			

Discharge	716.00	cfs

Results		
Wtd. Mannings Coefficient	0.060	
Water Surface Elevation	13.59	ft
Flow Area	399.00	ft^2
Wetted Perimeter	441.01	ft
Top Width	440.99	ft
Height	1.59	ft
Critical Depth	12.98	ft
Critical Slope	0.063980	ft/ft
Velocity	1.79	ft/s
Velocity Head	0.05	ft
Specific Energy	13.64	ft
Froude Number	0.33	
Flow is subcritical.		

$WSEL_{100} = 2613.59'$

X-SECTION 60
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSSECTION 60
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.010000	ft/ft
Elevation range: 10.00 ft to 12.00 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
140.00	12.00	140.00	800.00	0.065
410.00	11.50			
570.00	11.00			
700.00	10.00			
800.00	12.00			

Discharge	716.00	cfs

Results		
Wtd. Mannings Coefficient	0.065	
Water Surface Elevation	11.87	ft
Flow Area	401.66	ft^2
Wetted Perimeter	583.29	ft
Top Width	583.27	ft
Height	1.87	ft
Critical Depth	11.33	ft
Critical Slope	0.074684	ft/ft
Velocity	1.78	ft/s
Velocity Head	0.05	ft
Specific Energy	11.92	ft
Froude Number	0.38	
Flow is subcritical.		

$WSEL_{100} = 2611.87'$

X-SECTION 70
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSS SECTION 70
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.010000	ft/ft

Elevation range: 10.00 ft to 12.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
80.00	12.00	80.00	770.00	0.065
350.00	10.50			
460.00	10.00			
700.00	10.00			
770.00	12.00			

Discharge	716.00	cfs

Results		
Wtd. Mannings Coefficient	0.065	
Water Surface Elevation	11.02	ft
Flow Area	371.20	ft^2
Wetted Perimeter	478.94	ft
Top Width	478.92	ft
Height	1.02	ft
Critical Depth	10.58	ft
Critical Slope	0.078895	ft/ft
Velocity	1.93	ft/s
Velocity Head	0.06	ft
Specific Energy	11.08	ft
Froude Number	0.39	
Flow is subcritical.		

$WSEL_{100} = 2611.02'$

X-SECTION 80
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSS SECTION 80
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.013300	ft/ft
Elevation range: 8.00 ft to 12.00 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
120.00	12.00	120.00	385.00	0.065
200.00	10.00			
240.00	9.50			
300.00	9.00			
340.00	8.00			
370.00	8.00			
380.00	10.00			
385.00	10.50			

Discharge	767.00	cfs

Results		
Wtd. Mannings Coefficient	0.065	
Water Surface Elevation	10.34	ft
Flow Area	249.03	ft²
Wetted Perimeter	197.22	ft
Top Width	196.99	ft
Height	2.34	ft
Critical Depth	9.75	ft
Critical Slope	0.063901	ft/ft
Velocity	3.08	ft/s
Velocity Head	0.15	ft
Specific Energy	10.49	ft
Froude Number	0.48	
Flow is subcritical.		

$WSEL_{100} = 2610.34'$

X-SECTION 90
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSS SECTION 90
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.012500	ft/ft
Elevation range: 5.50 ft to 7.00 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
50.00	7.00	50.00	670.00	0.060
150.00	6.50			
200.00	6.00			
280.00	6.00			
350.00	5.50			
520.00	6.00			
670.00	7.00			

Discharge	767.00	cfs

Results		
Wtd. Mannings Coefficient	0.060	
Water Surface Elevation	6.72	ft
Flow Area	356.76	ft^2
Wetted Perimeter	521.43	ft
Top Width	521.42	ft
Height	1.22	ft
Critical Depth	6.37	ft
Critical Slope	0.067227	ft/ft
Velocity	2.15	ft/s
Velocity Head	0.07	ft
Specific Energy	6.79	ft
Froude Number	0.46	
Flow is subcritical.		

WSEL = 2606.72'

X-SECTION 100
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSS SECTIO 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.008000	ft/ft
Elevation range: 4.00 ft to 6.00 ft.		
Discharge	767.00	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	6.00	0.00	700.00	0.060
100.00	4.00			
500.00	4.00			
700.00	6.00			

Results		
Wtd. Mannings Coefficient	0.060	
Water Surface Elevation	4.88	ft
Flow Area	411.27	ft²
Wetted Perimeter	532.35	ft
Top Width	532.33	ft
Height	0.88	ft
Critical Depth	4.47	ft
Critical Slope	0.069215	ft/ft
Velocity	1.86	ft/s
Velocity Head	0.05	ft
Specific Energy	4.94	ft
Froude Number	0.37	
Flow is subcritical.		

$WSEL_{100} = 2604.88'$

X-SECTION 110
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSS SECTIO 110
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.007300	ft/ft
Elevation range: 1.50 ft to 4.00 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	4.00	0.00	740.00	0.065
200.00	2.00			
400.00	1.50			
600.00	2.00			
680.00	4.00			
740.00	4.00			

Discharge	767.00	cfs

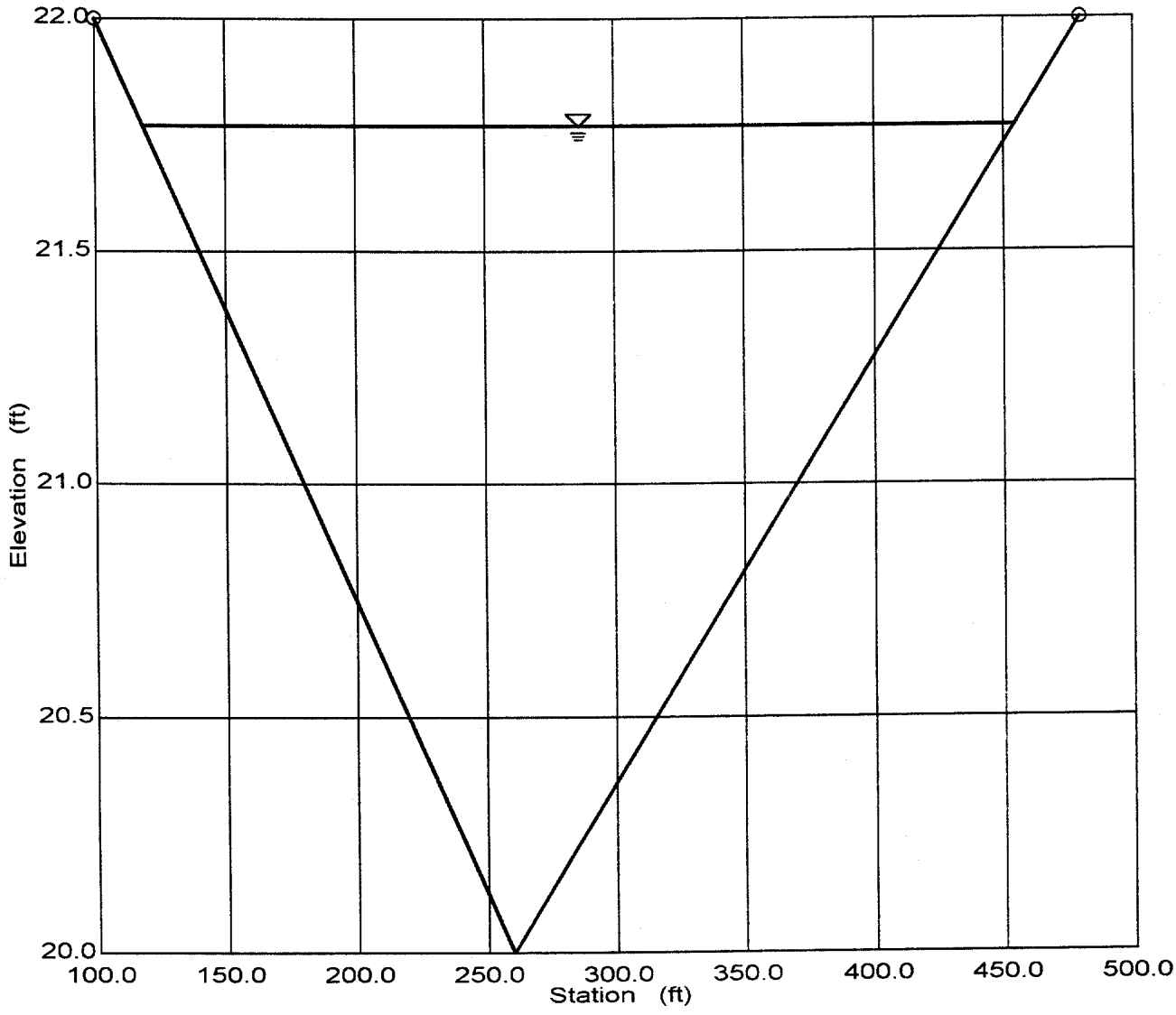
Results		
Wtd. Mannings Coefficient	0.065	
Water Surface Elevation	2.74	ft
Flow Area	433.72	ft²
Wetted Perimeter	503.44	ft
Top Width	503.43	ft
Height	1.24	ft
Critical Depth	2.24	ft
Critical Slope	0.079755	ft/ft
Velocity	1.77	ft/s
Velocity Head	0.05	ft
Specific Energy	2.79	ft
Froude Number	0.34	
Flow is subcritical.		

$WSEL_{100} = 2602.741$

Cross Section 20
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	EARP WASH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

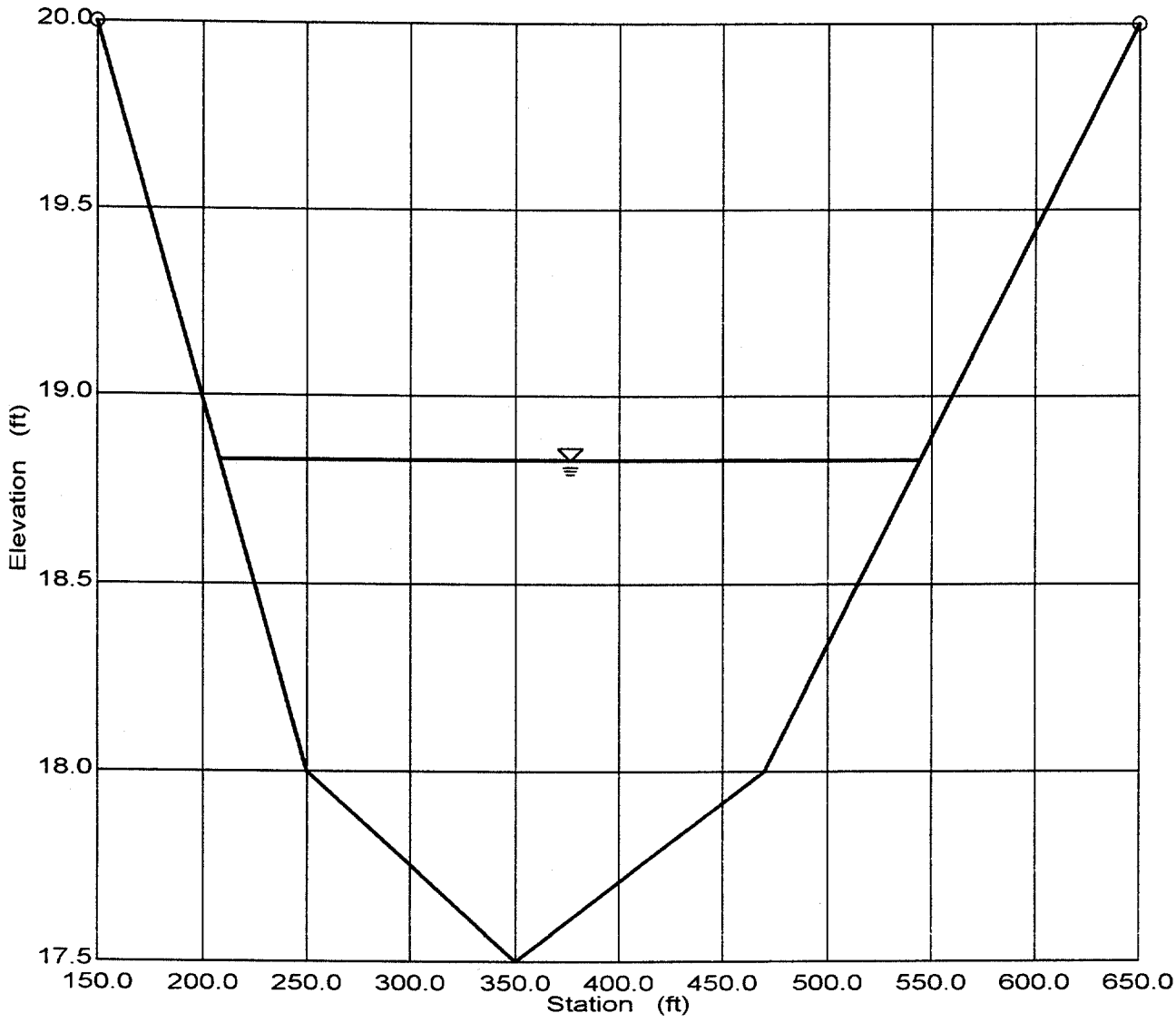
Section Data		
Wtd. Mannings Coefficient	0.040	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	21.77	ft
Discharge	716.00	cfs



Cross Section 30
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	EARP 30
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

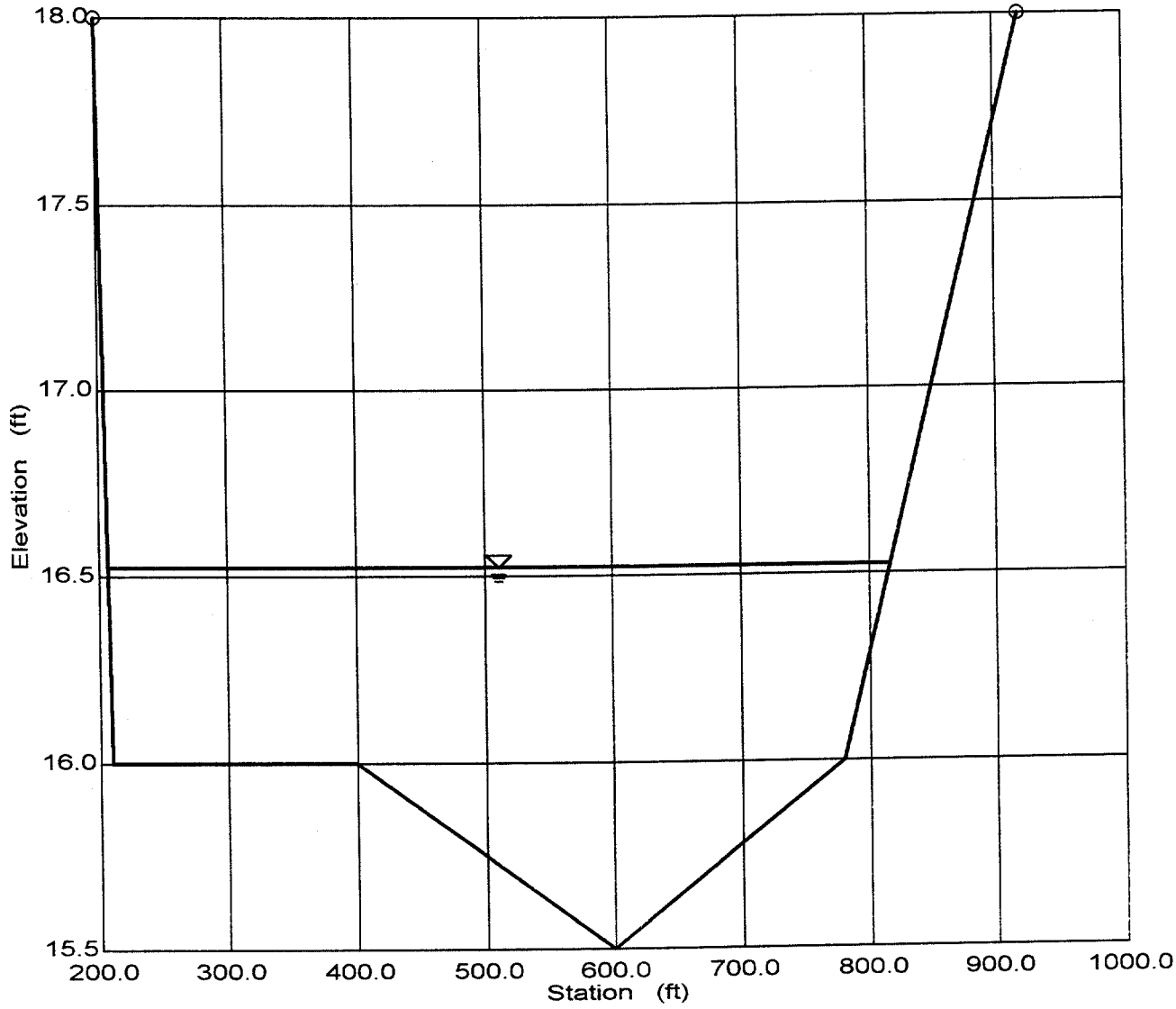
Section Data		
Wtd. Mannings Coefficient	0.040	
Channel Slope	0.005700	ft/ft
Water Surface Elevation	18.83	ft
Discharge	716.00	cfs



Cross Section 40
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	EARPH 40
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

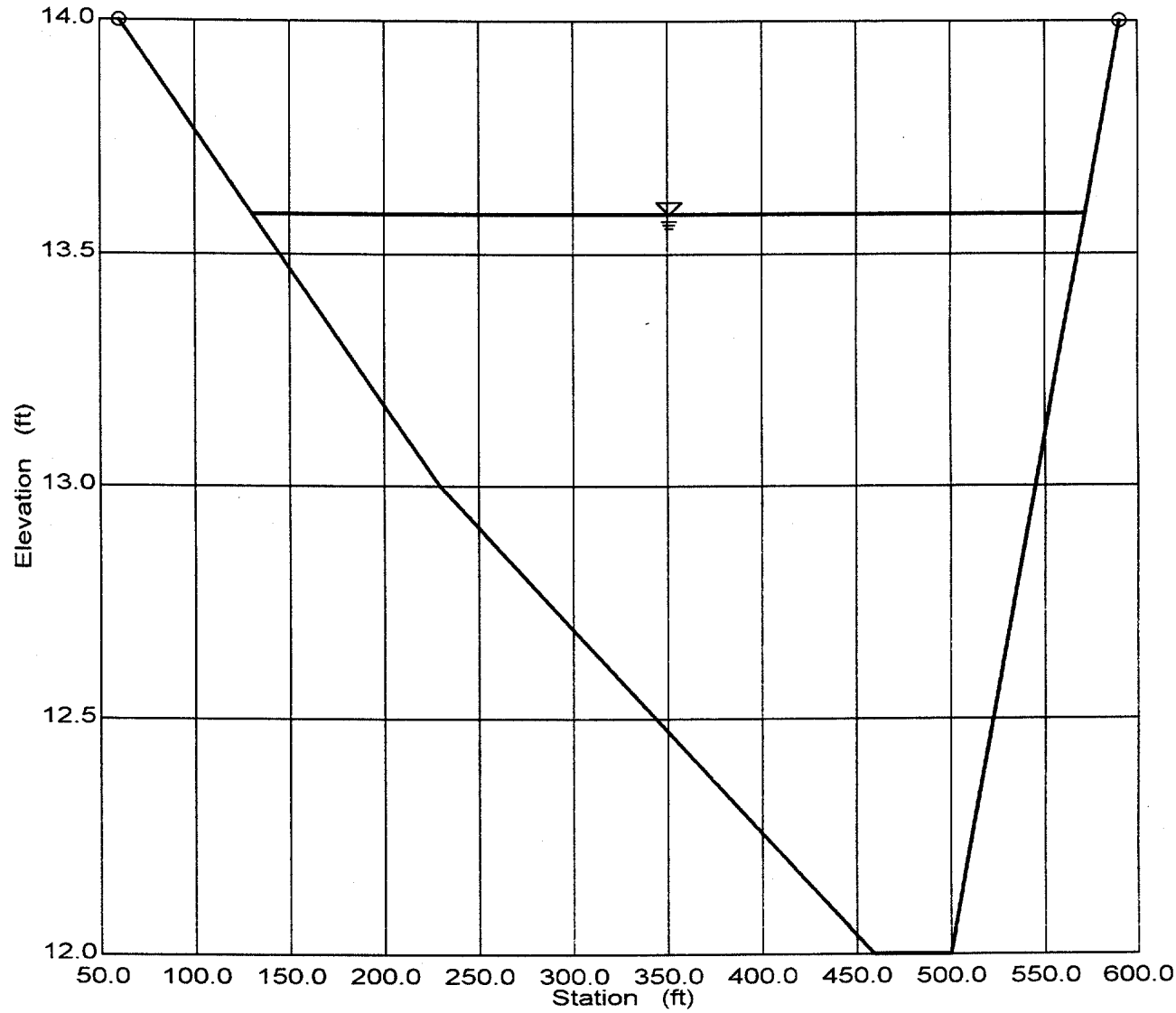
Section Data		
Wtd. Mannings Coefficient	0.045	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	16.52	ft
Discharge	716.00	cfs



Cross Section 50
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSSECTION 50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

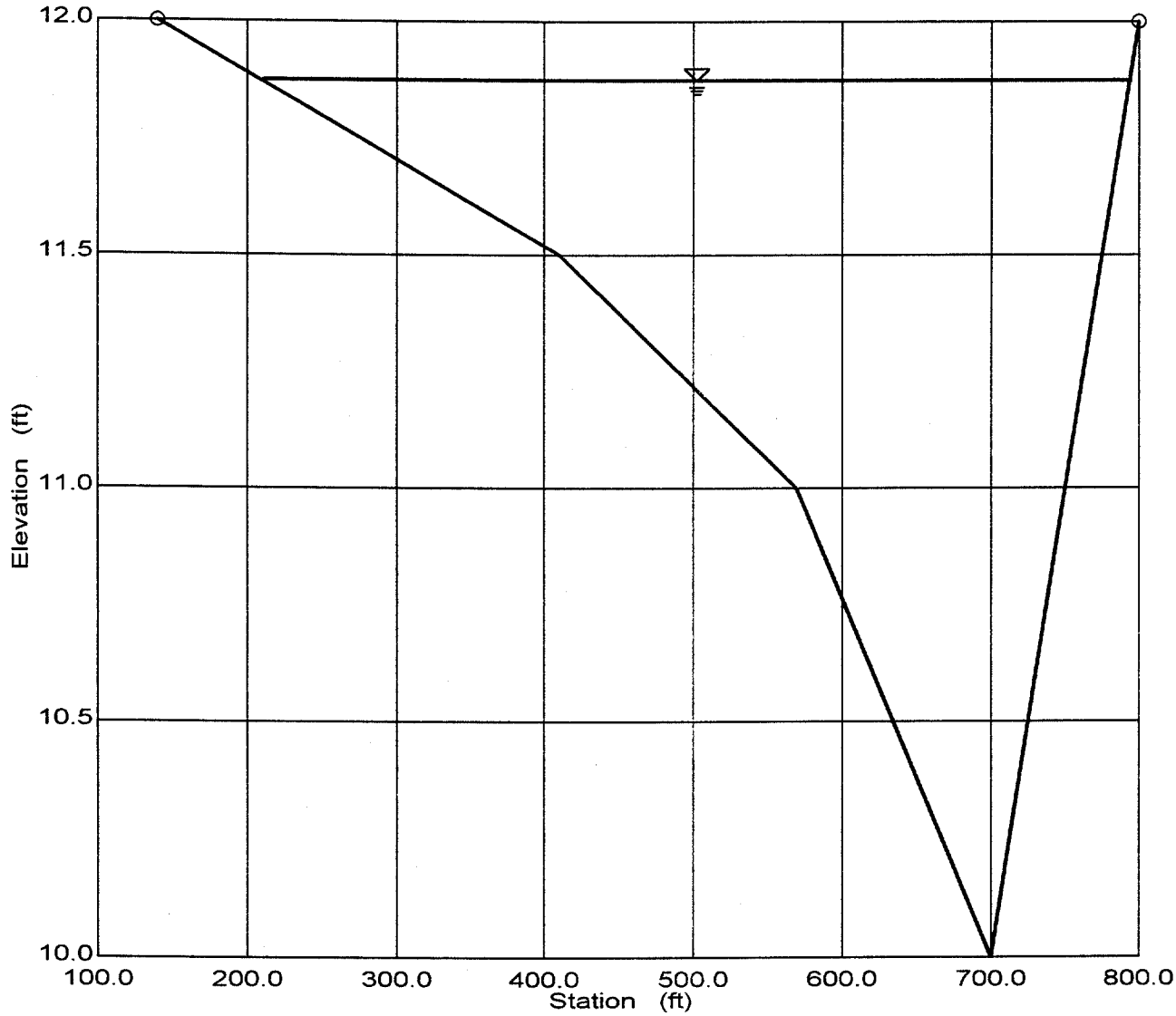
Section Data		
Wtd. Mannings Coefficient	0.060	
Channel Slope	0.006000	ft/ft
Water Surface Elevation	13.59	ft
Discharge	716.00	cfs



Cross Section 60
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSSECTION 60
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

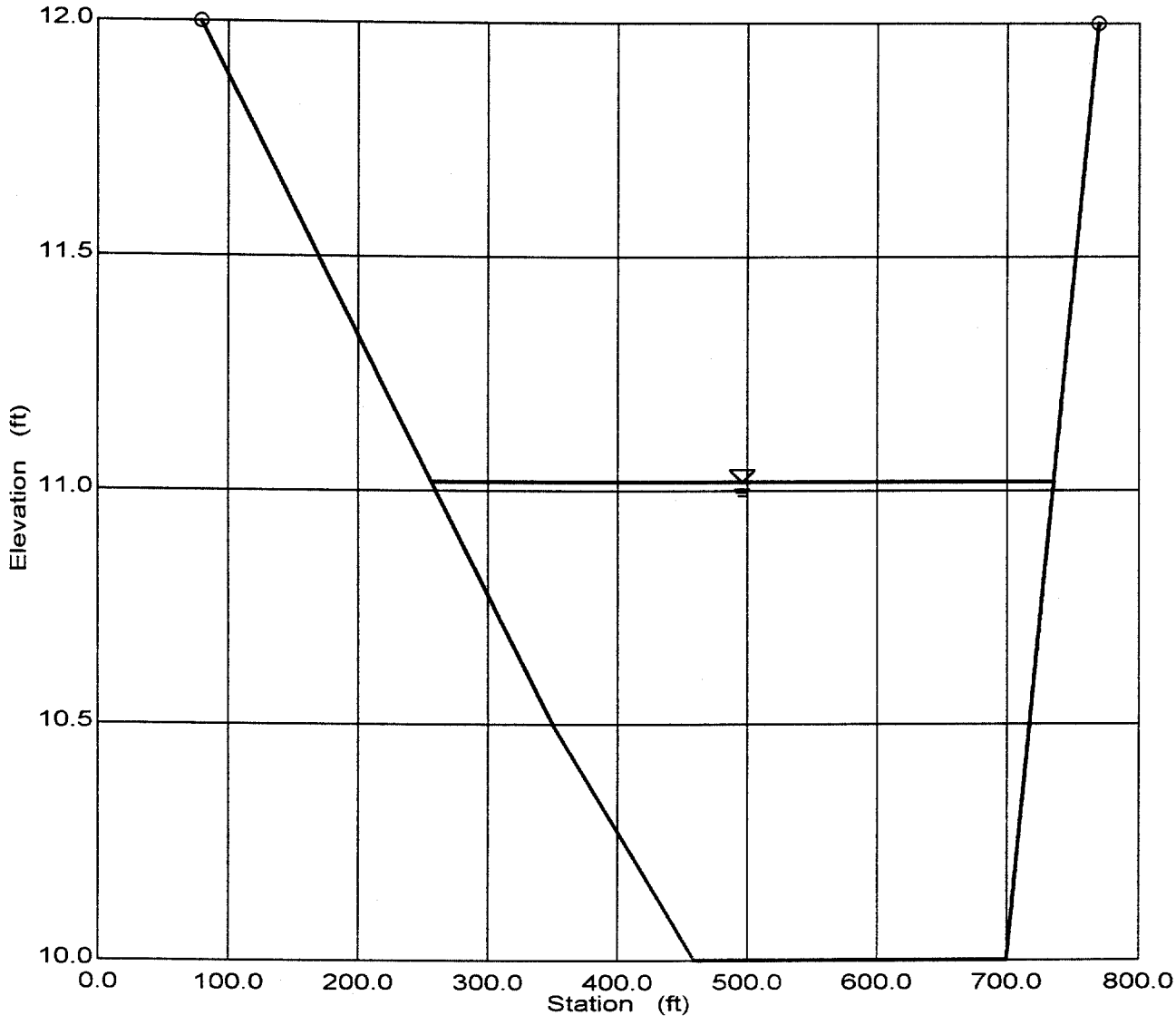
Section Data		
Wtd. Mannings Coefficient	0.065	
Channel Slope	0.010000	ft/ft
Water Surface Elevation	11.87	ft
Discharge	716.00	cfs



Cross Section 70
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSS SECTION 70
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

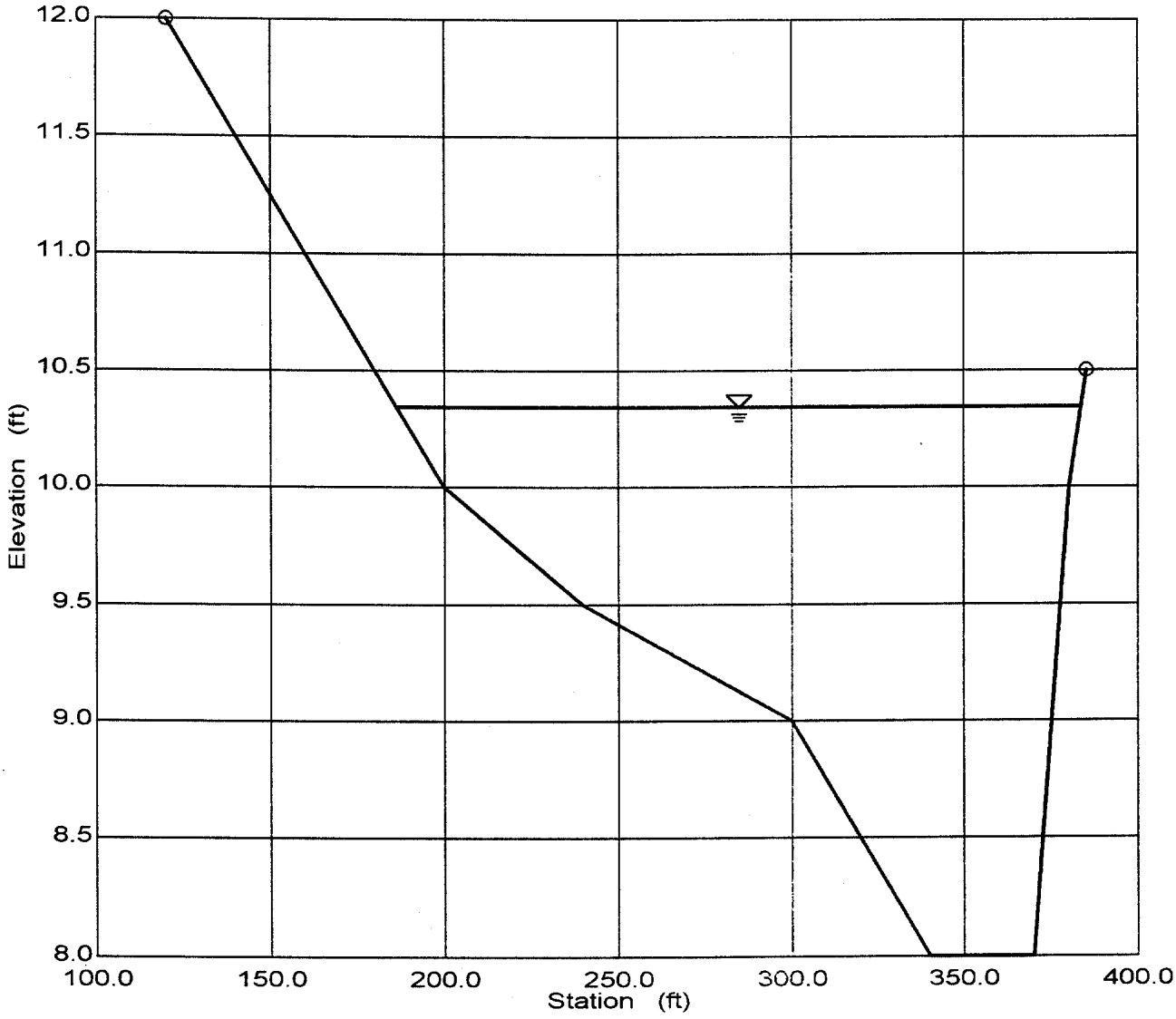
Section Data		
Wtd. Mannings Coefficient	0.065	
Channel Slope	0.010000	ft/ft
Water Surface Elevation	11.02	ft
Discharge	716.00	cfs



CROSS SECTION 80
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSS SECTION 80
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

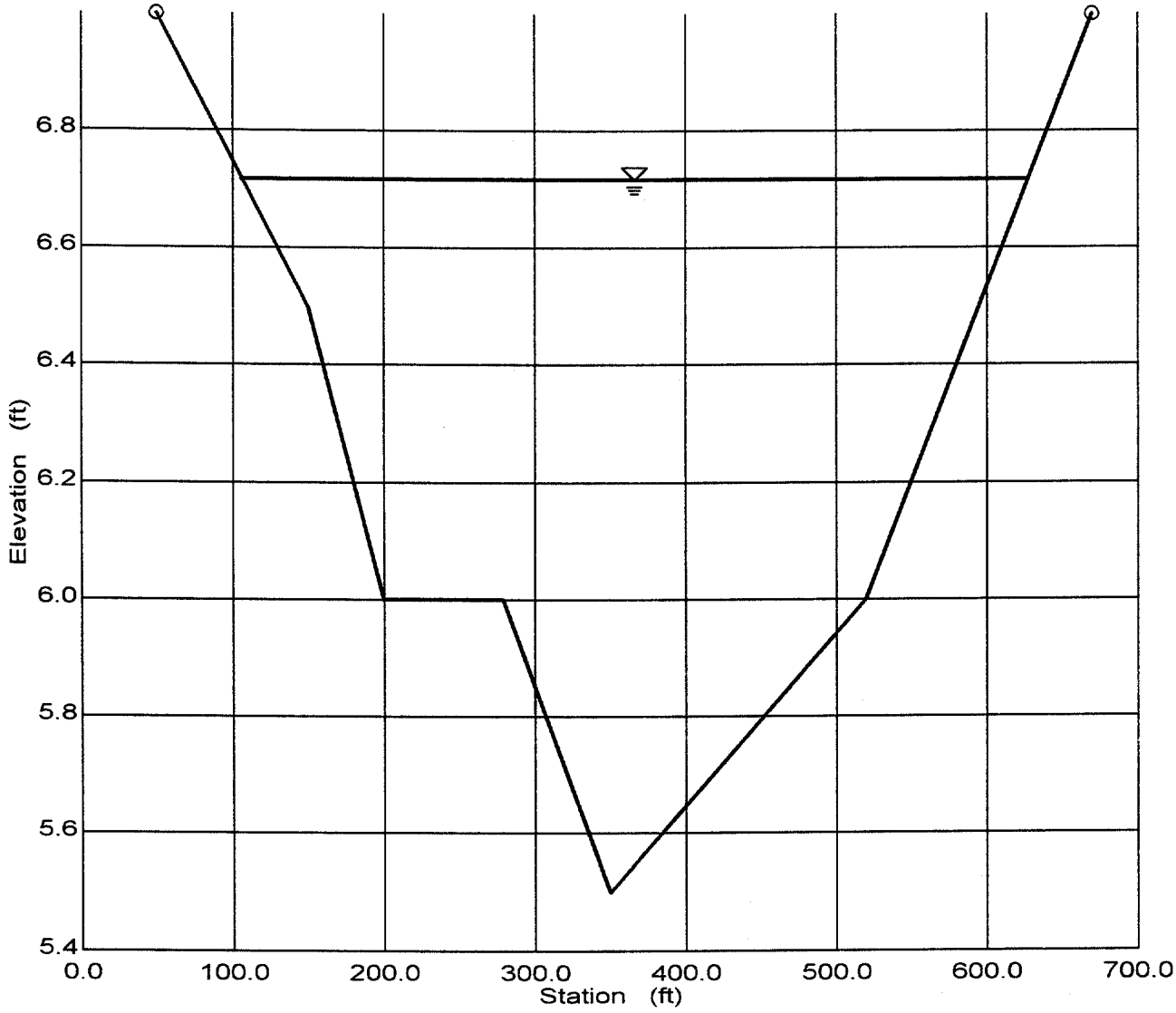
Section Data		
Wtd. Mannings Coefficient	0.065	
Channel Slope	0.013300	ft/ft
Water Surface Elevation	10.34	ft
Discharge	767.00	cfs



Cross Section 90
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSS SECTION 90
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

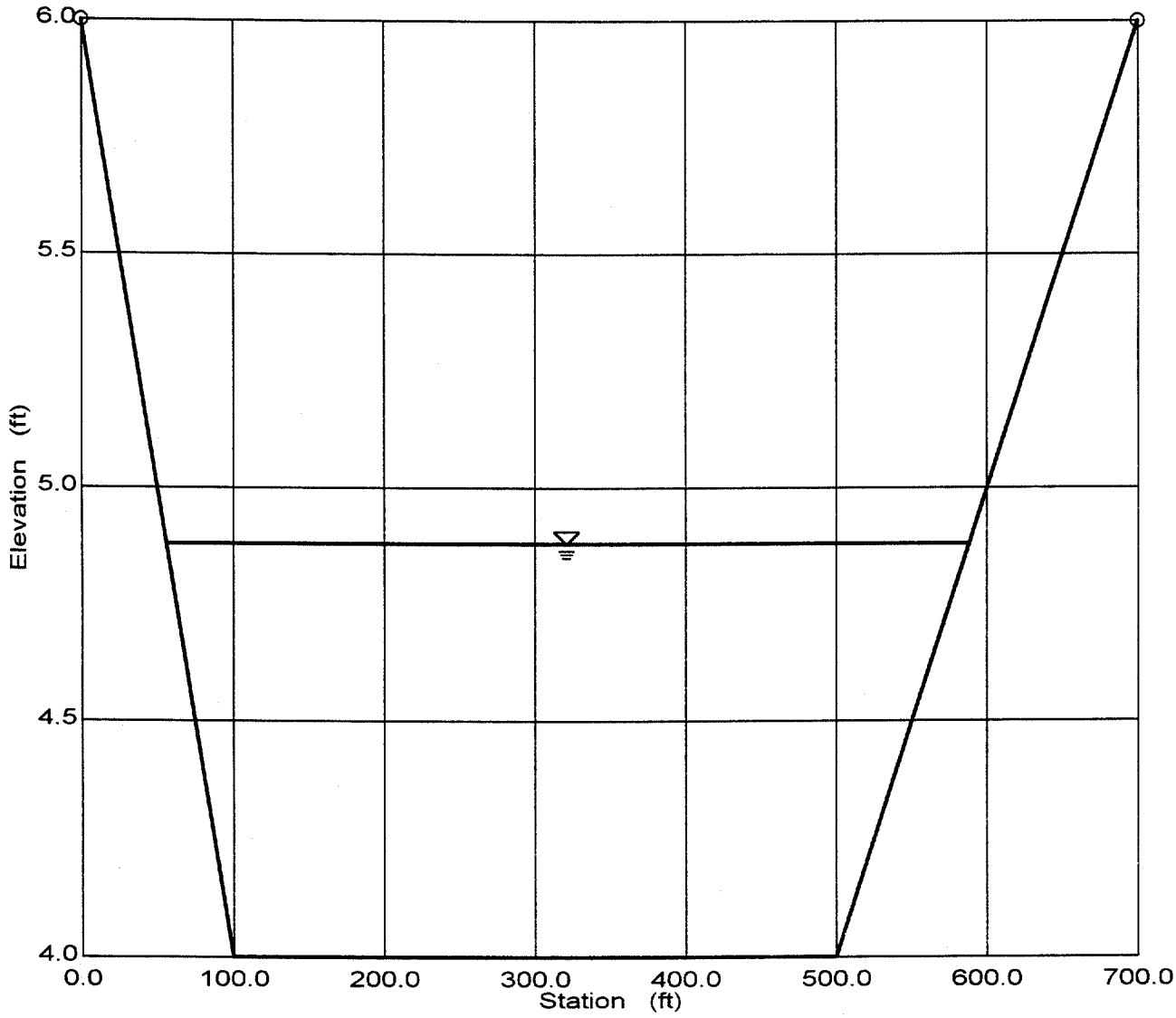
Section Data		
Wtd. Mannings Coefficient	0.060	
Channel Slope	0.012500	ft/ft
Water Surface Elevation	6.72	ft
Discharge	767.00	cfs



Cross Section 100
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSS SECTIO 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

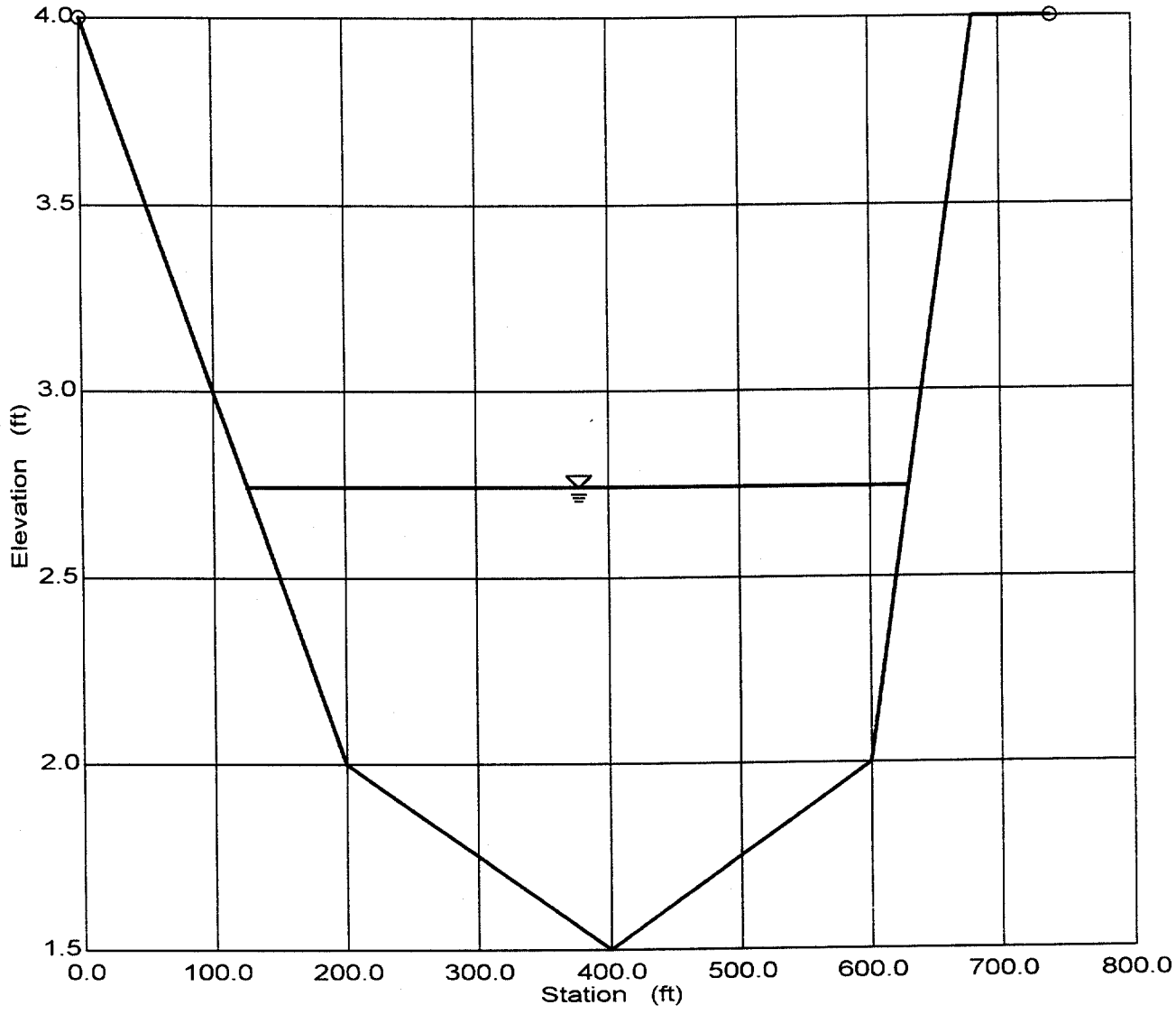
Section Data		
Wtd. Mannings Coefficient	0.060	
Channel Slope	0.008000	ft/ft
Water Surface Elevation	4.88	ft
Discharge	767.00	cfs



Cross Section 110
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\earph wash\earpwash.fm2
Worksheet	CROSS SECTIO 110
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.065	
Channel Slope	0.007300	ft/ft
Water Surface Elevation	2.74	ft
Discharge	767.00	cfs



APPENDIX C-1

Structural Alternative 1 Detention Basin

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            SEPTEMBER 1990             *
*             VERSION 4.0               *
*                                       *
*  RUN DATE  03/04/1999  TIME  16:19:13 *
*                                       *
*****************************************
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*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
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X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX          XXX
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LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   1          ID        EARP WASH UPSTREAM OF ALVERNON WAY
   2          ID        PROPOSED LAND PURCHASE UPSTREAM OF ALVERNON WAY BOX CULVERTS
   3          IT       1 20JAN99       0     140
   4          IO       2       2

   5          KK     100
   6          KM         INFLOW HYDROGRAPH FOR SUBBASIN A
   7          BA      .27
   8          QI      0.9     5.3    12.5    21.9    32.7    44.6    57.3    70.4    84.0    97.9
   9          QI    112.2     127     142     158     176     194     213     234     255     278
  10          QI      303     329     355     382     408     434     458     479     501     491
  11          QI      477     464     451     437     424     410     397     384     371     358
  12          QI      345     333     320     308     296     285     273     262     252     241
  13          QI      231     221     211     202     193     184     176     168     160     152
  14          QI      145     138     131     125     119     113     108     103    97.5      93
  15          QI       88      84      80      76      73      69      66      63      60      58
  16          QI       55      53      51      48      47      45      43      41      40      39
  17          QI       37      36      35      34      33      32      31      30      29      28
  18          QI       27      26      25      25      24      23      22      21      20      19
  19          QI       18    17.5      17      15      14      14      12      11      10      10
  20          QI        9       8       8       7       6       6       5       5       4       4
  21          QI        4       3       3

  22          KK     115     DETENTION  BASIN
  23          KM         PROPOSED DETENTION BASIN - LAND SIZE = 5 ACRES
  24          RS       1    STOR      0.0      0.
  25          SA     4.4       5
  26          SE     0.0       4
  27          SS       0      10    2.64     1.5

  28          KK     117 ROUTING DETENTION BASIN DISCHARGE THROUGH CHANNEL
  29          KM         LENGTH OF CHANNEL = 1760'
  30          RS       1    FLOW      -1
  31          RC    0.05    0.05    0.05    1760    .005
  32          RX       0     125     250     395     435     595     670     720
  33          RY    2622    2620  2619.5    2618    2618    2620    2622    2624
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34          KK     120
35          KM        INFLOW HYDROGRAPH FOR SUBBASIN B
36          BA    .074
37          QI     1.1      5.2     11.3      19      27      35      44      53      63      74
38          QI      85       98      111     126     142     159     176     193     207     218
39          QI     209      201      192     184     175     167     158     150     142     135
40          QI     127      120      113     106      99      93      87      82      76      71
41          QI      66       61       57      53      50      46      43      40      37      35
42          QI      32       30       28      26      25      23      22      20      19      18
43          QI      17       16       15      14      14      13      13      12      11      11
44          QI    10.7       10        9       9       8       8       7       6       6       5
45          QI       5        4        3       3       3       2     1.8     1.5     1.3

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


46          KK     130
47          KM        INFLOW HYDROGRAPH FOR SUBBASIN C
48          BA    .004
49          QI     0.2       .8      1.7     2.6     3.6     4.7     5.9     7.2     8.8    10.6
50          QI    12.4     14.2       16    15.3    14.3    12.5    11.5    10.7     9.8     9.0
51          QI     8.2      7.4      6.8     6.1     5.5     5.0     4.5     4.0     3.6     3.2
52          QI     2.9      2.6      2.3     2.1     1.9     1.7     1.6     1.4     1.3     1.2
53          QI     1.1      1.0      1.0     0.9      .8      .8      .7      .7      .6      .6
54          QI      .5       .5       .4      .3      .3      .2      .2      .2      .1      .1

55          KK     140
56          KM        INFLOW HYDROGRAPH FOR SUBBASIN D
57          BA    .12
58          QI     6.1     22.6     43.2    65.7    90.4   118.9   152.9   192.4   235.2   274.6
59          QI     293    263.3      241    15.3     220     200     180     161     143     126
60          QI     113       99       87      76      66      58      50      44      39      34
61          QI      30       27       24      22      20      18      17      15      14      13
62          QI      12       10        9       8       7       5       4       3       2       2

63          KK     150
64          KM        COMBINE HYDROGRAPHS FOR PROPOSED DETENTION BASIN & SUBBASINS B&C
65          HC       4

66          KK     150 ROUTING DISCHARGE TO CP 5
67          KM         LENGTH = 1800'
68          RS       1    FLOW      -1
69          RC   0.016    0.016   0.016    1800    0.02
70          RX       0       50     100     150     200     250     300     350
71          RY    2625     2622  2619.8  2619.8  2619.8  2619.8    2622    2625

72          KK     160
73          KM        INFLOW HYDROGRAPH FOR SUBBASIN E
74          BA    .12
75          QI     4.5       16       31      46      64      85     110     138     167     189
76          QI     174      159      144     130     117     104      92      81      71      62
77          QI      54       46       40      35      30      26      23      20      18      16
78          QI      12       11       10       9       8       7       6       5       4       4
79          QI       3        2        1

80          KK     170
81          KM        COMBINE HYDROGRAPHS FOR PROPOSED DETENTION BASIN
82          HC       2
83          ZZ
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1****************************************                                                  ****************************************
 *                                      *                                                  *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *   U.S. ARMY CORPS OF ENGINEERS       *
 *            SEPTEMBER 1990            *                                                  *   HYDROLOGIC ENGINEERING CENTER      *
 *             VERSION 4.0              *                                                  *         609 SECOND STREET            *
 *                                      *                                                  *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE  03/04/1999  TIME  16:19:13 *                                                 *          (916) 756-1104              *
 *                                      *                                                  *                                      *
 ****************************************                                                  ****************************************

                                   EARP WASH UPSTREAM OF ALVERNON WAY
                                   PROPOSED LAND PURCHASE UPSTREAM OF ALVERNON WAY BOX CULVERTS

    4 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           2  PRINT CONTROL
                        IPLOT           2  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE     20JAN99  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ         140  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     20JAN99  ENDING DATE
                       NDTIME        0219  ENDING TIME
                        ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE    2.32 HOURS

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

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
    5 KK      *      100   *
              *            *
              **************
                                   INFLOW HYDROGRAPH FOR SUBBASIN A

                SUBBASIN RUNOFF DATA

    7 BA          SUBBASIN CHARACTERISTICS
                        TAREA          .27  SUBBASIN AREA

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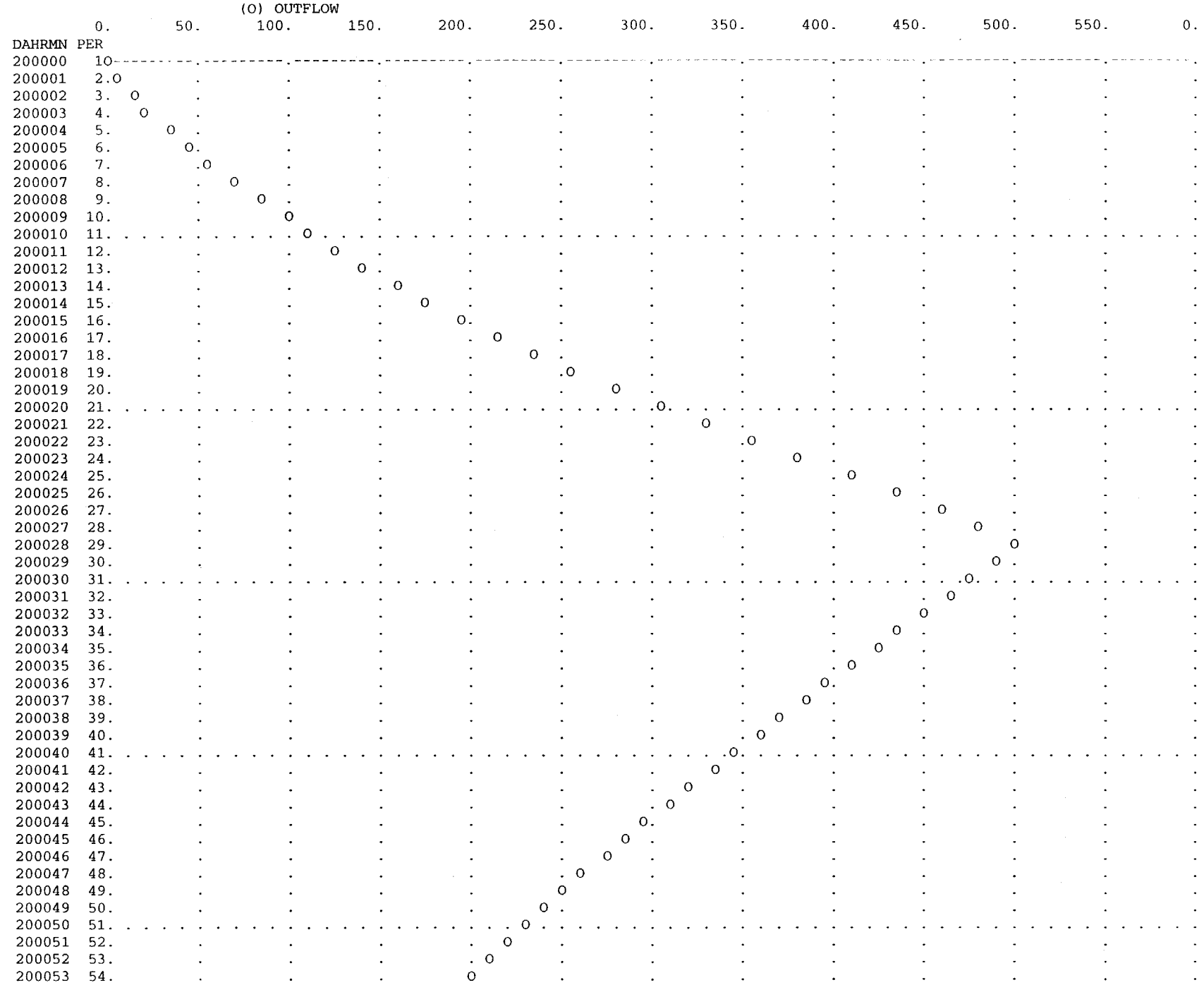
HYDROGRAPH AT STATION 100

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
20	JAN	0000	1	1.	20	JAN	0035	36	410.	20	JAN	0110	71	88.	20	JAN	0145	106	23.
20	JAN	0001	2	5.	20	JAN	0036	37	397.	20	JAN	0111	72	84.	20	JAN	0146	107	22.
20	JAN	0002	3	13.	20	JAN	0037	38	384.	20	JAN	0112	73	80.	20	JAN	0147	108	21.
20	JAN	0003	4	22.	20	JAN	0038	39	371.	20	JAN	0113	74	76.	20	JAN	0148	109	20.
20	JAN	0004	5	33.	20	JAN	0039	40	358.	20	JAN	0114	75	73.	20	JAN	0149	110	19.
20	JAN	0005	6	45.	20	JAN	0040	41	345.	20	JAN	0115	76	69.	20	JAN	0150	111	18.
20	JAN	0006	7	57.	20	JAN	0041	42	333.	20	JAN	0116	77	66.	20	JAN	0151	112	18.
20	JAN	0007	8	70.	20	JAN	0042	43	320.	20	JAN	0117	78	63.	20	JAN	0152	113	17.
20	JAN	0008	9	84.	20	JAN	0043	44	308.	20	JAN	0118	79	60.	20	JAN	0153	114	15.
20	JAN	0009	10	98.	20	JAN	0044	45	296.	20	JAN	0119	80	58.	20	JAN	0154	115	14.
20	JAN	0010	11	112.	20	JAN	0045	46	285.	20	JAN	0120	81	55.	20	JAN	0155	116	14.
20	JAN	0011	12	127.	20	JAN	0046	47	273.	20	JAN	0121	82	53.	20	JAN	0156	117	12.
20	JAN	0012	13	142.	20	JAN	0047	48	262.	20	JAN	0122	83	51.	20	JAN	0157	118	11.
20	JAN	0013	14	158.	20	JAN	0048	49	252.	20	JAN	0123	84	48.	20	JAN	0158	119	10.
20	JAN	0014	15	176.	20	JAN	0049	50	241.	20	JAN	0124	85	47.	20	JAN	0159	120	10.
20	JAN	0015	16	194.	20	JAN	0050	51	231.	20	JAN	0125	86	45.	20	JAN	0200	121	9.
20	JAN	0016	17	213.	20	JAN	0051	52	221.	20	JAN	0126	87	43.	20	JAN	0201	122	8.
20	JAN	0017	18	234.	20	JAN	0052	53	211.	20	JAN	0127	88	41.	20	JAN	0202	123	8.
20	JAN	0018	19	255.	20	JAN	0053	54	202.	20	JAN	0128	89	40.	20	JAN	0203	124	7.
20	JAN	0019	20	278.	20	JAN	0054	55	193.	20	JAN	0129	90	39.	20	JAN	0204	125	6.
20	JAN	0020	21	303.	20	JAN	0055	56	184.	20	JAN	0130	91	37.	20	JAN	0205	126	6.
20	JAN	0021	22	329.	20	JAN	0056	57	176.	20	JAN	0131	92	36.	20	JAN	0206	127	5.
20	JAN	0022	23	355.	20	JAN	0057	58	168.	20	JAN	0132	93	35.	20	JAN	0207	128	5.
20	JAN	0023	24	382.	20	JAN	0058	59	160.	20	JAN	0133	94	34.	20	JAN	0208	129	4.
20	JAN	0024	25	408.	20	JAN	0059	60	152.	20	JAN	0134	95	33.	20	JAN	0209	130	4.
20	JAN	0025	26	434.	20	JAN	0100	61	145.	20	JAN	0135	96	32.	20	JAN	0210	131	4.
20	JAN	0026	27	458.	20	JAN	0101	62	138.	20	JAN	0136	97	31.	20	JAN	0211	132	3.
20	JAN	0027	28	479.	20	JAN	0102	63	131.	20	JAN	0137	98	30.	20	JAN	0212	133	3.
20	JAN	0028	29	501.	20	JAN	0103	64	125.	20	JAN	0138	99	29.	20	JAN	0213	134	3.
20	JAN	0029	30	491.	20	JAN	0104	65	119.	20	JAN	0139	100	28.	20	JAN	0214	135	3.
20	JAN	0030	31	477.	20	JAN	0105	66	113.	20	JAN	0140	101	27.	20	JAN	0215	136	3.
20	JAN	0031	32	464.	20	JAN	0106	67	108.	20	JAN	0141	102	26.	20	JAN	0216	137	3.
20	JAN	0032	33	451.	20	JAN	0107	68	103.	20	JAN	0142	103	25.	20	JAN	0217	138	3.
20	JAN	0033	34	437.	20	JAN	0108	69	98.	20	JAN	0143	104	25.	20	JAN	0218	139	3.
20	JAN	0034	35	424.	20	JAN	0109	70	93.	20	JAN	0144	105	24.	20	JAN	0219	140	3.

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	2.32-HR
(CFS)	(HR)					
		(CFS)				
501.	.47		134.	134.	134.	134.
		(INCHES)	1.777	1.777	1.777	1.777
		(AC-FT)	26.	26.	26.	26.

CUMULATIVE AREA = .27 SQ MI

1 STATION 100



*** ***

22 KK

****
* 115 * DETENTION BASIN
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PROPOSED DETENTION BASIN - LAND SIZE = 5 ACRES

HYDROGRAPH ROUTING DATA

24 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	.00	INITIAL CONDITION
X	.00	WORKING R AND D COEFFICIENT

25 SA AREA 4.4 5.0

26 SE ELEVATION .00 4.00

27 SS SPILLWAY

CREL	.00	SPILLWAY CREST ELEVATION
SPWID	10.00	SPILLWAY WIDTH
COQW	2.64	WEIR COEFFICIENT
EXPW	1.50	EXPONENT OF HEAD

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	18.79
ELEVATION	.00	4.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	.00	.04	.29	.98	2.32	4.53	7.82	12.42	18.54
ELEVATION	.00	.00	.01	.05	.11	.20	.31	.44	.60	.79
OUTFLOW	26.40	36.21	48.20	62.58	79.56	99.37	122.22	148.33	177.92	211.20
ELEVATION	1.00	1.23	1.49	1.78	2.09	2.42	2.78	3.16	3.57	4.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.05	.22	.49	.87	1.36	1.97	2.69	3.52	4.47
OUTFLOW	.00	.04	.29	.98	2.32	4.53	7.82	12.42	18.54	26.40
ELEVATION	.00	.01	.05	.11	.20	.31	.44	.60	.79	1.00
STORAGE	5.54	6.74	8.05	9.50	11.08	12.79	14.64	16.64	18.79	
OUTFLOW	36.21	48.20	62.58	79.56	99.37	122.22	148.33	177.92	211.20	
ELEVATION	1.23	1.49	1.78	2.09	2.42	2.78	3.16	3.57	4.00	

HYDROGRAPH AT STATION 115

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
20	JAN	0000	1	0.	.0	.0	20	JAN	0047	48	146.	14.5	3.1	20	JAN	0134	95	114.	12.2	2.6
20	JAN	0001	2	0.	.0	.0	20	JAN	0048	49	148.	14.6	3.2	20	JAN	0135	96	112.	12.0	2.6
20	JAN	0002	3	0.	.0	.0	20	JAN	0049	50	150.	14.8	3.2	20	JAN	0136	97	111.	11.9	2.6
20	JAN	0003	4	0.	.0	.0	20	JAN	0050	51	152.	14.9	3.2	20	JAN	0137	98	109.	11.8	2.6
20	JAN	0004	5	0.	.1	.0	20	JAN	0051	52	153.	15.0	3.2	20	JAN	0138	99	108.	11.7	2.6
20	JAN	0005	6	0.	.1	.0	20	JAN	0052	53	155.	15.1	3.2	20	JAN	0139	100	106.	11.6	2.5
20	JAN	0006	7	0.	.2	.0	20	JAN	0053	54	156.	15.1	3.3	20	JAN	0140	101	105.	11.5	2.5
20	JAN	0007	8	0.	.3	.1	20	JAN	0054	55	157.	15.2	3.3	20	JAN	0141	102	104.	11.4	2.5
20	JAN	0008	9	1.	.4	.1	20	JAN	0055	56	157.	15.2	3.3	20	JAN	0142	103	102.	11.3	2.5
20	JAN	0009	10	1.	.5	.1	20	JAN	0056	57	158.	15.3	3.3	20	JAN	0143	104	101.	11.2	2.4
20	JAN	0010	11	2.	.7	.1	20	JAN	0057	58	158.	15.3	3.3	20	JAN	0144	105	99.	11.1	2.4
20	JAN	0011	12	2.	.8	.2	20	JAN	0058	59	158.	15.3	3.3	20	JAN	0145	106	98.	11.0	2.4
20	JAN	0012	13	3.	1.0	.2	20	JAN	0059	60	158.	15.3	3.3	20	JAN	0146	107	97.	10.9	2.4
20	JAN	0013	14	4.	1.2	.3	20	JAN	0100	61	158.	15.3	3.3	20	JAN	0147	108	95.	10.8	2.4
20	JAN	0014	15	5.	1.4	.3	20	JAN	0101	62	158.	15.3	3.3	20	JAN	0148	109	94.	10.7	2.3
20	JAN	0015	16	6.	1.7	.4	20	JAN	0102	63	157.	15.2	3.3	20	JAN	0149	110	93.	10.6	2.3
20	JAN	0016	17	8.	1.9	.4	20	JAN	0103	64	157.	15.2	3.3	20	JAN	0150	111	92.	10.5	2.3
20	JAN	0017	18	10.	2.2	.5	20	JAN	0104	65	156.	15.1	3.3	20	JAN	0151	112	90.	10.4	2.3
20	JAN	0018	19	12.	2.6	.6	20	JAN	0105	66	155.	15.1	3.3	20	JAN	0152	113	89.	10.3	2.2
20	JAN	0019	20	14.	2.9	.7	20	JAN	0106	67	154.	15.0	3.2	20	JAN	0153	114	88.	10.2	2.2
20	JAN	0020	21	17.	3.3	.7	20	JAN	0107	68	153.	15.0	3.2	20	JAN	0154	115	87.	10.1	2.2
20	JAN	0021	22	20.	3.7	.8	20	JAN	0108	69	152.	14.9	3.2	20	JAN	0155	116	85.	10.0	2.2
20	JAN	0022	23	24.	4.1	.9	20	JAN	0109	70	151.	14.8	3.2	20	JAN	0156	117	84.	9.9	2.2
20	JAN	0023	24	28.	4.6	1.0	20	JAN	0110	71	150.	14.7	3.2	20	JAN	0157	118	83.	9.8	2.1
20	JAN	0024	25	32.	5.1	1.1	20	JAN	0111	72	148.	14.6	3.2	20	JAN	0158	119	82.	9.7	2.1
20	JAN	0025	26	37.	5.7	1.3	20	JAN	0112	73	147.	14.6	3.1	20	JAN	0159	120	80.	9.6	2.1
20	JAN	0026	27	43.	6.2	1.4	20	JAN	0113	74	146.	14.5	3.1	20	JAN	0200	121	79.	9.5	2.1
20	JAN	0027	28	49.	6.8	1.5	20	JAN	0114	75	144.	14.4	3.1	20	JAN	0201	122	78.	9.4	2.1
20	JAN	0028	29	55.	7.4	1.6	20	JAN	0115	76	143.	14.3	3.1	20	JAN	0202	123	77.	9.3	2.0
20	JAN	0029	30	62.	8.0	1.8	20	JAN	0116	77	142.	14.2	3.1	20	JAN	0203	124	76.	9.2	2.0
20	JAN	0030	31	69.	8.6	1.9	20	JAN	0117	78	140.	14.1	3.0	20	JAN	0204	125	75.	9.1	2.0
20	JAN	0031	32	75.	9.1	2.0	20	JAN	0118	79	139.	14.0	3.0	20	JAN	0205	126	74.	9.0	2.0
20	JAN	0032	33	81.	9.6	2.1	20	JAN	0119	80	137.	13.8	3.0	20	JAN	0206	127	72.	8.9	2.0
20	JAN	0033	34	88.	10.1	2.2	20	JAN	0120	81	135.	13.7	3.0	20	JAN	0207	128	71.	8.8	1.9
20	JAN	0034	35	94.	10.6	2.3	20	JAN	0121	82	134.	13.6	2.9	20	JAN	0208	129	70.	8.7	1.9
20	JAN	0035	36	99.	11.1	2.4	20	JAN	0122	83	132.	13.5	2.9	20	JAN	0209	130	69.	8.6	1.9
20	JAN	0036	37	105.	11.5	2.5	20	JAN	0123	84	131.	13.4	2.9	20	JAN	0210	131	68.	8.5	1.9
20	JAN	0037	38	110.	11.9	2.6	20	JAN	0124	85	129.	13.3	2.9	20	JAN	0211	132	67.	8.4	1.9
20	JAN	0038	39	115.	12.2	2.7	20	JAN	0125	86	128.	13.2	2.9	20	JAN	0212	133	66.	8.4	1.8
20	JAN	0039	40	119.	12.6	2.7	20	JAN	0126	87	126.	13.1	2.8	20	JAN	0213	134	65.	8.3	1.8
20	JAN	0040	41	123.	12.9	2.8	20	JAN	0127	88	124.	12.9	2.8	20	JAN	0214	135	64.	8.2	1.8
20	JAN	0041	42	128.	13.2	2.9	20	JAN	0128	89	123.	12.8	2.8	20	JAN	0215	136	63.	8.1	1.8
20	JAN	0042	43	131.	13.4	2.9	20	JAN	0129	90	121.	12.7	2.8	20	JAN	0216	137	62.	8.0	1.8
20	JAN	0043	44	135.	13.7	3.0	20	JAN	0130	91	120.	12.6	2.7	20	JAN	0217	138	61.	7.9	1.8
20	JAN	0044	45	138.	13.9	3.0	20	JAN	0131	92	118.	12.5	2.7	20	JAN	0218	139	60.	7.9	1.7
20	JAN	0045	46	141.	14.1	3.1	20	JAN	0132	93	117.	12.4	2.7	20	JAN	0219	140	60.	7.8	1.7
20	JAN	0046	47	144.	14.3	3.1	20	JAN	0133	94	115.	12.3	2.7							

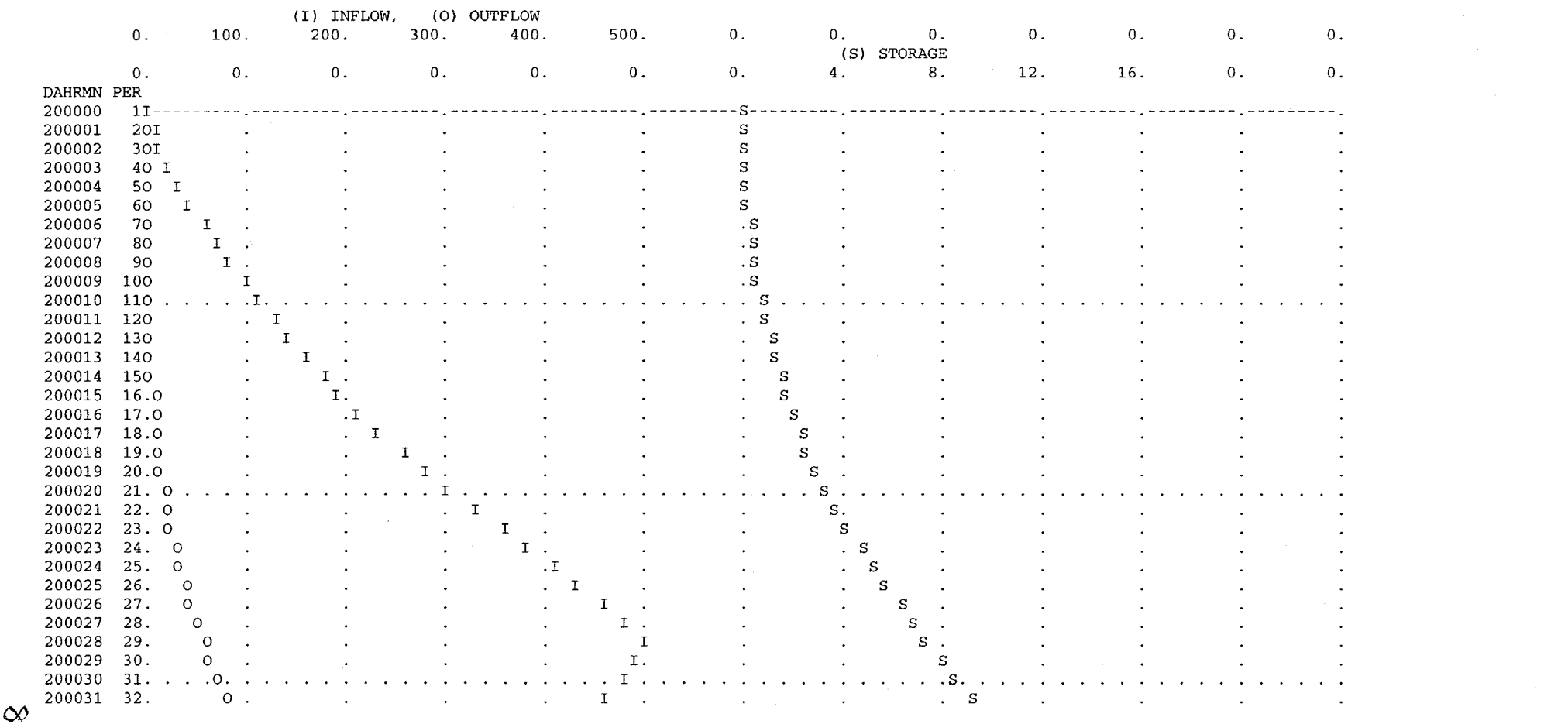
PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	2.32-HR
+ (CFS)	(HR)					
		(CFS)				
+ 158.	.97		93.	93.	93.	93.
		(INCHES)	1.237	1.237	1.237	1.237
		(AC-FT)	18.	18.	18.	18.

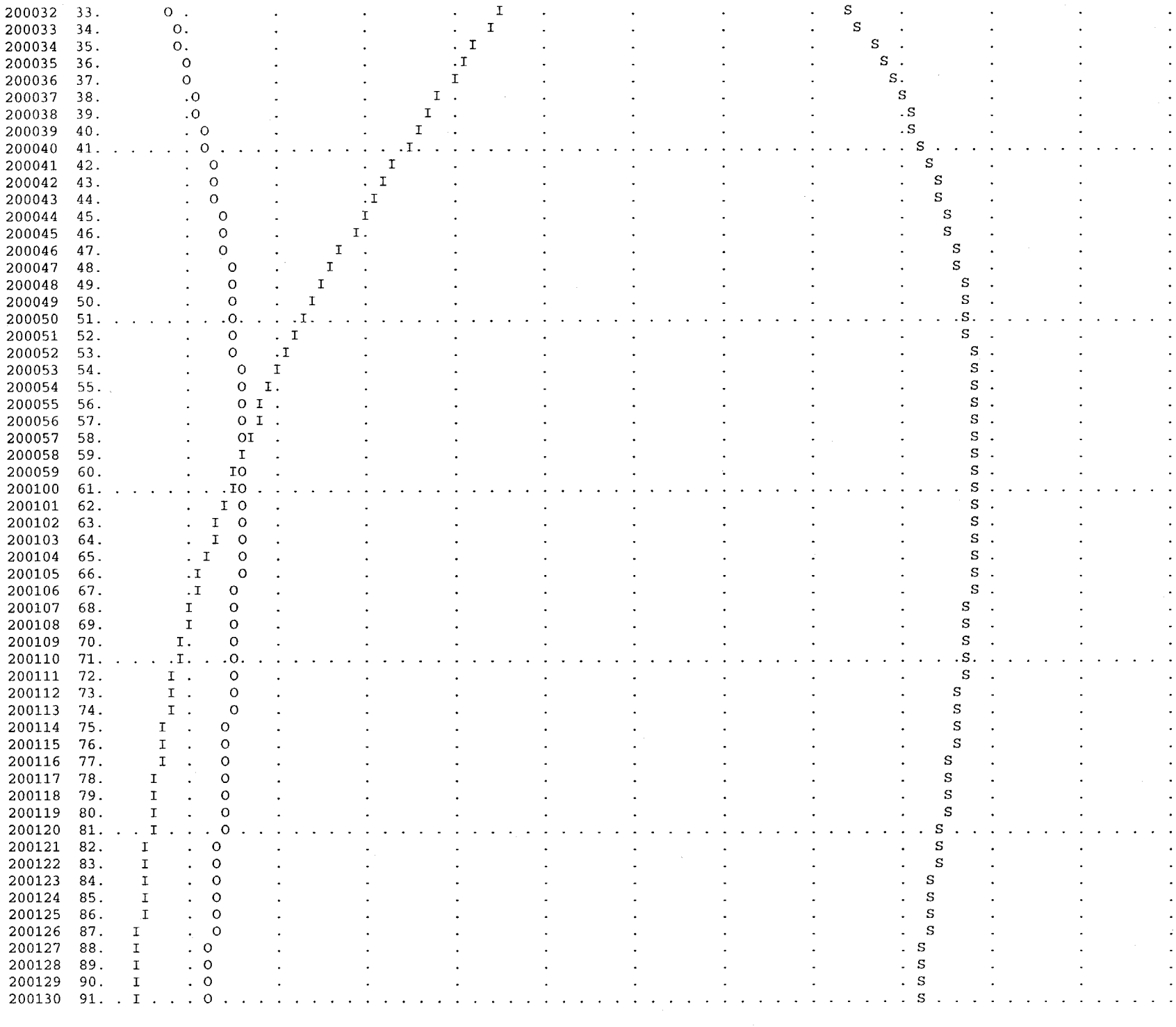
PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	2.32-HR
+ (AC-FT)	(HR)				
15.	.97	10.	10.	10.	10.

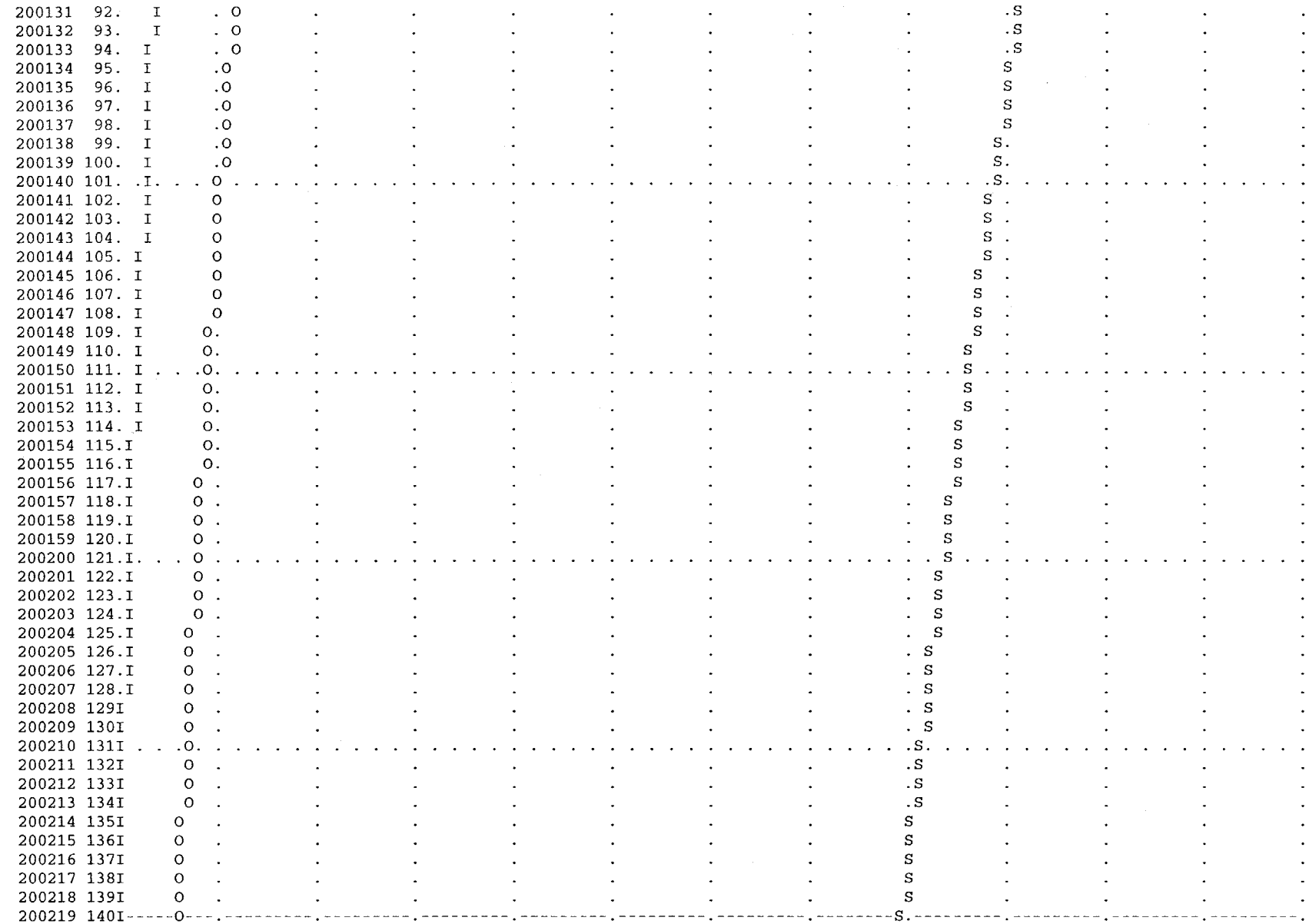
PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	2.32-HR
+ (FEET)	(HR)				
3.30	.97	2.19	2.19	2.19	2.19

CUMULATIVE AREA = .27 SQ MI

1 STATION 115



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200133 94. I . O . . . . . .S . . .
200134 95. I .O . . . . . S . . .
200135 96. I .O . . . . . S . . .
200136 97. I .O . . . . . S . . .
200137 98. I .O . . . . . S . . .
200138 99. I .O . . . . . S. . . .
200139 100. I .O . . . . . S. . . .
200140 101. .I. . . O . . . . . .S. . . . . .
200141 102. I O . . . . . S . . . .
200142 103. I O . . . . . S . . . .
200143 104. I O . . . . . S . . . .
200144 105. I O . . . . . S . . . .
200145 106. I O . . . . . S . . . .
200146 107. I O . . . . . S . . . .
200147 108. I O . . . . . S . . . .
200148 109. I O. . . . . S . . . .
200149 110. I O. . . . . S . . . .
200150 111. I . . .O. . . . . S . . . . . .
200151 112. I O. . . . . S . . . .
200152 113. I O. . . . . S . . . .
200153 114. I O. . . . . S . . . .
200154 115.I O. . . . . S . . . .
200155 116.I O. . . . . S . . . .
200156 117.I O . . . . . S . . . .
200157 118.I O . . . . . S . . . .
200158 119.I O . . . . . S . . . .
200159 120.I O . . . . . S . . . .
200200 121.I. . . O . . . . . S . . . . . .
200201 122.I O . . . . . S . . . .
200202 123.I O . . . . . S . . . .
200203 124.I O . . . . . S . . . .
200204 125.I O . . . . . S . . . .
200205 126.I O . . . . . S . . . .
200206 127.I O . . . . . S . . . .
200207 128.I O . . . . . S . . . .
200208 129I O . . . . . S . . . .
200209 130I O . . . . . S . . . .
200210 131I . . .O. . . . . .S. . . . . .
200211 132I O . . . . . .S . . . .
200212 133I O . . . . . .S . . . .
200213 134I O . . . . . .S . . . .
200214 135I O . . . . . S . . . .
200215 136I O . . . . . S . . . .
200216 137I O . . . . . S . . . .
200217 138I O . . . . . S . . . .
200218 139I O . . . . . S . . . .
200219 140I-----O---.---------.---------.---------.---------.---------.--------S.---------.---------.---------.---------.
1

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          **************
          *            *
28 KK     *       117  *      ROUTING DETENTION BASIN DISCHARGE THROUGH CHANNEL
          *            *
          **************
                              LENGTH OF CHANNEL = 1760'

             HYDROGRAPH ROUTING DATA

30 RS          STORAGE ROUTING
                    NSTPS           1  NUMBER OF SUBREACHES
                     ITYP        FLOW  TYPE OF INITIAL CONDITION
                    RSVRIC      -1.00  INITIAL CONDITION
                        X         .00 WORKING R AND D COEFFICIENT

31 RC          NORMAL DEPTH CHANNEL
                     ANL         .050  LEFT OVERBANK N-VALUE
                    ANCH         .050  MAIN CHANNEL N-VALUE
                     ANR         .050  RIGHT OVERBANK N-VALUE
                   RLNTH        1760.  REACH LENGTH
                     SEL        .0050  ENERGY SLOPE
                   ELMAX           .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                      CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
33 RY        ELEVATION   2622.00   2620.00   2619.50   2618.00   2618.00   2620.00   2622.00   2624.00
32 RX        DISTANCE        .00    125.00    250.00    395.00    435.00    595.00    670.00    720.00

                                                  ***

                                      COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE        .00       .87      2.44      4.73      7.73     11.46     16.35     22.35     28.82     35.68
          OUTFLOW        .00     16.64     69.05    168.61    326.09    559.49    901.78   1391.17   2015.65   2753.81
        ELEVATION    2618.00   2618.32   2618.63   2618.95   2619.26   2619.58   2619.89   2620.21   2620.53   2620.84

          STORAGE      42.95     50.62     58.70     67.16     75.79     84.52     93.35    102.28    111.31    120.44
          OUTFLOW    3605.62   4572.12   5654.94   6878.33   8266.06   9769.64  11386.33  13113.89  14950.48  16894.56
        ELEVATION    2621.16   2621.47   2621.79   2622.10   2622.42   2622.74   2623.05   2623.37   2623.68   2624.00

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                                      HYDROGRAPH AT STATION      117

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                                    *                                    *                                    *
 DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE * DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE * DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE
                                    *                                    *                                    *
 20 JAN 0000   1       0.       .0  2618.0 * 20 JAN 0047  48      67.      2.4  2618.6 * 20 JAN 0134  95     129.      3.8  2618.8
 20 JAN 0001   2       0.       .0  2618.0 * 20 JAN 0048  49      71.      2.5  2618.6 * 20 JAN 0135  96     128.      3.8  2618.8
 20 JAN 0002   3       0.       .0  2618.0 * 20 JAN 0049  50      76.      2.6  2618.7 * 20 JAN 0136  97     127.      3.8  2618.8
 20 JAN 0003   4       0.       .0  2618.0 * 20 JAN 0050  51      80.      2.7  2618.7 * 20 JAN 0137  98     126.      3.8  2618.8
 20 JAN 0004   5       0.       .0  2618.0 * 20 JAN 0051  52      84.      2.8  2618.7 * 20 JAN 0138  99     125.      3.7  2618.8
 20 JAN 0005   6       0.       .0  2618.0 * 20 JAN 0052  53      88.      2.9  2618.7 * 20 JAN 0139 100     124.      3.7  2618.8
 20 JAN 0006   7       0.       .0  2618.0 * 20 JAN 0053  54      92.      3.0  2618.7 * 20 JAN 0140 101     123.      3.7  2618.8
 20 JAN 0007   8       0.       .0  2618.0 * 20 JAN 0054  55      96.      3.1  2618.7 * 20 JAN 0141 102     122.      3.7  2618.8
 20 JAN 0008   9       0.       .0  2618.0 * 20 JAN 0055  56      99.      3.1  2618.7 * 20 JAN 0142 103     121.      3.6  2618.8
```

f8

20 JAN 0009	10	0.	.0	2618.0 *	20 JAN 0056	57	103.	3.2	2618.7 *	20 JAN 0143	104	120.	3.6	2618.8
20 JAN 0010	11	0.	.0	2618.0 *	20 JAN 0057	58	106.	3.3	2618.7 *	20 JAN 0144	105	118.	3.6	2618.8
20 JAN 0011	12	0.	.0	2618.0 *	20 JAN 0058	59	109.	3.4	2618.8 *	20 JAN 0145	106	117.	3.6	2618.8
20 JAN 0012	13	0.	.0	2618.0 *	20 JAN 0059	60	112.	3.4	2618.8 *	20 JAN 0146	107	116.	3.5	2618.8
20 JAN 0013	14	0.	.0	2618.0 *	20 JAN 0100	61	115.	3.5	2618.8 *	20 JAN 0147	108	115.	3.5	2618.8
20 JAN 0014	15	0.	.0	2618.0 *	20 JAN 0101	62	117.	3.5	2618.8 *	20 JAN 0148	109	114.	3.5	2618.8
20 JAN 0015	16	1.	.0	2618.0 *	20 JAN 0102	63	119.	3.6	2618.8 *	20 JAN 0149	110	113.	3.4	2618.8
20 JAN 0016	17	1.	.0	2618.0 *	20 JAN 0103	64	122.	3.7	2618.8 *	20 JAN 0150	111	111.	3.4	2618.8
20 JAN 0017	18	1.	.0	2618.0 *	20 JAN 0104	65	124.	3.7	2618.8 *	20 JAN 0151	112	110.	3.4	2618.8
20 JAN 0018	19	1.	.1	2618.0 *	20 JAN 0105	66	125.	3.7	2618.8 *	20 JAN 0152	113	109.	3.4	2618.8
20 JAN 0019	20	1.	.1	2618.0 *	20 JAN 0106	67	127.	3.8	2618.8 *	20 JAN 0153	114	108.	3.3	2618.8
20 JAN 0020	21	2.	.1	2618.0 *	20 JAN 0107	68	129.	3.8	2618.8 *	20 JAN 0154	115	107.	3.3	2618.8
20 JAN 0021	22	2.	.1	2618.0 *	20 JAN 0108	69	130.	3.8	2618.8 *	20 JAN 0155	116	105.	3.3	2618.7
20 JAN 0022	23	3.	.1	2618.1 *	20 JAN 0109	70	131.	3.9	2618.8 *	20 JAN 0156	117	104.	3.3	2618.7
20 JAN 0023	24	3.	.2	2618.1 *	20 JAN 0110	71	132.	3.9	2618.8 *	20 JAN 0157	118	103.	3.2	2618.7
20 JAN 0024	25	4.	.2	2618.1 *	20 JAN 0111	72	133.	3.9	2618.8 *	20 JAN 0158	119	102.	3.2	2618.7
20 JAN 0025	26	5.	.3	2618.1 *	20 JAN 0112	73	134.	3.9	2618.8 *	20 JAN 0159	120	101.	3.2	2618.7
20 JAN 0026	27	6.	.3	2618.1 *	20 JAN 0113	74	135.	4.0	2618.8 *	20 JAN 0200	121	99.	3.1	2618.7
20 JAN 0027	28	7.	.4	2618.1 *	20 JAN 0114	75	136.	4.0	2618.8 *	20 JAN 0201	122	98.	3.1	2618.7
20 JAN 0028	29	8.	.4	2618.2 *	20 JAN 0115	76	136.	4.0	2618.8 *	20 JAN 0202	123	97.	3.1	2618.7
20 JAN 0029	30	9.	.5	2618.2 *	20 JAN 0116	77	136.	4.0	2618.8 *	20 JAN 0203	124	96.	3.1	2618.7
20 JAN 0030	31	11.	.6	2618.2 *	20 JAN 0117	78	137.	4.0	2618.8 *	20 JAN 0204	125	95.	3.0	2618.7
20 JAN 0031	32	12.	.6	2618.2 *	20 JAN 0118	79	137.	4.0	2618.8 *	20 JAN 0205	126	93.	3.0	2618.7
20 JAN 0032	33	14.	.7	2618.3 *	20 JAN 0119	80	137.	4.0	2618.8 *	20 JAN 0206	127	92.	3.0	2618.7
20 JAN 0033	34	16.	.8	2618.3 *	20 JAN 0120	81	137.	4.0	2618.8 *	20 JAN 0207	128	91.	2.9	2618.7
20 JAN 0034	35	19.	.9	2618.3 *	20 JAN 0121	82	137.	4.0	2618.8 *	20 JAN 0208	129	90.	2.9	2618.7
20 JAN 0035	36	22.	1.0	2618.3 *	20 JAN 0122	83	137.	4.0	2618.8 *	20 JAN 0209	130	89.	2.9	2618.7
20 JAN 0036	37	26.	1.1	2618.4 *	20 JAN 0123	84	136.	4.0	2618.8 *	20 JAN 0210	131	88.	2.9	2618.7
20 JAN 0037	38	29.	1.3	2618.4 *	20 JAN 0124	85	136.	4.0	2618.8 *	20 JAN 0211	132	86.	2.8	2618.7
20 JAN 0038	39	33.	1.4	2618.4 *	20 JAN 0125	86	135.	4.0	2618.8 *	20 JAN 0212	133	85.	2.8	2618.7
20 JAN 0039	40	37.	1.5	2618.4 *	20 JAN 0126	87	135.	4.0	2618.8 *	20 JAN 0213	134	84.	2.8	2618.7
20 JAN 0040	41	41.	1.6	2618.5 *	20 JAN 0127	88	134.	3.9	2618.8 *	20 JAN 0214	135	83.	2.8	2618.7
20 JAN 0041	42	45.	1.7	2618.5 *	20 JAN 0128	89	134.	3.9	2618.8 *	20 JAN 0215	136	82.	2.7	2618.7
20 JAN 0042	43	48.	1.8	2618.5 *	20 JAN 0129	90	133.	3.9	2618.8 *	20 JAN 0216	137	81.	2.7	2618.7
20 JAN 0043	44	52.	1.9	2618.5 *	20 JAN 0130	91	132.	3.9	2618.8 *	20 JAN 0217	138	80.	2.7	2618.7
20 JAN 0044	45	56.	2.0	2618.6 *	20 JAN 0131	92	132.	3.9	2618.8 *	20 JAN 0218	139	79.	2.7	2618.7
20 JAN 0045	46	60.	2.2	2618.6 *	20 JAN 0132	93	131.	3.9	2618.8 *	20 JAN 0219	140	77.	2.6	2618.7
20 JAN 0046	47	63.	2.3	2618.6 *	20 JAN 0133	94	130.	3.8	2618.8 *					

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	2.32-HR
+ (CFS)	(HR)					
		(CFS)				
+ 137.	1.32		79.	79.	79.	79.
		(INCHES)	1.054	1.054	1.054	1.054
		(AC-FT)	15.	15.	15.	15.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	2.32-HR
+ (AC-FT)	(HR)				
4.	1.32	2.	2.	2.	2.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	2.32-HR
+ (FEET)	(HR)				
2618.85	1.32	2618.57	2618.57	2618.57	2618.57

CUMULATIVE AREA = .27 SQ MI

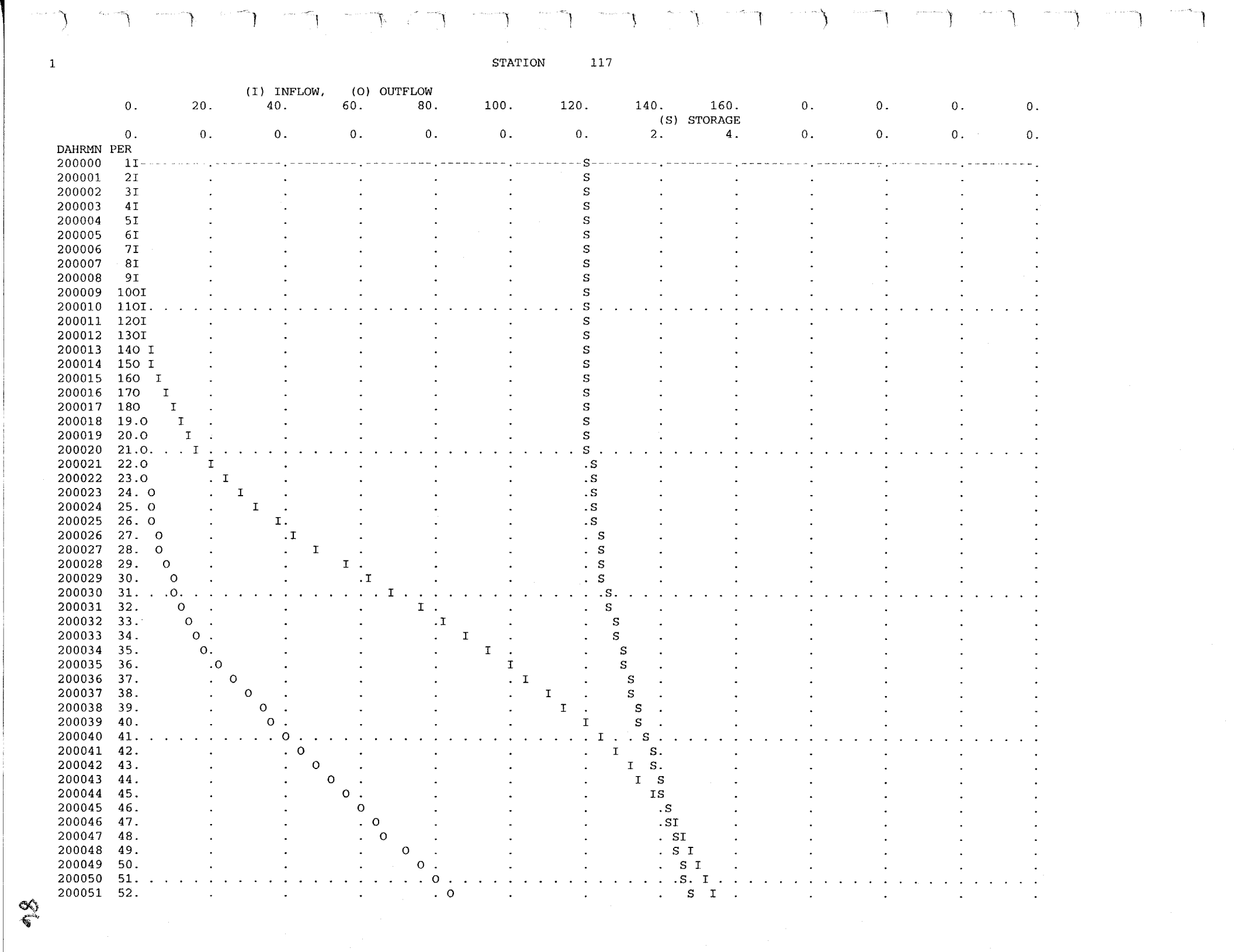
1 STATION 117

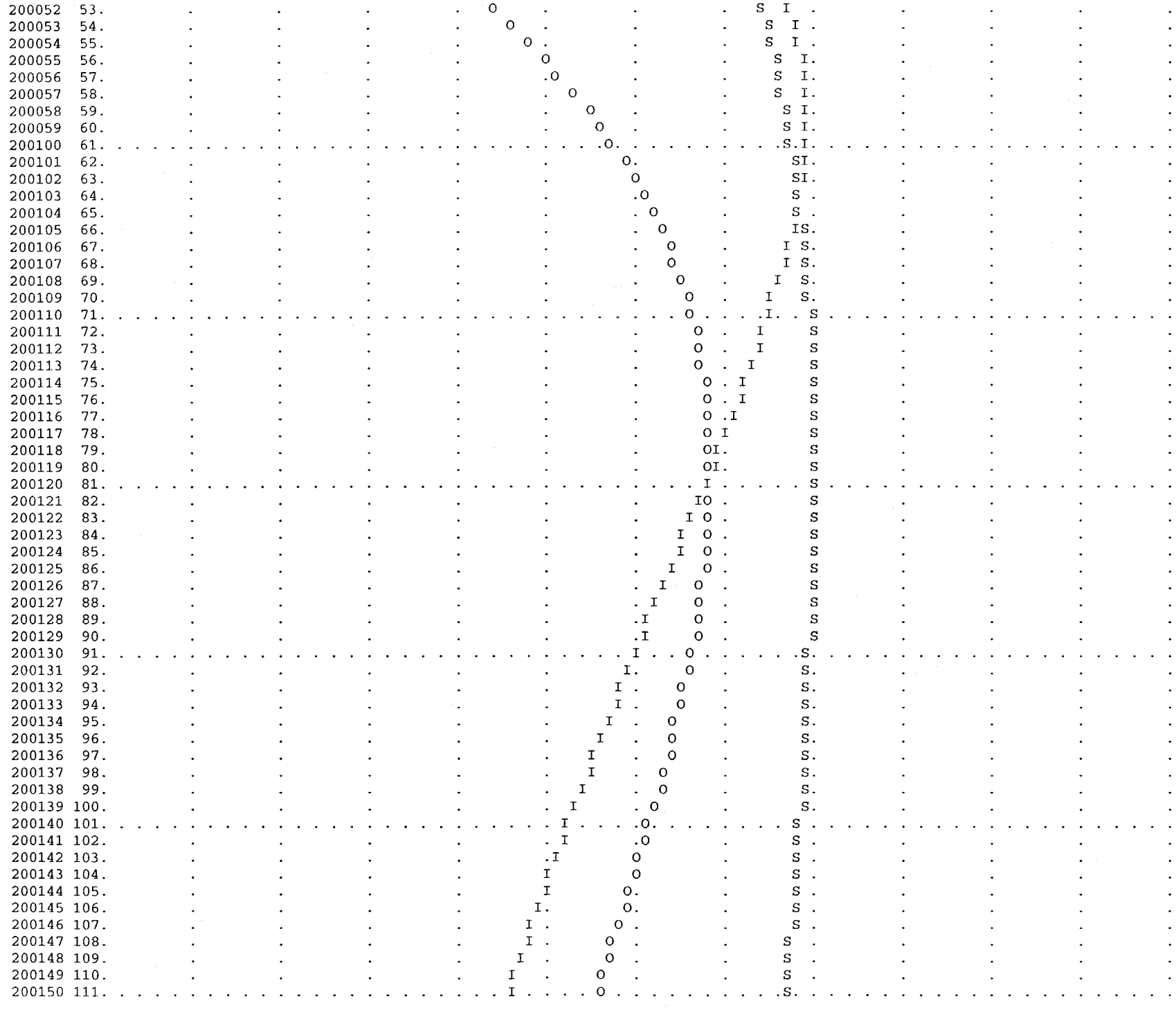
(I) INFLOW, (O) OUTFLOW

0. 20. 40. 60. 80. 100. 120. 140. 160. 0. 0. 0. 0.

(S) STORAGE

0. 0. 0. 0. 0. 0. 0. 2. 4. 0. 0. 0. 0.

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200108 69.
200109 70.
200110 71.
200111 72.
200112 73.
200113 74.
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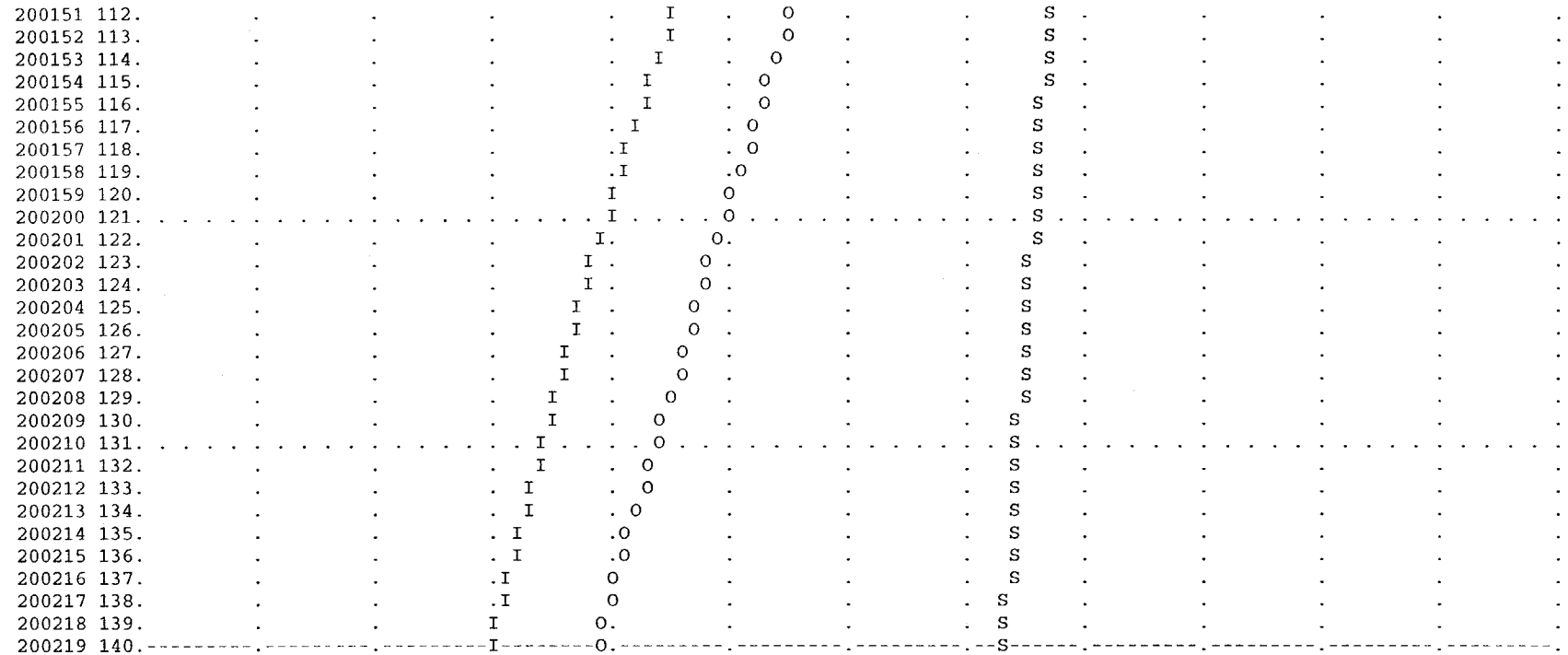
28



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          **************
          *            *
34 KK     *       120  *
          *            *
          **************
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INFLOW HYDROGRAPH FOR SUBBASIN B

SUBBASIN RUNOFF DATA

36 BA SUBBASIN CHARACTERISTICS

TAREA .07 SUBBASIN AREA

HYDROGRAPH AT STATION 120

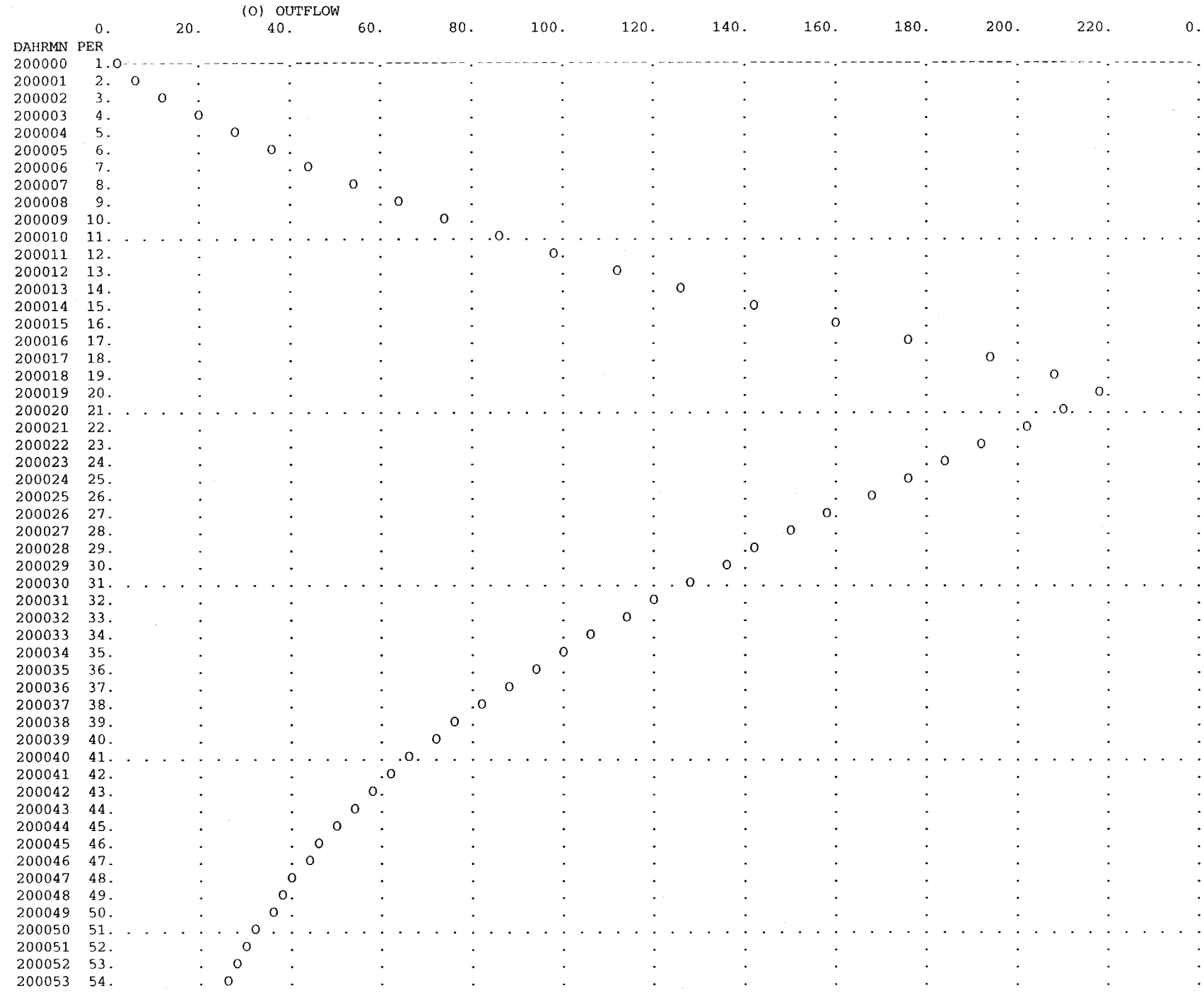
DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
20 JAN 0000	1	1.	20 JAN 0035	36	93.	20 JAN 0110	71	11.	20 JAN 0145	106	1.
20 JAN 0001	2	5.	20 JAN 0036	37	87.	20 JAN 0111	72	10.	20 JAN 0146	107	1.
20 JAN 0002	3	11.	20 JAN 0037	38	82.	20 JAN 0112	73	9.	20 JAN 0147	108	1.
20 JAN 0003	4	19.	20 JAN 0038	39	76.	20 JAN 0113	74	9.	20 JAN 0148	109	1.
20 JAN 0004	5	27.	20 JAN 0039	40	71.	20 JAN 0114	75	8.	20 JAN 0149	110	1.
20 JAN 0005	6	35.	20 JAN 0040	41	66.	20 JAN 0115	76	8.	20 JAN 0150	111	1.
20 JAN 0006	7	44.	20 JAN 0041	42	61.	20 JAN 0116	77	7.	20 JAN 0151	112	1.
20 JAN 0007	8	53.	20 JAN 0042	43	57.	20 JAN 0117	78	6.	20 JAN 0152	113	1.
20 JAN 0008	9	63.	20 JAN 0043	44	53.	20 JAN 0118	79	6.	20 JAN 0153	114	1.
20 JAN 0009	10	74.	20 JAN 0044	45	50.	20 JAN 0119	80	5.	20 JAN 0154	115	1.
20 JAN 0010	11	85.	20 JAN 0045	46	46.	20 JAN 0120	81	5.	20 JAN 0155	116	1.
20 JAN 0011	12	98.	20 JAN 0046	47	43.	20 JAN 0121	82	4.	20 JAN 0156	117	1.
20 JAN 0012	13	111.	20 JAN 0047	48	40.	20 JAN 0122	83	3.	20 JAN 0157	118	1.
20 JAN 0013	14	126.	20 JAN 0048	49	37.	20 JAN 0123	84	3.	20 JAN 0158	119	1.
20 JAN 0014	15	142.	20 JAN 0049	50	35.	20 JAN 0124	85	3.	20 JAN 0159	120	1.
20 JAN 0015	16	159.	20 JAN 0050	51	32.	20 JAN 0125	86	2.	20 JAN 0200	121	1.
20 JAN 0016	17	176.	20 JAN 0051	52	30.	20 JAN 0126	87	2.	20 JAN 0201	122	1.
20 JAN 0017	18	193.	20 JAN 0052	53	28.	20 JAN 0127	88	2.	20 JAN 0202	123	1.
20 JAN 0018	19	207.	20 JAN 0053	54	26.	20 JAN 0128	89	1.	20 JAN 0203	124	1.
20 JAN 0019	20	218.	20 JAN 0054	55	25.	20 JAN 0129	90	1.	20 JAN 0204	125	1.
20 JAN 0020	21	209.	20 JAN 0055	56	23.	20 JAN 0130	91	1.	20 JAN 0205	126	1.
20 JAN 0021	22	201.	20 JAN 0056	57	22.	20 JAN 0131	92	1.	20 JAN 0206	127	1.
20 JAN 0022	23	192.	20 JAN 0057	58	20.	20 JAN 0132	93	1.	20 JAN 0207	128	1.
20 JAN 0023	24	184.	20 JAN 0058	59	19.	20 JAN 0133	94	1.	20 JAN 0208	129	1.
20 JAN 0024	25	175.	20 JAN 0059	60	18.	20 JAN 0134	95	1.	20 JAN 0209	130	1.
20 JAN 0025	26	167.	20 JAN 0100	61	17.	20 JAN 0135	96	1.	20 JAN 0210	131	1.
20 JAN 0026	27	158.	20 JAN 0101	62	16.	20 JAN 0136	97	1.	20 JAN 0211	132	1.
20 JAN 0027	28	150.	20 JAN 0102	63	15.	20 JAN 0137	98	1.	20 JAN 0212	133	1.
20 JAN 0028	29	142.	20 JAN 0103	64	14.	20 JAN 0138	99	1.	20 JAN 0213	134	1.
20 JAN 0029	30	135.	20 JAN 0104	65	14.	20 JAN 0139	100	1.	20 JAN 0214	135	1.
20 JAN 0030	31	127.	20 JAN 0105	66	13.	20 JAN 0140	101	1.	20 JAN 0215	136	1.
20 JAN 0031	32	120.	20 JAN 0106	67	13.	20 JAN 0141	102	1.	20 JAN 0216	137	1.
20 JAN 0032	33	113.	20 JAN 0107	68	12.	20 JAN 0142	103	1.	20 JAN 0217	138	1.
20 JAN 0033	34	106.	20 JAN 0108	69	11.	20 JAN 0143	104	1.	20 JAN 0218	139	1.
20 JAN 0034	35	99.	20 JAN 0109	70	11.	20 JAN 0144	105	1.	20 JAN 0219	140	1.

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	2.32-HR
(CFS)	(HR)					
		(CFS)				
218.	.32		40.	40.	40.	40.
		(INCHES)	1.944	1.944	1.944	1.944
		(AC-FT)	8.	8.	8.	8.

CUMULATIVE AREA = .07 SQ MI

1

STATION 120



50

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              **************
              *            *
46 KK         *       130  *
              *            *
              **************
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INFLOW HYDROGRAPH FOR SUBBASIN C

SUBBASIN RUNOFF DATA

48 BA SUBBASIN CHARACTERISTICS
TAREA .00 SUBBASIN AREA

***

HYDROGRAPH AT STATION 130

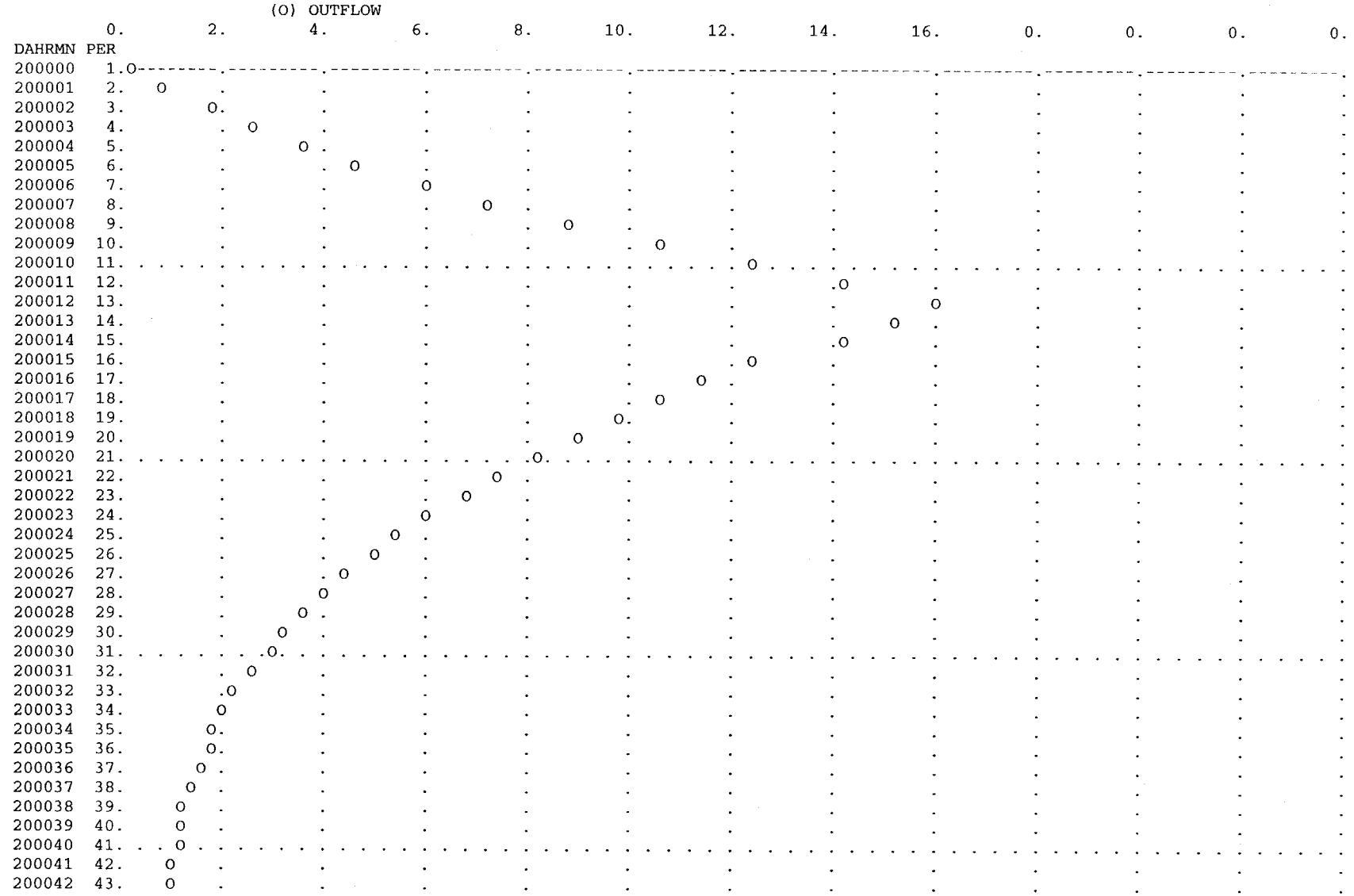
DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
20	JAN	0000	1	0.	20	JAN	0035	36	2.	20	JAN	0110	71	0.	20	JAN	0145	106	0.
20	JAN	0001	2	1.	20	JAN	0036	37	2.	20	JAN	0111	72	0.	20	JAN	0146	107	0.
20	JAN	0002	3	2.	20	JAN	0037	38	1.	20	JAN	0112	73	0.	20	JAN	0147	108	0.
20	JAN	0003	4	3.	20	JAN	0038	39	1.	20	JAN	0113	74	0.	20	JAN	0148	109	0.
20	JAN	0004	5	4.	20	JAN	0039	40	1.	20	JAN	0114	75	0.	20	JAN	0149	110	0.
20	JAN	0005	6	5.	20	JAN	0040	41	1.	20	JAN	0115	76	0.	20	JAN	0150	111	0.
20	JAN	0006	7	6.	20	JAN	0041	42	1.	20	JAN	0116	77	0.	20	JAN	0151	112	0.
20	JAN	0007	8	7.	20	JAN	0042	43	1.	20	JAN	0117	78	0.	20	JAN	0152	113	0.
20	JAN	0008	9	9.	20	JAN	0043	44	1.	20	JAN	0118	79	0.	20	JAN	0153	114	0.
20	JAN	0009	10	11.	20	JAN	0044	45	1.	20	JAN	0119	80	0.	20	JAN	0154	115	0.
20	JAN	0010	11	12.	20	JAN	0045	46	1.	20	JAN	0120	81	0.	20	JAN	0155	116	0.
20	JAN	0011	12	14.	20	JAN	0046	47	1.	20	JAN	0121	82	0.	20	JAN	0156	117	0.
20	JAN	0012	13	16.	20	JAN	0047	48	1.	20	JAN	0122	83	0.	20	JAN	0157	118	0.
20	JAN	0013	14	15.	20	JAN	0048	49	1.	20	JAN	0123	84	0.	20	JAN	0158	119	0.
20	JAN	0014	15	14.	20	JAN	0049	50	1.	20	JAN	0124	85	0.	20	JAN	0159	120	0.
20	JAN	0015	16	13.	20	JAN	0050	51	1.	20	JAN	0125	86	0.	20	JAN	0200	121	0.
20	JAN	0016	17	12.	20	JAN	0051	52	1.	20	JAN	0126	87	0.	20	JAN	0201	122	0.
20	JAN	0017	18	11.	20	JAN	0052	53	0.	20	JAN	0127	88	0.	20	JAN	0202	123	0.
20	JAN	0018	19	10.	20	JAN	0053	54	0.	20	JAN	0128	89	0.	20	JAN	0203	124	0.
20	JAN	0019	20	9.	20	JAN	0054	55	0.	20	JAN	0129	90	0.	20	JAN	0204	125	0.
20	JAN	0020	21	8.	20	JAN	0055	56	0.	20	JAN	0130	91	0.	20	JAN	0205	126	0.
20	JAN	0021	22	7.	20	JAN	0056	57	0.	20	JAN	0131	92	0.	20	JAN	0206	127	0.
20	JAN	0022	23	7.	20	JAN	0057	58	0.	20	JAN	0132	93	0.	20	JAN	0207	128	0.
20	JAN	0023	24	6.	20	JAN	0058	59	0.	20	JAN	0133	94	0.	20	JAN	0208	129	0.
20	JAN	0024	25	6.	20	JAN	0059	60	0.	20	JAN	0134	95	0.	20	JAN	0209	130	0.
20	JAN	0025	26	5.	20	JAN	0100	61	0.	20	JAN	0135	96	0.	20	JAN	0210	131	0.
20	JAN	0026	27	5.	20	JAN	0101	62	0.	20	JAN	0136	97	0.	20	JAN	0211	132	0.
20	JAN	0027	28	4.	20	JAN	0102	63	0.	20	JAN	0137	98	0.	20	JAN	0212	133	0.
20	JAN	0028	29	4.	20	JAN	0103	64	0.	20	JAN	0138	99	0.	20	JAN	0213	134	0.
20	JAN	0029	30	3.	20	JAN	0104	65	0.	20	JAN	0139	100	0.	20	JAN	0214	135	0.
20	JAN	0030	31	3.	20	JAN	0105	66	0.	20	JAN	0140	101	0.	20	JAN	0215	136	0.
20	JAN	0031	32	3.	20	JAN	0106	67	0.	20	JAN	0141	102	0.	20	JAN	0216	137	0.
20	JAN	0032	33	2.	20	JAN	0107	68	0.	20	JAN	0142	103	0.	20	JAN	0217	138	0.
20	JAN	0033	34	2.	20	JAN	0108	69	0.	20	JAN	0143	104	0.	20	JAN	0218	139	0.
20	JAN	0034	35	2.	20	JAN	0109	70	0.	20	JAN	0144	105	0.	20	JAN	0219	140	0.

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	2.32-HR
(CFS)	(HR)				
	(CFS)				
16.	.20	2.	2.	2.	2.
	(INCHES)	1.704	1.704	1.704	1.704
	(AC-FT)	0.	0.	0.	0.

CUMULATIVE AREA = .00 SQ MI

1 STATION 130

(O) OUTFLOW



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          **************
          *            *
55 KK     *       140  *
          *            *
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INFLOW HYDROGRAPH FOR SUBBASIN D

SUBBASIN RUNOFF DATA

57 BA SUBBASIN CHARACTERISTICS
TAREA .12 SUBBASIN AREA

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HYDROGRAPH AT STATION 140

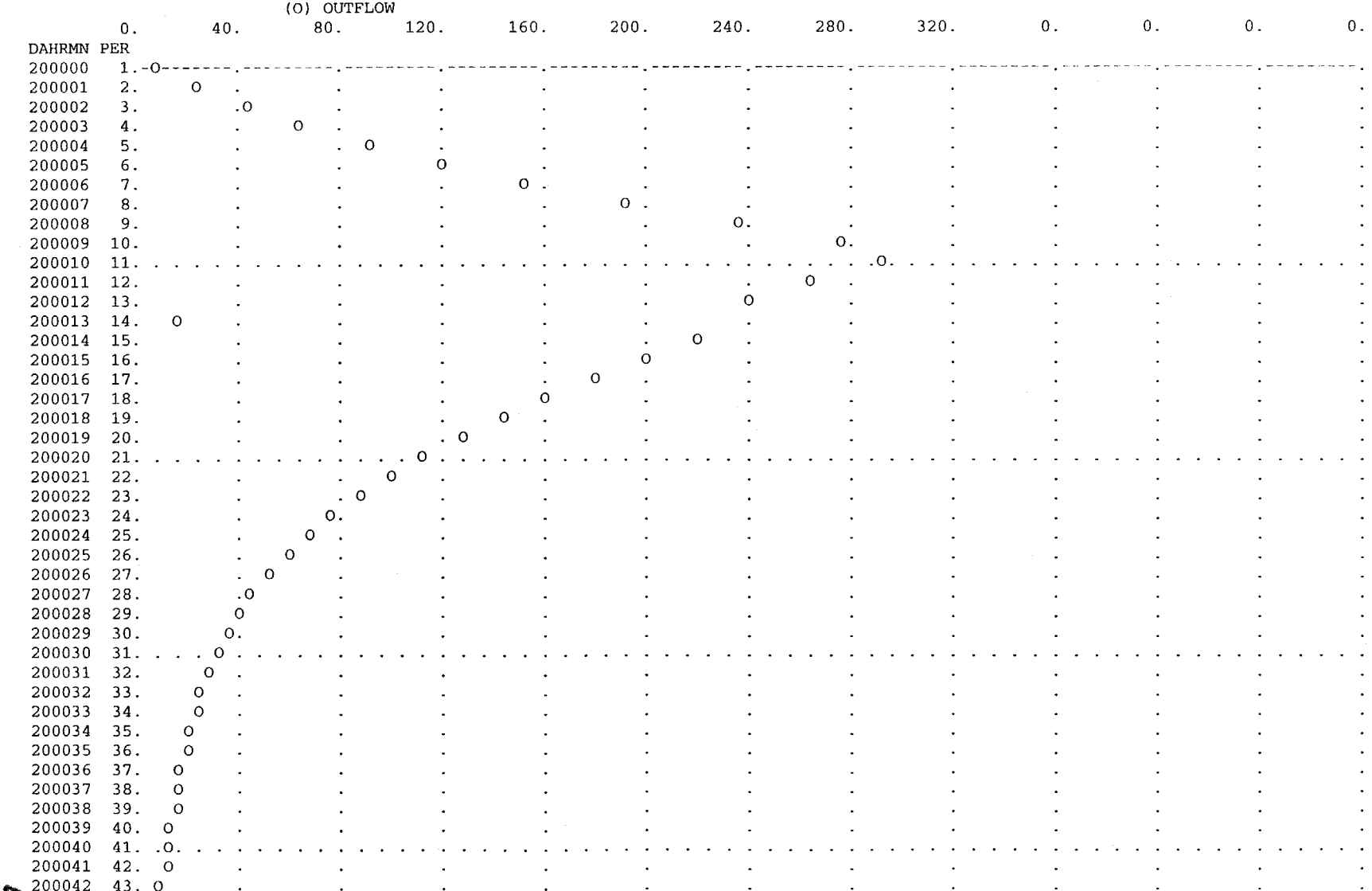
DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
20 JAN 0000	1	6.	20 JAN 0035	36	18.	20 JAN 0110	71	2.	20 JAN 0145	106	2.
20 JAN 0001	2	23.	20 JAN 0036	37	17.	20 JAN 0111	72	2.	20 JAN 0146	107	2.
20 JAN 0002	3	43.	20 JAN 0037	38	15.	20 JAN 0112	73	2.	20 JAN 0147	108	2.
20 JAN 0003	4	66.	20 JAN 0038	39	14.	20 JAN 0113	74	2.	20 JAN 0148	109	2.
20 JAN 0004	5	90.	20 JAN 0039	40	13.	20 JAN 0114	75	2.	20 JAN 0149	110	2.
20 JAN 0005	6	119.	20 JAN 0040	41	12.	20 JAN 0115	76	2.	20 JAN 0150	111	2.
20 JAN 0006	7	153.	20 JAN 0041	42	10.	20 JAN 0116	77	2.	20 JAN 0151	112	2.
20 JAN 0007	8	192.	20 JAN 0042	43	9.	20 JAN 0117	78	2.	20 JAN 0152	113	2.
20 JAN 0008	9	235.	20 JAN 0043	44	8.	20 JAN 0118	79	2.	20 JAN 0153	114	2.
20 JAN 0009	10	275.	20 JAN 0044	45	7.	20 JAN 0119	80	2.	20 JAN 0154	115	2.
20 JAN 0010	11	293.	20 JAN 0045	46	5.	20 JAN 0120	81	2.	20 JAN 0155	116	2.
20 JAN 0011	12	263.	20 JAN 0046	47	4.	20 JAN 0121	82	2.	20 JAN 0156	117	2.
20 JAN 0012	13	241.	20 JAN 0047	48	3.	20 JAN 0122	83	2.	20 JAN 0157	118	2.
20 JAN 0013	14	15.	20 JAN 0048	49	2.	20 JAN 0123	84	2.	20 JAN 0158	119	2.
20 JAN 0014	15	220.	20 JAN 0049	50	2.	20 JAN 0124	85	2.	20 JAN 0159	120	2.
20 JAN 0015	16	200.	20 JAN 0050	51	2.	20 JAN 0125	86	2.	20 JAN 0200	121	2.
20 JAN 0016	17	180.	20 JAN 0051	52	2.	20 JAN 0126	87	2.	20 JAN 0201	122	2.
20 JAN 0017	18	161.	20 JAN 0052	53	2.	20 JAN 0127	88	2.	20 JAN 0202	123	2.
20 JAN 0018	19	143.	20 JAN 0053	54	2.	20 JAN 0128	89	2.	20 JAN 0203	124	2.
20 JAN 0019	20	126.	20 JAN 0054	55	2.	20 JAN 0129	90	2.	20 JAN 0204	125	2.
20 JAN 0020	21	113.	20 JAN 0055	56	2.	20 JAN 0130	91	2.	20 JAN 0205	126	2.
20 JAN 0021	22	99.	20 JAN 0056	57	2.	20 JAN 0131	92	2.	20 JAN 0206	127	2.
20 JAN 0022	23	87.	20 JAN 0057	58	2.	20 JAN 0132	93	2.	20 JAN 0207	128	2.
20 JAN 0023	24	76.	20 JAN 0058	59	2.	20 JAN 0133	94	2.	20 JAN 0208	129	2.
20 JAN 0024	25	66.	20 JAN 0059	60	2.	20 JAN 0134	95	2.	20 JAN 0209	130	2.
20 JAN 0025	26	58.	20 JAN 0100	61	2.	20 JAN 0135	96	2.	20 JAN 0210	131	2.
20 JAN 0026	27	50.	20 JAN 0101	62	2.	20 JAN 0136	97	2.	20 JAN 0211	132	2.
20 JAN 0027	28	44.	20 JAN 0102	63	2.	20 JAN 0137	98	2.	20 JAN 0212	133	2.
20 JAN 0028	29	39.	20 JAN 0103	64	2.	20 JAN 0138	99	2.	20 JAN 0213	134	2.
20 JAN 0029	30	34.	20 JAN 0104	65	2.	20 JAN 0139	100	2.	20 JAN 0214	135	2.
20 JAN 0030	31	30.	20 JAN 0105	66	2.	20 JAN 0140	101	2.	20 JAN 0215	136	2.
20 JAN 0031	32	27.	20 JAN 0106	67	2.	20 JAN 0141	102	2.	20 JAN 0216	137	2.
20 JAN 0032	33	24.	20 JAN 0107	68	2.	20 JAN 0142	103	2.	20 JAN 0217	138	2.
20 JAN 0033	34	22.	20 JAN 0108	69	2.	20 JAN 0143	104	2.	20 JAN 0218	139	2.
20 JAN 0034	35	20.	20 JAN 0109	70	2.	20 JAN 0144	105	2.	20 JAN 0219	140	2.

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	2.32-HR
(CFS)	(HR)				
		(CFS)			
293.	.17	30.	30.	30.	30.
		(INCHES) .893	.893	.893	.893
		(AC-FT) 6.	6.	6.	6.

CUMULATIVE AREA = .12 SQ MI

1 STATION 140

(O) OUTFLOW



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          **************
          *            *
63 KK     *       150  *
          *            *
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COMBINE HYDROGRAPHS FOR PROPOSED DETENTION BASIN & SUBBASINS B&C

65 HC HYDROGRAPH COMBINATION
ICOMP 4 NUMBER OF HYDROGRAPHS TO COMBINE

***

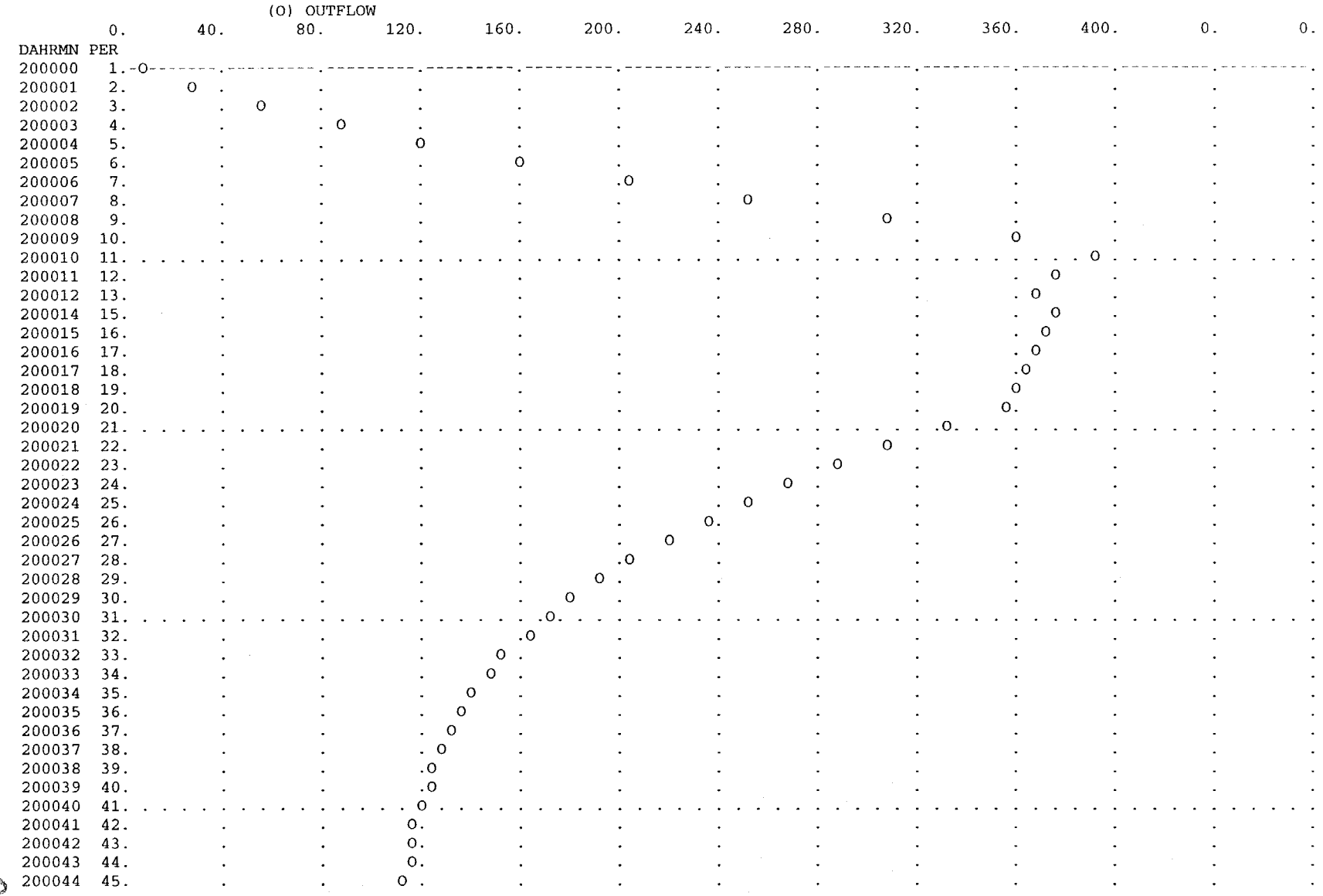
HYDROGRAPH AT STATION 150
SUM OF 4 HYDROGRAPHS

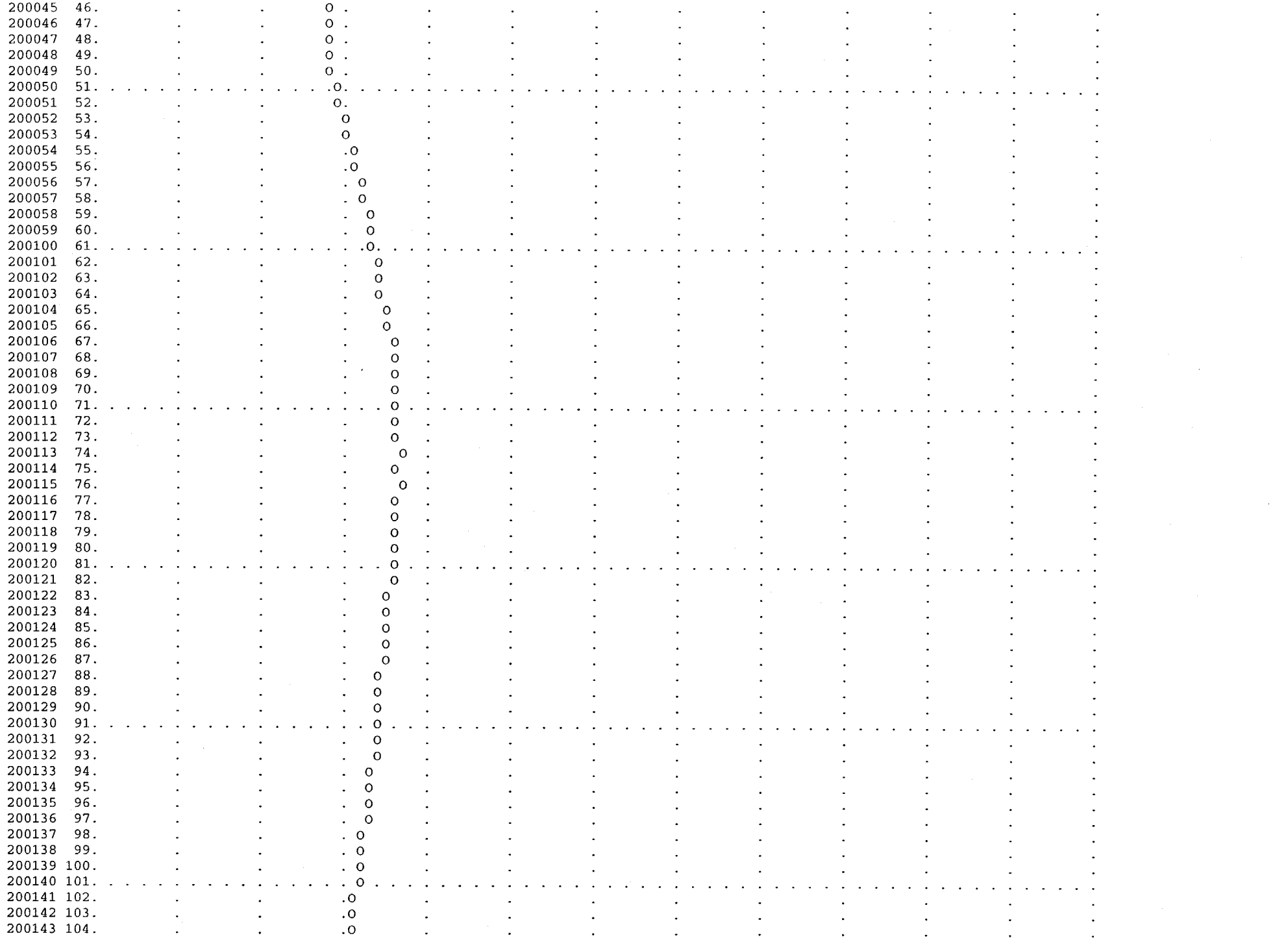
DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
20 JAN 0000	1	7.	20 JAN 0035	36	135.	20 JAN 0110	71	145.	20 JAN 0145	106	121.
20 JAN 0001	2	29.	20 JAN 0036	37	131.	20 JAN 0111	72	146.	20 JAN 0146	107	120.
20 JAN 0002	3	56.	20 JAN 0037	38	128.	20 JAN 0112	73	145.	20 JAN 0147	108	118.
20 JAN 0003	4	87.	20 JAN 0038	39	124.	20 JAN 0113	74	146.	20 JAN 0148	109	117.
20 JAN 0004	5	121.	20 JAN 0039	40	122.	20 JAN 0114	75	146.	20 JAN 0149	110	116.
20 JAN 0005	6	159.	20 JAN 0040	41	120.	20 JAN 0115	76	146.	20 JAN 0150	111	115.
20 JAN 0006	7	203.	20 JAN 0041	42	117.	20 JAN 0116	77	145.	20 JAN 0151	112	114.
20 JAN 0007	8	253.	20 JAN 0042	43	115.	20 JAN 0117	78	145.	20 JAN 0152	113	112.
20 JAN 0008	9	307.	20 JAN 0043	44	114.	20 JAN 0118	79	145.	20 JAN 0153	114	111.
20 JAN 0009	10	359.	20 JAN 0044	45	114.	20 JAN 0119	80	144.	20 JAN 0154	115	110.
20 JAN 0010	11	390.	20 JAN 0045	46	111.	20 JAN 0120	81	144.	20 JAN 0155	116	109.
20 JAN 0011	12	376.	20 JAN 0046	47	111.	20 JAN 0121	82	143.	20 JAN 0156	117	108.
20 JAN 0012	13	368.	20 JAN 0047	48	111.	20 JAN 0122	83	142.	20 JAN 0157	118	106.
20 JAN 0013	14	157.	20 JAN 0048	49	111.	20 JAN 0123	84	141.	20 JAN 0158	119	105.
20 JAN 0014	15	377.	20 JAN 0049	50	113.	20 JAN 0124	85	141.	20 JAN 0159	120	104.
20 JAN 0015	16	372.	20 JAN 0050	51	114.	20 JAN 0125	86	140.	20 JAN 0200	121	103.
20 JAN 0016	17	368.	20 JAN 0051	52	117.	20 JAN 0126	87	139.	20 JAN 0201	122	102.
20 JAN 0017	18	366.	20 JAN 0052	53	119.	20 JAN 0127	88	138.	20 JAN 0202	123	100.
20 JAN 0018	19	361.	20 JAN 0053	54	120.	20 JAN 0128	89	137.	20 JAN 0203	124	99.
20 JAN 0019	20	354.	20 JAN 0054	55	123.	20 JAN 0129	90	136.	20 JAN 0204	125	98.
20 JAN 0020	21	332.	20 JAN 0055	56	125.	20 JAN 0130	91	136.	20 JAN 0205	126	97.
20 JAN 0021	22	310.	20 JAN 0056	57	127.	20 JAN 0131	92	135.	20 JAN 0206	127	96.
20 JAN 0022	23	289.	20 JAN 0057	58	128.	20 JAN 0132	93	134.	20 JAN 0207	128	94.
20 JAN 0023	24	269.	20 JAN 0058	59	130.	20 JAN 0133	94	133.	20 JAN 0208	129	93.
20 JAN 0024	25	251.	20 JAN 0059	60	132.	20 JAN 0134	95	132.	20 JAN 0209	130	92.
20 JAN 0025	26	235.	20 JAN 0100	61	134.	20 JAN 0135	96	131.	20 JAN 0210	131	91.
20 JAN 0026	27	218.	20 JAN 0101	62	135.	20 JAN 0136	97	130.	20 JAN 0211	132	90.
20 JAN 0027	28	205.	20 JAN 0102	63	137.	20 JAN 0137	98	129.	20 JAN 0212	133	89.
20 JAN 0028	29	193.	20 JAN 0103	64	138.	20 JAN 0138	99	128.	20 JAN 0213	134	87.
20 JAN 0029	30	182.	20 JAN 0104	65	140.	20 JAN 0139	100	127.	20 JAN 0214	135	86.
20 JAN 0030	31	171.	20 JAN 0105	66	141.	20 JAN 0140	101	126.	20 JAN 0215	136	85.
20 JAN 0031	32	162.	20 JAN 0106	67	142.	20 JAN 0141	102	125.	20 JAN 0216	137	84.
20 JAN 0032	33	153.	20 JAN 0107	68	143.	20 JAN 0142	103	124.	20 JAN 0217	138	83.
20 JAN 0033	34	146.	20 JAN 0108	69	143.	20 JAN 0143	104	123.	20 JAN 0218	139	82.
20 JAN 0034	35	140.	20 JAN 0109	70	144.	20 JAN 0144	105	122.	20 JAN 0219	140	81.

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	2.32-HR
+ (CFS)	(HR)				
		(CFS)			
+ 390.	.17	151.	151.	151.	151.
		(INCHES) 1.159	1.159	1.159	1.159
		(AC-FT) 29.	29.	29.	29.

CUMULATIVE AREA = .47 SQ MI

1 STATION 150




200045 46.
200046 47.
200047 48.
200048 49.
200049 50.
200050 51.
200051 52.
200052 53.
200053 54.
200054 55.
200055 56.
200056 57.
200057 58.
200058 59.
200059 60.
200100 61.
200101 62.
200102 63.
200103 64.
200104 65.
200105 66.
200106 67.
200107 68.
200108 69.
200109 70.
200110 71.
200111 72.
200112 73.
200113 74.
200114 75.
200115 76.
200116 77.
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200132 93.
200133 94.
200134 95.
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200136 97.
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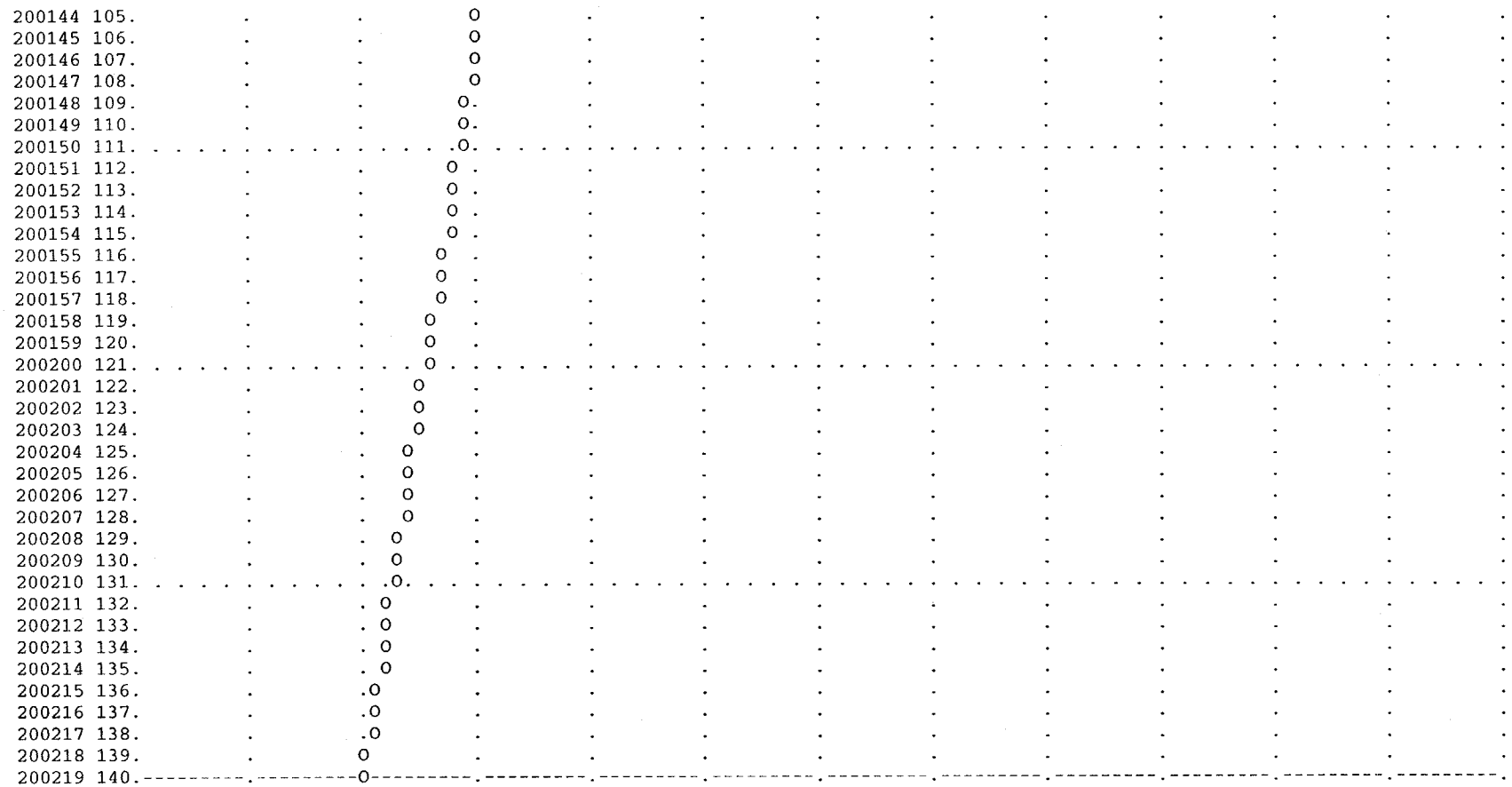
200138 99.
200139 100.
200140 101.
200141 102.
200142 103.
200143 104.



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          **************
          *            *
66 KK     *       150  *      ROUTING DISCHARGE
          *            *
          **************
                              LENGTH = 1800'

     HYDROGRAPH ROUTING DATA

68 RS          STORAGE ROUTING
                    NSTPS           1  NUMBER OF SUBREACHES
                     ITYP        FLOW  TYPE OF INITIAL CONDITION
                   RSVRIC       -1.00  INITIAL CONDITION
                        X         .00 WORKING R AND D COEFFICIENT

69 RC          NORMAL DEPTH CHANNEL
```

2

ANL	.016	LEFT OVERBANK N-VALUE
ANCH	.016	MAIN CHANNEL N-VALUE
ANR	.016	RIGHT OVERBANK N-VALUE
RLNTH	1800.	REACH LENGTH
SEL	.0200	ENERGY SLOPE
ELMAX	.0	MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

CROSS-SECTION DATA

		--- LEFT OVERBANK ---		+ ------ MAIN CHANNEL -------			+ --- RIGHT OVERBANK ---	
71 RY	ELEVATION	2625.00	2622.00	2619.80	2619.80	2619.80	2619.80	2622.00	2625.00
70 RX	DISTANCE	.00	50.00	100.00	150.00	200.00	250.00	300.00	350.00

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	1.77	3.67	5.72	7.91	10.24	12.71	15.32	18.07	20.95
OUTFLOW	.00	233.85	761.32	1533.55	2536.99	3766.88	5222.33	6904.56	8815.99	10989.55
ELEVATION	2619.80	2620.07	2620.35	2620.62	2620.89	2621.17	2621.44	2621.72	2621.99	2622.26
STORAGE	23.93	27.01	30.19	33.48	36.87	40.36	43.96	47.66	51.46	55.37
OUTFLOW	13391.57	16021.33	18880.03	21969.26	25291.00	28847.43	32640.94	36674.07	40949.45	45469.86
ELEVATION	2622.54	2622.81	2623.08	2623.36	2623.63	2623.91	2624.18	2624.45	2624.73	2625.00

HYDROGRAPH AT STATION 150

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
20	JAN	0000	1	7.	.1	2619.8	20	JAN	0047	48	122.	.9	2619.9	20	JAN	0134	95	137.	1.0	2620.0
20	JAN	0001	2	9.	.1	2619.8	20	JAN	0048	49	120.	.9	2619.9	20	JAN	0135	96	136.	1.0	2620.0
20	JAN	0002	3	15.	.1	2619.8	20	JAN	0049	50	119.	.9	2619.9	20	JAN	0136	97	135.	1.0	2620.0
20	JAN	0003	4	24.	.2	2619.8	20	JAN	0050	51	118.	.9	2619.9	20	JAN	0137	98	134.	1.0	2620.0
20	JAN	0004	5	38.	.3	2619.8	20	JAN	0051	52	118.	.9	2619.9	20	JAN	0138	99	133.	1.0	2620.0
20	JAN	0005	6	55.	.4	2619.9	20	JAN	0052	53	118.	.9	2619.9	20	JAN	0139	100	132.	1.0	2620.0
20	JAN	0006	7	76.	.6	2619.9	20	JAN	0053	54	118.	.9	2619.9	20	JAN	0140	101	131.	1.0	2620.0
20	JAN	0007	8	101.	.8	2619.9	20	JAN	0054	55	119.	.9	2619.9	20	JAN	0141	102	130.	1.0	2620.0
20	JAN	0008	9	131.	1.0	2620.0	20	JAN	0055	56	119.	.9	2619.9	20	JAN	0142	103	130.	1.0	2620.0
20	JAN	0009	10	165.	1.2	2620.0	20	JAN	0056	57	121.	.9	2619.9	20	JAN	0143	104	129.	1.0	2620.0
20	JAN	0010	11	200.	1.5	2620.0	20	JAN	0057	58	122.	.9	2619.9	20	JAN	0144	105	128.	1.0	2619.9
20	JAN	0011	12	230.	1.7	2620.1	20	JAN	0058	59	123.	.9	2619.9	20	JAN	0145	106	126.	1.0	2619.9
20	JAN	0012	13	273.	1.9	2620.1	20	JAN	0059	60	124.	.9	2619.9	20	JAN	0146	107	125.	.9	2619.9
20	JAN	0013	14	269.	1.9	2620.1	20	JAN	0100	61	126.	1.0	2619.9	20	JAN	0147	108	124.	.9	2619.9
20	JAN	0014	15	269.	1.9	2620.1	20	JAN	0101	62	127.	1.0	2619.9	20	JAN	0148	109	123.	.9	2619.9
20	JAN	0015	16	302.	2.0	2620.1	20	JAN	0102	63	129.	1.0	2620.0	20	JAN	0149	110	122.	.9	2619.9
20	JAN	0016	17	324.	2.1	2620.1	20	JAN	0103	64	130.	1.0	2620.0	20	JAN	0150	111	121.	.9	2619.9
20	JAN	0017	18	338.	2.1	2620.1	20	JAN	0104	65	132.	1.0	2620.0	20	JAN	0151	112	120.	.9	2619.9
20	JAN	0018	19	346.	2.2	2620.1	20	JAN	0105	66	133.	1.0	2620.0	20	JAN	0152	113	119.	.9	2619.9
20	JAN	0019	20	350.	2.2	2620.1	20	JAN	0106	67	134.	1.0	2620.0	20	JAN	0153	114	118.	.9	2619.9
20	JAN	0020	21	348.	2.2	2620.1	20	JAN	0107	68	136.	1.0	2620.0	20	JAN	0154	115	116.	.9	2619.9
20	JAN	0021	22	339.	2.1	2620.1	20	JAN	0108	69	137.	1.0	2620.0	20	JAN	0155	116	115.	.9	2619.9
20	JAN	0022	23	326.	2.1	2620.1	20	JAN	0109	70	138.	1.0	2620.0	20	JAN	0156	117	114.	.9	2619.9
20	JAN	0023	24	311.	2.0	2620.1	20	JAN	0110	71	139.	1.1	2620.0	20	JAN	0157	118	113.	.9	2619.9
20	JAN	0024	25	295.	2.0	2620.1	20	JAN	0111	72	140.	1.1	2620.0	20	JAN	0158	119	112.	.8	2619.9
20	JAN	0025	26	278.	1.9	2620.1	20	JAN	0112	73	141.	1.1	2620.0	20	JAN	0159	120	111.	.8	2619.9

20 JAN	0026	27	262.	1.9	2620.1	*	20 JAN	0113	74	142.	1.1	2620.0	*	20 JAN	0200	121	109.	.8	2619.9
20 JAN	0027	28	246.	1.8	2620.1	*	20 JAN	0114	75	143.	1.1	2620.0	*	20 JAN	0201	122	108.	.8	2619.9
20 JAN	0028	29	232.	1.8	2620.1	*	20 JAN	0115	76	143.	1.1	2620.0	*	20 JAN	0202	123	107.	.8	2619.9
20 JAN	0029	30	225.	1.7	2620.1	*	20 JAN	0116	77	144.	1.1	2620.0	*	20 JAN	0203	124	106.	.8	2619.9
20 JAN	0030	31	217.	1.6	2620.1	*	20 JAN	0117	78	144.	1.1	2620.0	*	20 JAN	0204	125	105.	.8	2619.9
20 JAN	0031	32	208.	1.6	2620.0	*	20 JAN	0118	79	144.	1.1	2620.0	*	20 JAN	0205	126	103.	.8	2619.9
20 JAN	0032	33	200.	1.5	2620.0	*	20 JAN	0119	80	144.	1.1	2620.0	*	20 JAN	0206	127	102.	.8	2619.9
20 JAN	0033	34	191.	1.4	2620.0	*	20 JAN	0120	81	144.	1.1	2620.0	*	20 JAN	0207	128	101.	.8	2619.9
20 JAN	0034	35	183.	1.4	2620.0	*	20 JAN	0121	82	144.	1.1	2620.0	*	20 JAN	0208	129	100.	.8	2619.9
20 JAN	0035	36	176.	1.3	2620.0	*	20 JAN	0122	83	144.	1.1	2620.0	*	20 JAN	0209	130	99.	.7	2619.9
20 JAN	0036	37	169.	1.3	2620.0	*	20 JAN	0123	84	143.	1.1	2620.0	*	20 JAN	0210	131	97.	.7	2619.9
20 JAN	0037	38	162.	1.2	2620.0	*	20 JAN	0124	85	143.	1.1	2620.0	*	20 JAN	0211	132	96.	.7	2619.9
20 JAN	0038	39	156.	1.2	2620.0	*	20 JAN	0125	86	142.	1.1	2620.0	*	20 JAN	0212	133	95.	.7	2619.9
20 JAN	0039	40	151.	1.1	2620.0	*	20 JAN	0126	87	142.	1.1	2620.0	*	20 JAN	0213	134	94.	.7	2619.9
20 JAN	0040	41	146.	1.1	2620.0	*	20 JAN	0127	88	141.	1.1	2620.0	*	20 JAN	0214	135	93.	.7	2619.9
20 JAN	0041	42	141.	1.1	2620.0	*	20 JAN	0128	89	141.	1.1	2620.0	*	20 JAN	0215	136	92.	.7	2619.9
20 JAN	0042	43	137.	1.0	2620.0	*	20 JAN	0129	90	140.	1.1	2620.0	*	20 JAN	0216	137	90.	.7	2619.9
20 JAN	0043	44	133.	1.0	2620.0	*	20 JAN	0130	91	139.	1.1	2620.0	*	20 JAN	0217	138	89.	.7	2619.9
20 JAN	0044	45	130.	1.0	2620.0	*	20 JAN	0131	92	139.	1.0	2620.0	*	20 JAN	0218	139	88.	.7	2619.9
20 JAN	0045	46	127.	1.0	2619.9	*	20 JAN	0132	93	138.	1.0	2620.0	*	20 JAN	0219	140	87.	.7	2619.9
20 JAN	0046	47	124.	.9	2619.9	*	20 JAN	0133	94	137.	1.0	2620.0	*						
						*							*						

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	2.32-HR
+ (CFS)	(HR)					
		(CFS)				
+ 350.	.32		148.	148.	148.	148.
		(INCHES)	1.135	1.135	1.135	1.135
		(AC-FT)	28.	28.	28.	28.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	2.32-HR
+ (AC-FT)	(HR)				
2.	.32	1.	1.	1.	1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	2.32-HR
+ (FEET)	(HR)				
2620.13	.32	2619.97	2619.97	2619.97	2619.97

CUMULATIVE AREA = .47 SQ MI

1 STATION 150

(I) INFLOW, (O) OUTFLOW

0. 50. 100. 150. 200. 250. 300. 350. 400. 0. 0. 0. 0.

(S) STORAGE

0. 0. 0. 0. 0. 0. 0. 1. 2. 3. 0. 0. 0.

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DAHRMN PER
200000   1.I--------.---------.---------.---------.---------.---------.S--------.---------.---------.---------.---------.---------.
200001   2. O   I   .         .         .         .         .         .S        .         .         .         .         .         .
200002   3.  O      .I        .         .         .         .         .S        .         .         .         .         .         .
200003   4.    O    .      I  .         .         .         .         . S       .         .         .         .         .         .
200004   5.       O .         .   I     .         .         .         .  S      .         .         .         .         .         .
200005   6.         .O        .         . I       .         .         .   S     .         .         .         .         .         .
200006   7.         .    O    .         .         .I        .         .    S    .         .         .         .         .         .
200007   8.         .         O         .         .         .I        .     S   .         .         .         .         .         .
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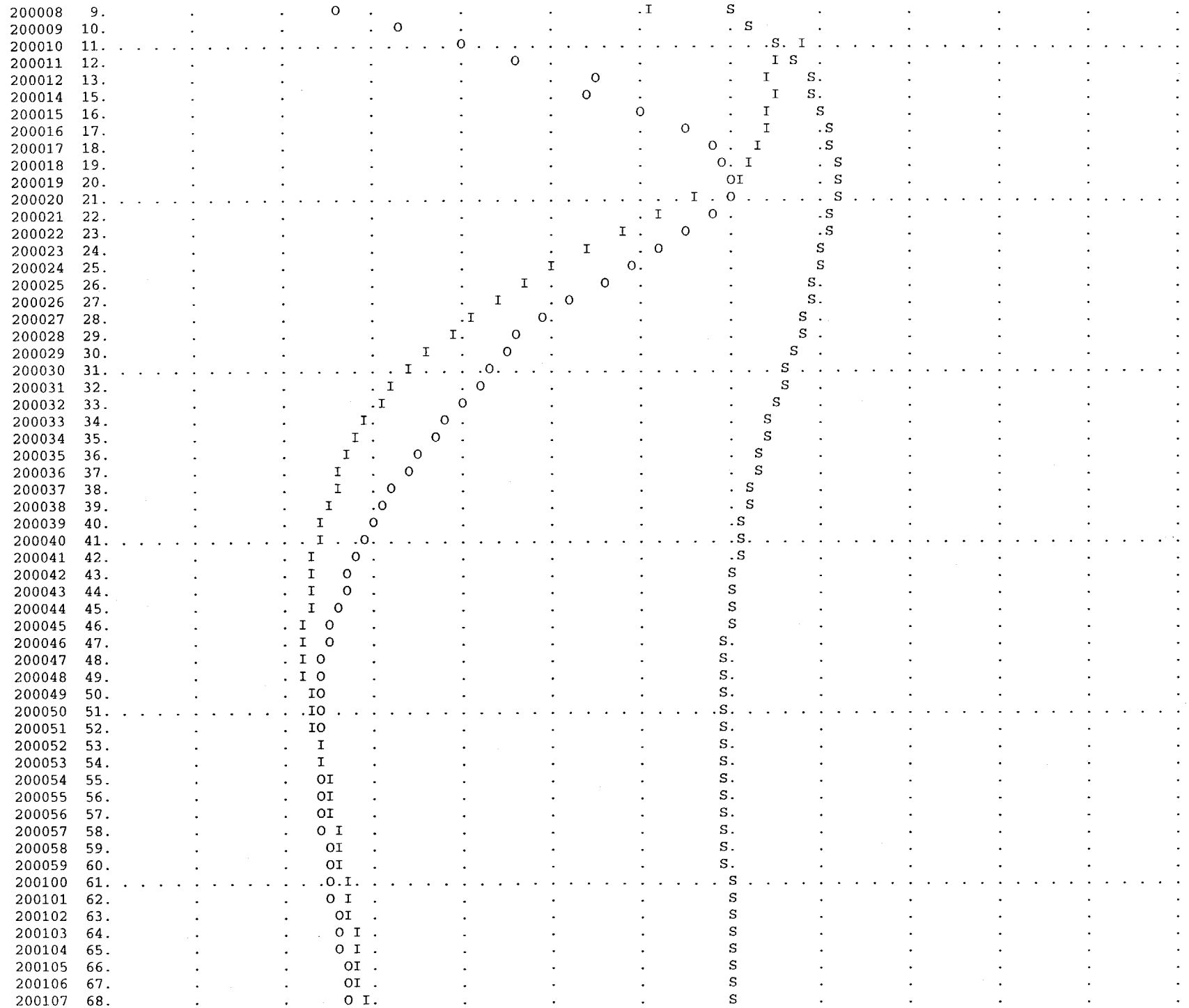
200008 9.
200009 10.
200010 11.
200011 12.
200012 13.
200014 15.
200015 16.
200016 17.
200017 18.
200018 19.
200019 20.
200020 21.
200021 22.
200022 23.
200023 24.
200024 25.
200025 26.
200026 27.
200027 28.
200028 29.
200029 30.
200030 31.
200031 32.
200032 33.
200033 34.
200034 35.
200035 36.
200036 37.
200037 38.
200038 39.
200039 40.
200040 41.
200041 42.
200042 43.
200043 44.
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200047 48.
200048 49.
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200054 55.
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200056 57.
200057 58.
200058 59.
200059 60.
200100 61.
200101 62.
200102 63.
200103 64.
200104 65.
200105 66.
200106 67.
200107 68.

```
200108  69.          O I.                    S
200109  70.           OI.                    S
200110  71.           OI.                    .S
200111  72.           OI.                    .S
200112  73.           OI.                    .S
200113  74.           OI.                    .S
200114  75.            I.                    .S
200115  76.            I.                    .S
200116  77.            I.                    .S
200117  78.            I.                    .S
200118  79.            I.                    .S
200119  80.            I.                    .S
200120  81.            I.                    .S
200121  82.            I.                    .S
200122  83.           IO.                    .S
200123  84.           IO.                    .S
200124  85.           IO.                    .S
200125  86.           I .                    .S
200126  87.           I .                    .S
200127  88.           I .                    .S
200128  89.          IO .                    .S
200129  90.          IO .                    .S
200130  91.          IO .                    .S
200131  92.          IO .                    S
200132  93.          IO .                    S
200133  94.          I  .                    S
200134  95.         IO  .                    S
200135  96.         IO  .                    S
200136  97.         IO  .                    S
200137  98.         IO  .                    S
200138  99.         IO  .                    S
200139 100.        IO   .                    S
200140 101.        IO   .                    S
200141 102.        IO   .                    S
200142 103.        IO   .                    S
200143 104.        IO   .                    S
200144 105.       I O   .                    S
200145 106.       IO    .                    S
200146 107.       IO    .                    S.
200147 108.       IO    .                    S.
200148 109.      I O    .                    S.
200149 110.      IO     .                    S.
200150 111.      IO     .                    S.
200151 112.      IO     .                    S.
200152 113.     I O     .                    S.
200153 114.     I O     .                    S.
200154 115.     IO      .                    S.
200155 116.     IO      .                    S.
200156 117.     IO      .                    S.
200157 118.    I O      .                    S.
200158 119.    IO       .                    S .
200159 120.    IO       .                    S .
200200 121.    IO       .                    S .
200201 122.   I O       .                    S .
200202 123.   IO        .                    S .
200203 124.   IO        .                    S .
200204 125.   IO        .                    S .
200205 126.  I.O        .                    S .
200206 127.  IO         .                    S .
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          **************
          *            *
72 KK     *       160  *
          *            *
          **************
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INFLOW HYDROGRAPH FOR SUBBASIN E

SUBBASIN RUNOFF DATA

74 BA SUBBASIN CHARACTERISTICS
TAREA .12 SUBBASIN AREA

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HYDROGRAPH AT STATION 160

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DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
20 JAN 0000	1	5.	20 JAN 0035	36	7.	20 JAN 0110	71	1.	20 JAN 0145	106	1.
20 JAN 0001	2	16.	20 JAN 0036	37	6.	20 JAN 0111	72	1.	20 JAN 0146	107	1.
20 JAN 0002	3	31.	20 JAN 0037	38	5.	20 JAN 0112	73	1.	20 JAN 0147	108	1.
20 JAN 0003	4	46.	20 JAN 0038	39	4.	20 JAN 0113	74	1.	20 JAN 0148	109	1.
20 JAN 0004	5	64.	20 JAN 0039	40	4.	20 JAN 0114	75	1.	20 JAN 0149	110	1.
20 JAN 0005	6	85.	20 JAN 0040	41	3.	20 JAN 0115	76	1.	20 JAN 0150	111	1.
20 JAN 0006	7	110.	20 JAN 0041	42	2.	20 JAN 0116	77	1.	20 JAN 0151	112	1.
20 JAN 0007	8	138.	20 JAN 0042	43	1.	20 JAN 0117	78	1.	20 JAN 0152	113	1.
20 JAN 0008	9	167.	20 JAN 0043	44	1.	20 JAN 0118	79	1.	20 JAN 0153	114	1.
20 JAN 0009	10	189.	20 JAN 0044	45	1.	20 JAN 0119	80	1.	20 JAN 0154	115	1.
20 JAN 0010	11	174.	20 JAN 0045	46	1.	20 JAN 0120	81	1.	20 JAN 0155	116	1.
20 JAN 0011	12	159.	20 JAN 0046	47	1.	20 JAN 0121	82	1.	20 JAN 0156	117	1.
20 JAN 0012	13	144.	20 JAN 0047	48	1.	20 JAN 0122	83	1.	20 JAN 0157	118	1.
20 JAN 0013	14	130.	20 JAN 0048	49	1.	20 JAN 0123	84	1.	20 JAN 0158	119	1.
20 JAN 0014	15	117.	20 JAN 0049	50	1.	20 JAN 0124	85	1.	20 JAN 0159	120	1.
20 JAN 0015	16	104.	20 JAN 0050	51	1.	20 JAN 0125	86	1.	20 JAN 0200	121	1.
20 JAN 0016	17	92.	20 JAN 0051	52	1.	20 JAN 0126	87	1.	20 JAN 0201	122	1.
20 JAN 0017	18	81.	20 JAN 0052	53	1.	20 JAN 0127	88	1.	20 JAN 0202	123	1.
20 JAN 0018	19	71.	20 JAN 0053	54	1.	20 JAN 0128	89	1.	20 JAN 0203	124	1.
20 JAN 0019	20	62.	20 JAN 0054	55	1.	20 JAN 0129	90	1.	20 JAN 0204	125	1.
20 JAN 0020	21	54.	20 JAN 0055	56	1.	20 JAN 0130	91	1.	20 JAN 0205	126	1.
20 JAN 0021	22	46.	20 JAN 0056	57	1.	20 JAN 0131	92	1.	20 JAN 0206	127	1.
20 JAN 0022	23	40.	20 JAN 0057	58	1.	20 JAN 0132	93	1.	20 JAN 0207	128	1.
20 JAN 0023	24	35.	20 JAN 0058	59	1.	20 JAN 0133	94	1.	20 JAN 0208	129	1.
20 JAN 0024	25	30.	20 JAN 0059	60	1.	20 JAN 0134	95	1.	20 JAN 0209	130	1.
20 JAN 0025	26	26.	20 JAN 0100	61	1.	20 JAN 0135	96	1.	20 JAN 0210	131	1.
20 JAN 0026	27	23.	20 JAN 0101	62	1.	20 JAN 0136	97	1.	20 JAN 0211	132	1.
20 JAN 0027	28	20.	20 JAN 0102	63	1.	20 JAN 0137	98	1.	20 JAN 0212	133	1.
20 JAN 0028	29	18.	20 JAN 0103	64	1.	20 JAN 0138	99	1.	20 JAN 0213	134	1.
20 JAN 0029	30	16.	20 JAN 0104	65	1.	20 JAN 0139	100	1.	20 JAN 0214	135	1.
20 JAN 0030	31	12.	20 JAN 0105	66	1.	20 JAN 0140	101	1.	20 JAN 0215	136	1.

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 20 JAN 0031   32       11.   *  20 JAN 0106   67        1.   *  20 JAN 0141  102        1.   *  20 JAN 0216  137        1.
 20 JAN 0032   33       10.   *  20 JAN 0107   68        1.   *  20 JAN 0142  103        1.   *  20 JAN 0217  138        1.
 20 JAN 0033   34        9.   *  20 JAN 0108   69        1.   *  20 JAN 0143  104        1.   *  20 JAN 0218  139        1.
 20 JAN 0034   35        8.   *  20 JAN 0109   70        1.   *  20 JAN 0144  105        1.   *  20 JAN 0219  140        1.
                              *                                 *                                 *
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  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR        24-HR        72-HR       2.32-HR

+   (CFS)       (HR)
                          (CFS)
+      189.       .15                  18.         18.          18.          18.
                        (INCHES)      .531        .531         .531         .531
                         (AC-FT)        3.          3.           3.           3.

                      CUMULATIVE AREA =      .12 SQ MI
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1                                                        STATION      160

                             (O) OUTFLOW
               0.        20.       40.       60.       80.      100.      120.      140.      160.      180.      200.        0.        0.
 DAHRMN PER
 200000   1.-O-------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.
 200001   2.        O .         .         .         .         .         .         .         .         .         .         .         .
 200002   3.          .      O  .         .         .         .         .         .         .         .         .         .         .
 200003   4.          .         . O       .         .         .         .         .         .         .         .         .         .
 200004   5.          .         .         . O       .         .         .         .         .         .         .         .         .
 200005   6.          .         .         .         .  O      .         .         .         .         .         .         .         .
 200006   7.          .         .         .         .         .    O    .         .         .         .         .         .         .
 200007   8.          .         .         .         .         .         .         O.        .         .         .         .         .
 200008   9.          .         .         .         .         .         .         .         .   O     .         .         .         .
 200009  10.          .         .         .         .         .         .         .         .         .    O    .         .         .
 200010  11. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . .
 200011  12.          .         .         .         .         .         .         .         O         .         .         .         .
 200012  13.          .         .         .         .         .         .         . O       .         .         .         .         .
 200013  14.          .         .         .         .         .         .      O  .         .         .         .         .         .
 200014  15.          .         .         .         .         .        O.         .         .         .         .         .         .
 200015  16.          .         .         .         .         . O       .         .         .         .         .         .         .
 200016  17.          .         .         .         .     O   .         .         .         .         .         .         .         .
 200017  18.          .         .         .         .O        .         .         .         .         .         .         .         .
 200018  19.          .         .         .     O   .         .         .         .         .         .         .         .         .
 200019  20.          .         .         .O        .         .         .         .         .         .         .         .         .
 200020  21. . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 200021  22.          .         . O       .         .         .         .         .         .         .         .         .         .
 200022  23.          .         O         .         .         .         .         .         .         .         .         .         .
 200023  24.          .       O .         .         .         .         .         .         .         .         .         .         .
 200024  25.          .    O    .         .         .         .         .         .         .         .         .         .         .
 200025  26.          . O       .         .         .         .         .         .         .         .         .         .         .
 200026  27.          .O        .         .         .         .         .         .         .         .         .         .         .
 200027  28.          O         .         .         .         .         .         .         .         .         .         .         .
 200028  29.         O.         .         .         .         .         .         .         .         .         .         .         .
 200029  30.        O .         .         .         .         .         .         .         .         .         .         .         .
 200030  31. . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 200031  32.      O   .         .         .         .         .         .         .         .         .         .         .         .
 200032  33.     O    .         .         .         .         .         .         .         .         .         .         .         .
 200033  34.     O    .         .         .         .         .         .         .         .         .         .         .         .
 200034  35.    O     .         .         .         .         .         .         .         .         .         .         .         .
 200035  36.    O     .         .         .         .         .         .         .         .         .         .         .         .
 200036  37.  O       .         .         .         .         .         .         .         .         .         .         .         .
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200037  38.  O      .       .       .       .       .       .       .       .       .       .       .       .
200038  39. O       .       .       .       .       .       .       .       .       .       .       .       .
200039  40. O       .       .       .       .       .       .       .       .       .       .       .       .
200040  41. O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
200041  42.O        .       .       .       .       .       .       .       .       .       .       .       .
200042  43.O        .       .       .       .       .       .       .       .       .       .       .       .
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            *            *
 80 KK      *       170  *
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COMBINE HYDROGRAPHS FOR PROPOSED DETENTION BASIN

82 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

***

HYDROGRAPH AT STATION 170
SUM OF 2 HYDROGRAPHS

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
20 JAN 0000	1	12.	20 JAN 0035	36	183.	20 JAN 0110	71	140.	20 JAN 0145	106	127.
20 JAN 0001	2	25.	20 JAN 0036	37	175.	20 JAN 0111	72	141.	20 JAN 0146	107	126.
20 JAN 0002	3	46.	20 JAN 0037	38	167.	20 JAN 0112	73	142.	20 JAN 0147	108	125.
20 JAN 0003	4	70.	20 JAN 0038	39	160.	20 JAN 0113	74	143.	20 JAN 0148	109	124.
20 JAN 0004	5	102.	20 JAN 0039	40	155.	20 JAN 0114	75	144.	20 JAN 0149	110	123.
20 JAN 0005	6	140.	20 JAN 0040	41	149.	20 JAN 0115	76	144.	20 JAN 0150	111	122.
20 JAN 0006	7	186.	20 JAN 0041	42	143.	20 JAN 0116	77	145.	20 JAN 0151	112	121.
20 JAN 0007	8	239.	20 JAN 0042	43	138.	20 JAN 0117	78	145.	20 JAN 0152	113	120.
20 JAN 0008	9	298.	20 JAN 0043	44	134.	20 JAN 0118	79	145.	20 JAN 0153	114	119.
20 JAN 0009	10	354.	20 JAN 0044	45	131.	20 JAN 0119	80	145.	20 JAN 0154	115	117.
20 JAN 0010	11	374.	20 JAN 0045	46	128.	20 JAN 0120	81	145.	20 JAN 0155	116	116.
20 JAN 0011	12	389.	20 JAN 0046	47	125.	20 JAN 0121	82	145.	20 JAN 0156	117	115.
20 JAN 0012	13	417.	20 JAN 0047	48	123.	20 JAN 0122	83	145.	20 JAN 0157	118	114.
20 JAN 0013	14	399.	20 JAN 0048	49	121.	20 JAN 0123	84	144.	20 JAN 0158	119	113.
20 JAN 0014	15	386.	20 JAN 0049	50	120.	20 JAN 0124	85	144.	20 JAN 0159	120	112.
20 JAN 0015	16	406.	20 JAN 0050	51	119.	20 JAN 0125	86	143.	20 JAN 0200	121	110.
20 JAN 0016	17	416.	20 JAN 0051	52	119.	20 JAN 0126	87	143.	20 JAN 0201	122	109.
20 JAN 0017	18	419.	20 JAN 0052	53	119.	20 JAN 0127	88	142.	20 JAN 0202	123	108.
20 JAN 0018	19	417.	20 JAN 0053	54	119.	20 JAN 0128	89	142.	20 JAN 0203	124	107.
20 JAN 0019	20	412.	20 JAN 0054	55	120.	20 JAN 0129	90	141.	20 JAN 0204	125	106.
20 JAN 0020	21	402.	20 JAN 0055	56	120.	20 JAN 0130	91	140.	20 JAN 0205	126	104.
20 JAN 0021	22	385.	20 JAN 0056	57	122.	20 JAN 0131	92	140.	20 JAN 0206	127	103.
20 JAN 0022	23	366.	20 JAN 0057	58	123.	20 JAN 0132	93	139.	20 JAN 0207	128	102.
20 JAN 0023	24	346.	20 JAN 0058	59	124.	20 JAN 0133	94	138.	20 JAN 0208	129	101.
20 JAN 0024	25	325.	20 JAN 0059	60	125.	20 JAN 0134	95	138.	20 JAN 0209	130	100.
20 JAN 0025	26	304.	20 JAN 0100	61	127.	20 JAN 0135	96	137.	20 JAN 0210	131	98.
20 JAN 0026	27	285.	20 JAN 0101	62	128.	20 JAN 0136	97	136.	20 JAN 0211	132	97.
20 JAN 0027	28	266.	20 JAN 0102	63	130.	20 JAN 0137	98	135.	20 JAN 0212	133	96.
20 JAN 0028	29	250.	20 JAN 0103	64	131.	20 JAN 0138	99	134.	20 JAN 0213	134	95.
20 JAN 0029	30	241.	20 JAN 0104	65	133.	20 JAN 0139	100	133.	20 JAN 0214	135	94.

20 JAN	0030	31	229.	*	20 JAN	0105	66	134.	*	20 JAN	0140	101	132.	*	20 JAN	0215	136	93.
20 JAN	0031	32	219.	*	20 JAN	0106	67	135.	*	20 JAN	0141	102	131.	*	20 JAN	0216	137	91.
20 JAN	0032	33	210.	*	20 JAN	0107	68	137.	*	20 JAN	0142	103	131.	*	20 JAN	0217	138	90.
20 JAN	0033	34	200.	*	20 JAN	0108	69	138.	*	20 JAN	0143	104	130.	*	20 JAN	0218	139	89.
20 JAN	0034	35	191.	*	20 JAN	0109	70	139.	*	20 JAN	0144	105	129.	*	20 JAN	0219	140	88.
				*					*					*				

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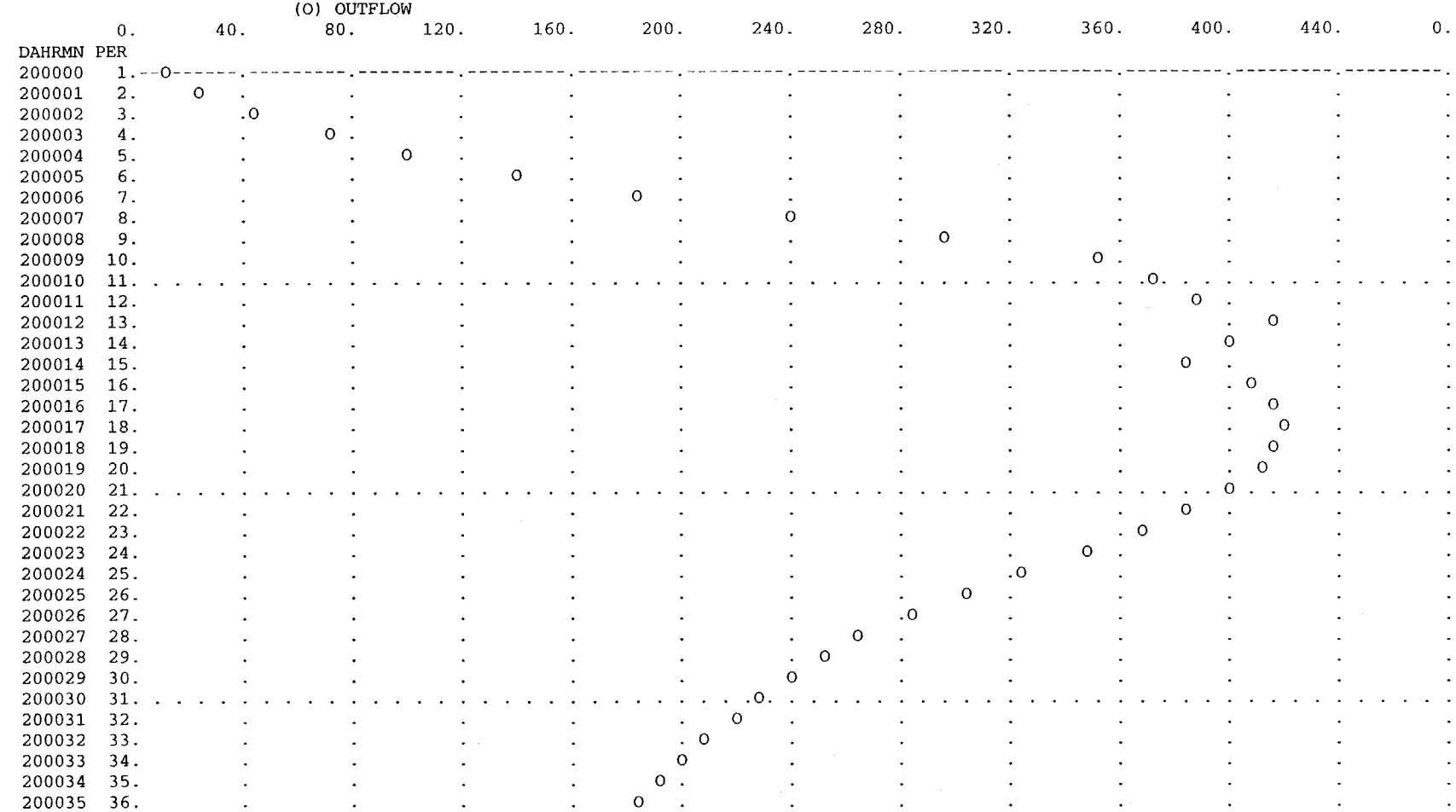
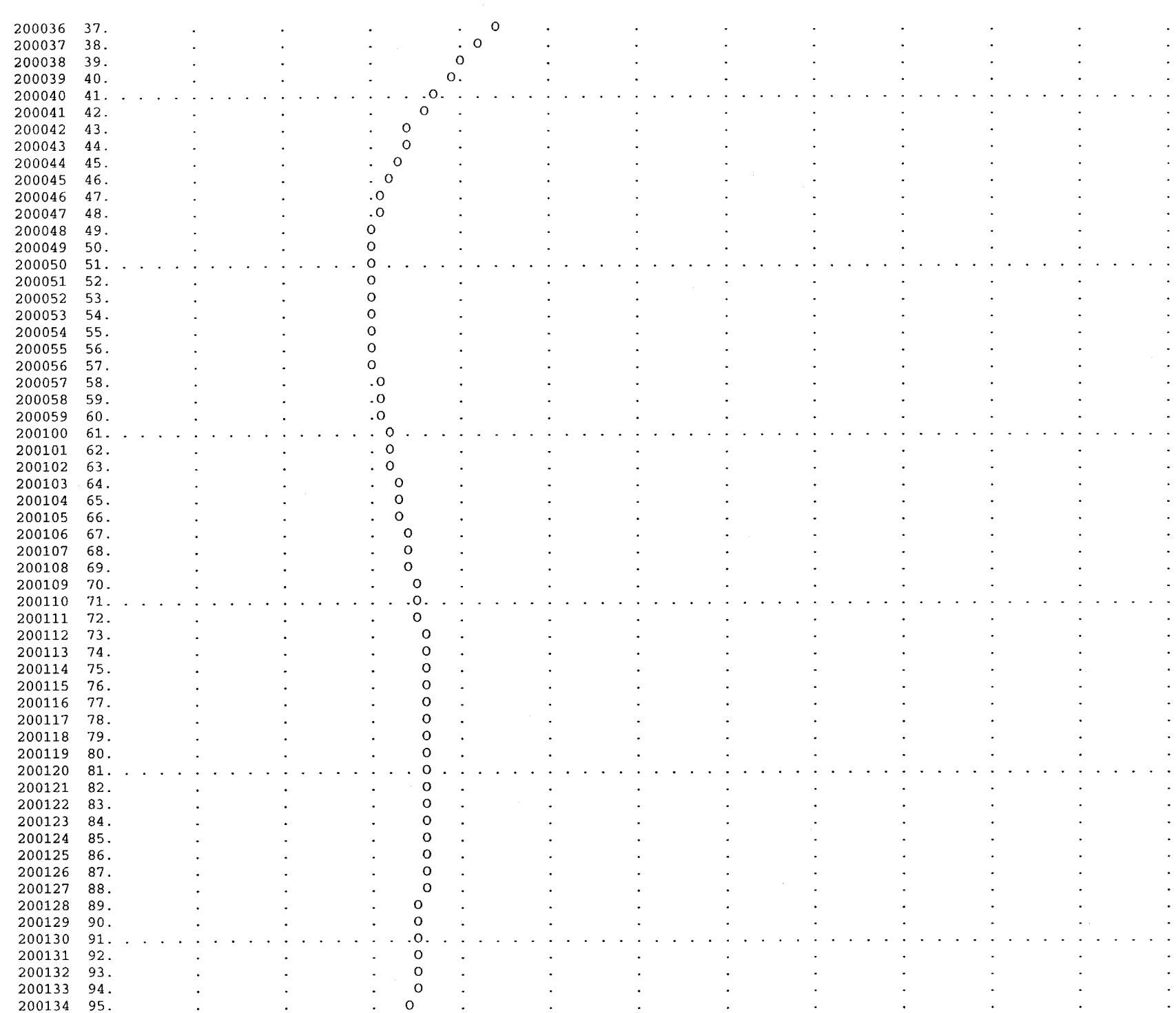
PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	2.32-HR
+ (CFS)	(HR)				
		(CFS)			
+ 419.	.28	166.	166.	166.	166.
		(INCHES) 1.012	1.012	1.012	1.012
		(AC-FT) 32.	32.	32.	32.

CUMULATIVE AREA = .59 SQ MI

1 STATION 170

(O) OUTFLOW




200036 37.
200037 38.
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200039 40.
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200042 43.
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200117 78.
200118 79.
200119 80.
200120 81.
200121 82.
200122 83.
200123 84.
200124 85.
200125 86.
200126 87.
200127 88.
200128 89.
200129 90.
200130 91.
200131 92.
200132 93.
200133 94.
200134 95.

1

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	100	501.	.47	134.	134.	134.	.27		
+	ROUTED TO	115	158.	.97	93.	93.	93.	.27	3.30	.97
+	ROUTED TO	117	137.	1.32	79.	79.	79.	.27	2618.85	1.32
+	HYDROGRAPH AT	120	218.	.32	40.	40.	40.	.07		
+	HYDROGRAPH AT	130	16.	.20	2.	2.	2.	.00		
+	HYDROGRAPH AT	140	293.	.17	30.	30.	30.	.12		
+	4 COMBINED AT	150	390.	.17	151.	151.	151.	.47		
+	ROUTED TO	150	350.	.32	148.	148.	148.	.47	2620.13	.32
+	HYDROGRAPH AT	160	189.	.15	18.	18.	18.	.12		
+	2 COMBINED AT	170	419.	.28	166.	166.	166.	.59		

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

X-SECTION 50 ALT 1
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSSECTION 50 DETENTION BASIN
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.006000	ft/ft
Elevation range: 12.00 ft to 14.00 ft.		
Discharge	390.00	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
60.00	14.00	60.00	590.00	0.060
230.00	13.00			
460.00	12.00			
500.00	12.00			
590.00	14.00			

Results		
Wtd. Mannings Coefficient	0.060	
Water Surface Elevation	13.23	ft
Flow Area	257.00	ft²
Wetted Perimeter	365.27	ft
Top Width	365.25	ft
Height	1.23	ft
Critical Depth	12.74	ft
Critical Slope	0.069474	ft/ft
Velocity	1.52	ft/s
Velocity Head	0.04	ft
Specific Energy	13.27	ft
Froude Number	0.32	
Flow is subcritical.		

X-SECTION 60 ALT 1
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSSECTION 60 DETENTION BASIN
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data				
Channel Slope	0.010000 ft/ft			
Elevation range: 10.00 ft to 12.00 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
140.00	12.00	140.00	800.00	0.065
410.00	11.50			
570.00	11.00			
700.00	10.00			
800.00	12.00			
Discharge	390.00 cfs			

Results		
Wtd. Mannings Coefficient	0.065	
Water Surface Elevation	11.52	ft
Flow Area	234.59	ft²
Wetted Perimeter	378.26	ft
Top Width	378.24	ft
Height	1.52	ft
Critical Depth	11.04	ft
Critical Slope	0.077556	ft/ft
Velocity	1.66	ft/s
Velocity Head	0.04	ft
Specific Energy	11.57	ft
Froude Number	0.37	
Flow is subcritical.		

X-SECTION 70 ALT 1
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSS SECTION 70 DETENTION BASIN
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.010000	ft/ft
Elevation range: 10.00 ft to 12.00 ft.		
Discharge	390.00	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
80.00	12.00	80.00	770.00	0.065
350.00	10.50			
460.00	10.00			
700.00	10.00			
770.00	12.00			

Results		
Wtd. Mannings Coefficient	0.065	
Water Surface Elevation	10.73	ft
Flow Area	244.16	ft^2
Wetted Perimeter	418.03	ft
Top Width	418.02	ft
Height	0.73	ft
Critical Depth	10.40	ft
Critical Slope	0.087980	ft/ft
Velocity	1.60	ft/s
Velocity Head	0.04	ft
Specific Energy	10.77	ft
Froude Number	0.37	
Flow is subcritical.		

X-SECTION 80 ALT 1
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSS SECTION 80 DETENTION BASIN
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data				
Channel Slope	0.013300 ft/ft			
Elevation range: 8.00 ft to 12.00 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
120.00	12.00	120.00	900.00	0.065
200.00	10.00			
240.00	9.50			
300.00	9.00			
340.00	8.00			
370.00	8.00			
380.00	9.00			
385.00	10.00			
400.00	8.00			
810.00	8.00			
900.00	10.00			
Discharge	419.00	cfs		

Results		
Wtd. Mannings Coefficient	0.065	
Water Surface Elevation	8.54	ft
Flow Area	250.36	ft^2
Wetted Perimeter	494.97	ft
Top Width	494.90	ft
Height	0.54	ft
Critical Depth	8.30	ft
Critical Slope	0.092923	ft/ft
Velocity	1.67	ft/s
Velocity Head	0.04	ft
Specific Energy	8.58	ft
Froude Number	0.41	
Flow is subcritical.		
Flow is divided.		

X-SECTION 90 ALT 1
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSS SECTION 90 DETENTION BASIN
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data				
Channel Slope	0.012500 ft/ft			
Elevation range: 5.50 ft to 7.00 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
50.00	7.00	50.00	670.00	0.060
150.00	6.50			
200.00	6.00			
280.00	6.00			
350.00	5.50			
520.00	6.00			
670.00	7.00			
Discharge	419.00 cfs			

Results		
Wtd. Mannings Coefficient	0.060	
Water Surface Elevation	6.45	ft
Flow Area	230.47	ft^2
Wetted Perimeter	433.18	ft
Top Width	433.17	ft
Height	0.95	ft
Critical Depth	6.19	ft
Critical Slope	0.074961	ft/ft
Velocity	1.82	ft/s
Velocity Head	0.05	ft
Specific Energy	6.50	ft
Froude Number	0.44	
Flow is subcritical.		

X-SECTION 100 ALT 1
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSS SECTIO 100 ALT 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.008000	ft/ft
Elevation range: 4.00 ft to 6.00 ft.		
Discharge	419.00	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	6.00	0.00	700.00	0.060
100.00	4.00			
500.00	4.00			
700.00	6.00			

Results		
Wtd. Mannings Coefficient	0.060	
Water Surface Elevation	4.62	ft
Flow Area	277.53	ft²
Wetted Perimeter	493.22	ft
Top Width	493.21	ft
Height	0.62	ft
Critical Depth	4.32	ft
Critical Slope	0.078287	ft/ft
Velocity	1.51	ft/s
Velocity Head	0.04	ft
Specific Energy	4.66	ft
Froude Number	0.35	
Flow is subcritical.		

X-SECTION 110 ALT 1
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSS SECTIO 110 ALT 1 DETENTION BASIN
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.007300	ft/ft
Discharge	419.00	cfs

Elevation range: 1.50 ft to 4.00 ft.

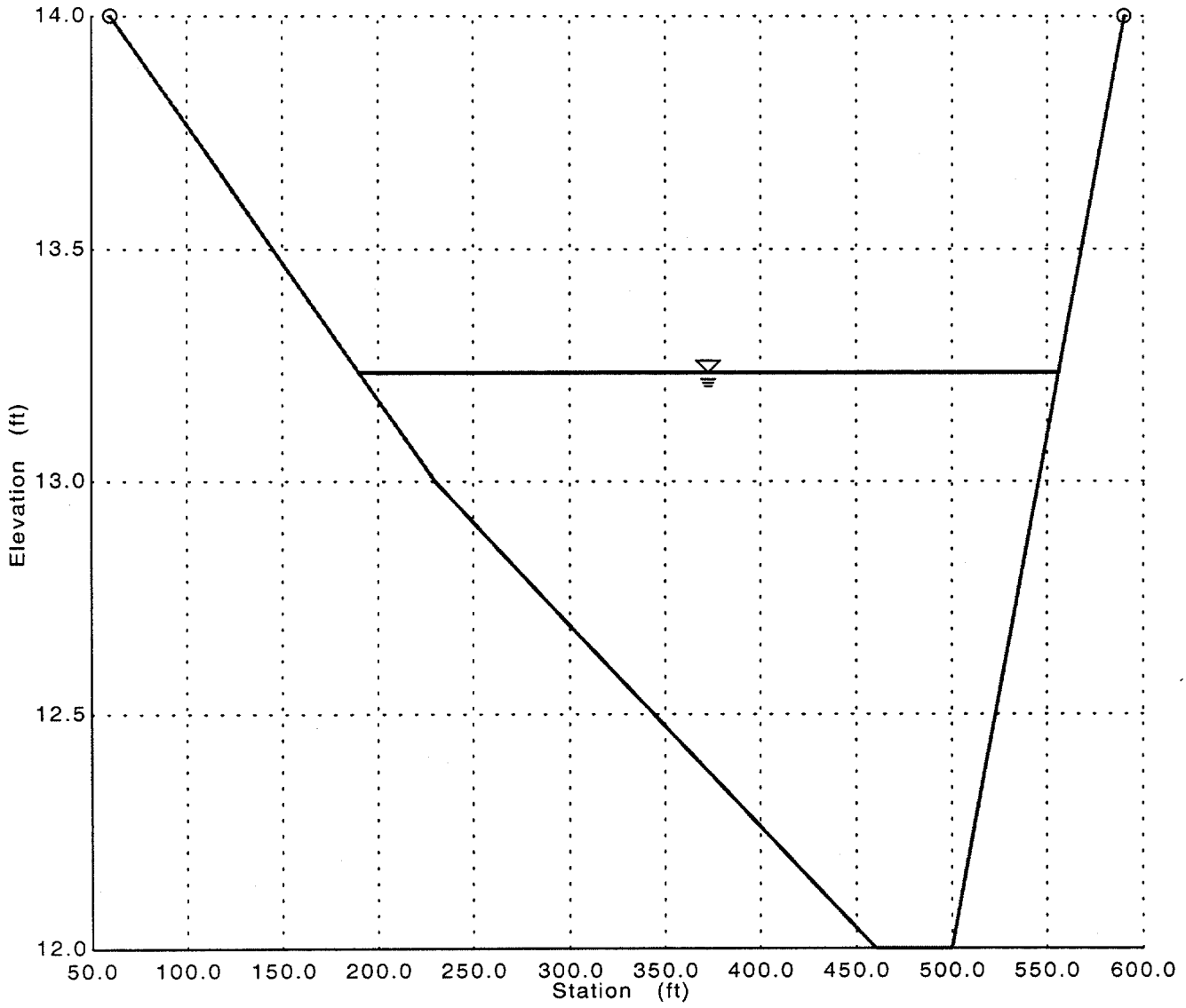
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	4.00	0.00	740.00	0.065
200.00	2.00			
400.00	1.50			
600.00	2.00			
680.00	4.00			
740.00	4.00			

Results		
Wtd. Mannings Coefficient	0.065	
Water Surface Elevation	2.44	ft
Flow Area	291.63	ft²
Wetted Perimeter	462.24	ft
Top Width	462.23	ft
Height	0.94	ft
Critical Depth	2.08	ft
Critical Slope	0.090133	ft/ft
Velocity	1.44	ft/s
Velocity Head	0.03	ft
Specific Energy	2.48	ft
Froude Number	0.32	
Flow is subcritical.		

Cross Section 50 ALT 1
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSSECTION 50 DETENTION BASIN
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

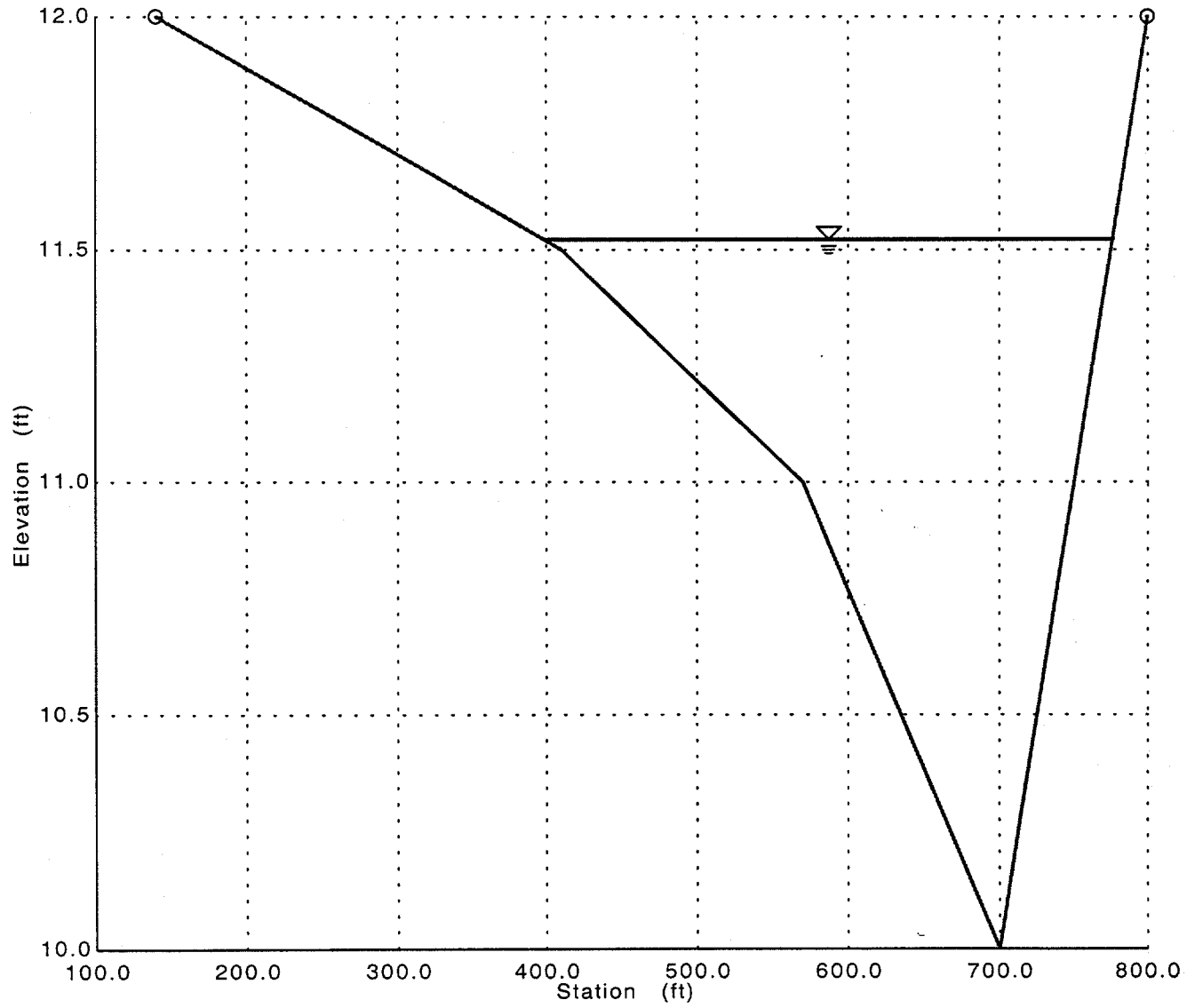
Section Data		
Wtd. Mannings Coefficient	0.060	
Channel Slope	0.006000	ft/ft
Water Surface Elevation	13.23	ft
Discharge	390.00	cfs



Cross Section 60 ALT 1
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSSECTION 60 DETENTION BASIN
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

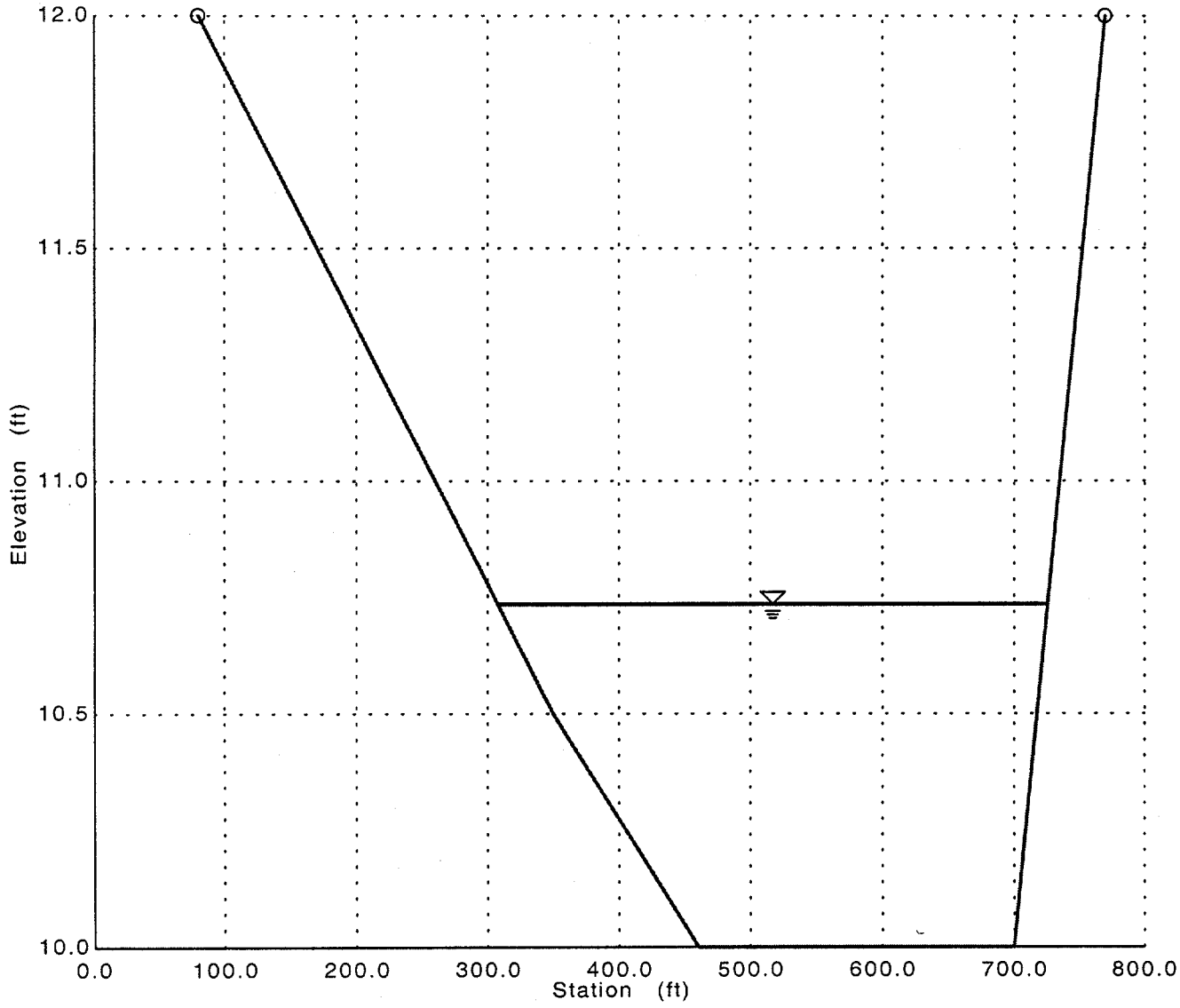
Section Data		
Wtd. Mannings Coefficient	0.065	
Channel Slope	0.010000	ft/ft
Water Surface Elevation	11.52	ft
Discharge	390.00	cfs



Cross Section 70 ALT 1
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSS SECTION 70 DETENTION BASIN
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

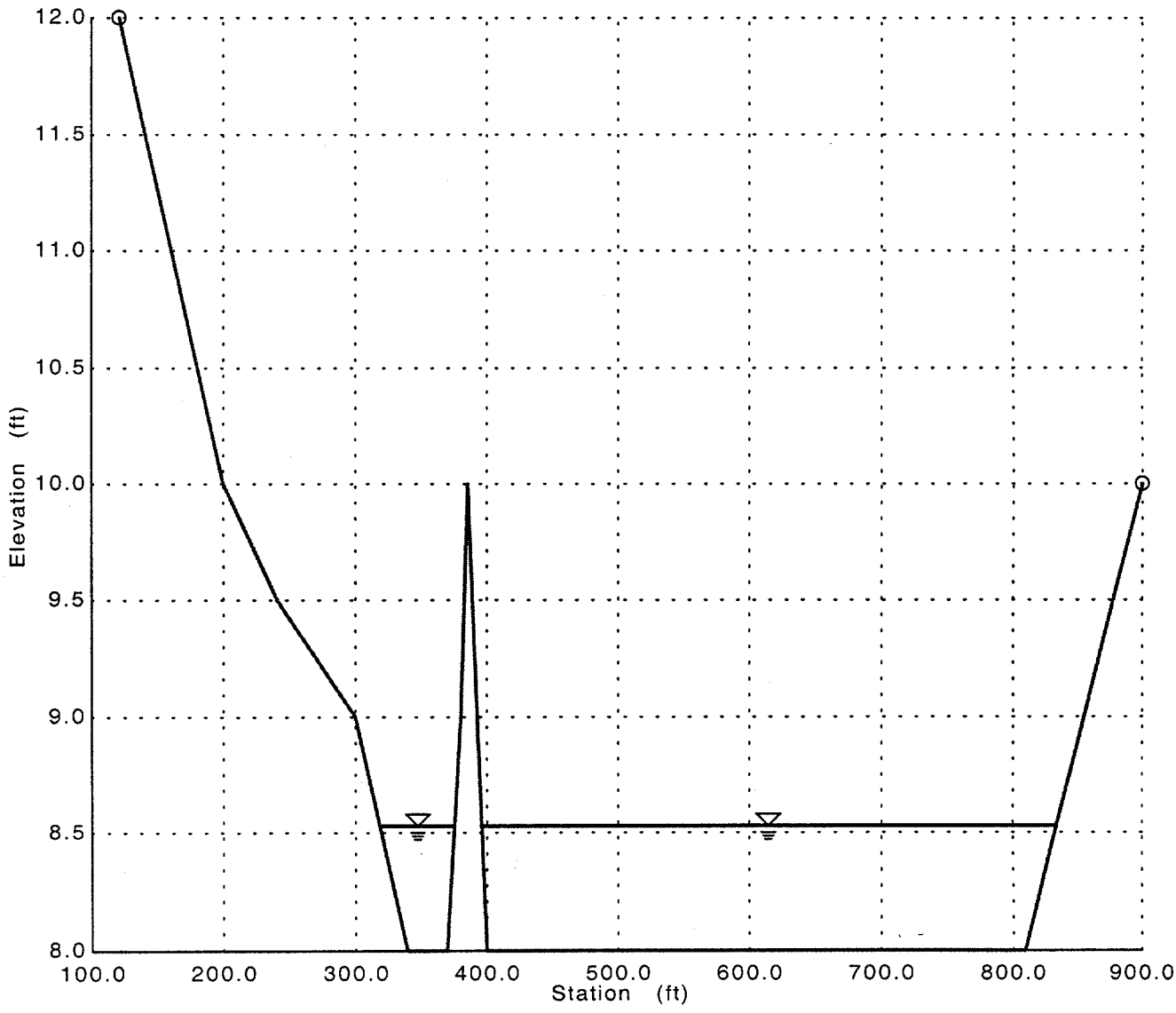
Section Data		
Wtd. Mannings Coefficient	0.065	
Channel Slope	0.010000	ft/ft
Water Surface Elevation	10.73	ft
Discharge	390.00	cfs



CROSS SECTION 80 ALT 1
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSS SECTION 80 DETENTION BASIN
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

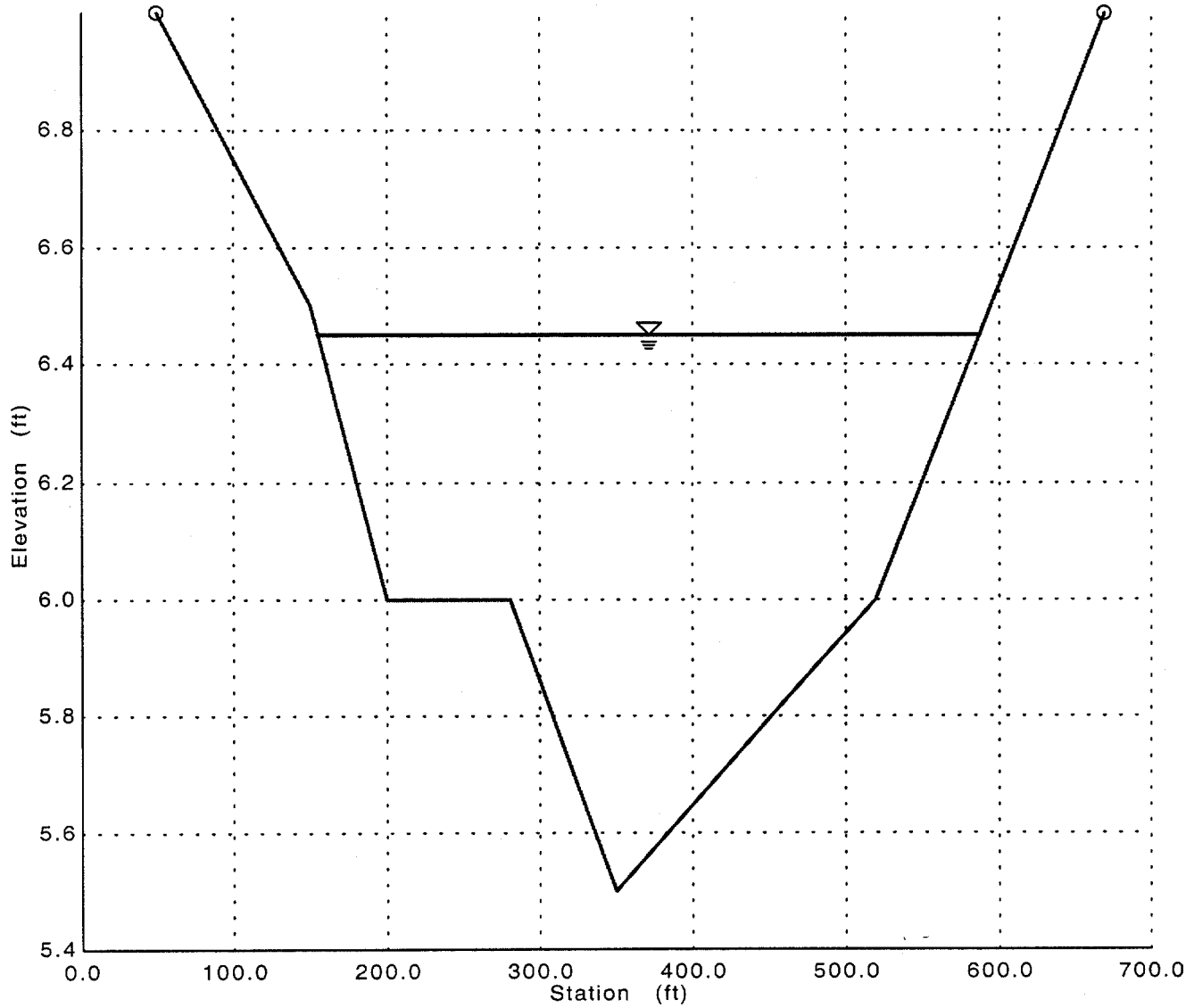
Section Data		
Wtd. Mannings Coefficient	0.065	
Channel Slope	0.013300	ft/ft
Water Surface Elevation	8.54	ft
Discharge	419.00	cfs



Cross Section 90 ALT 1
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSS SECTION 90 DETENTION BASIN
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

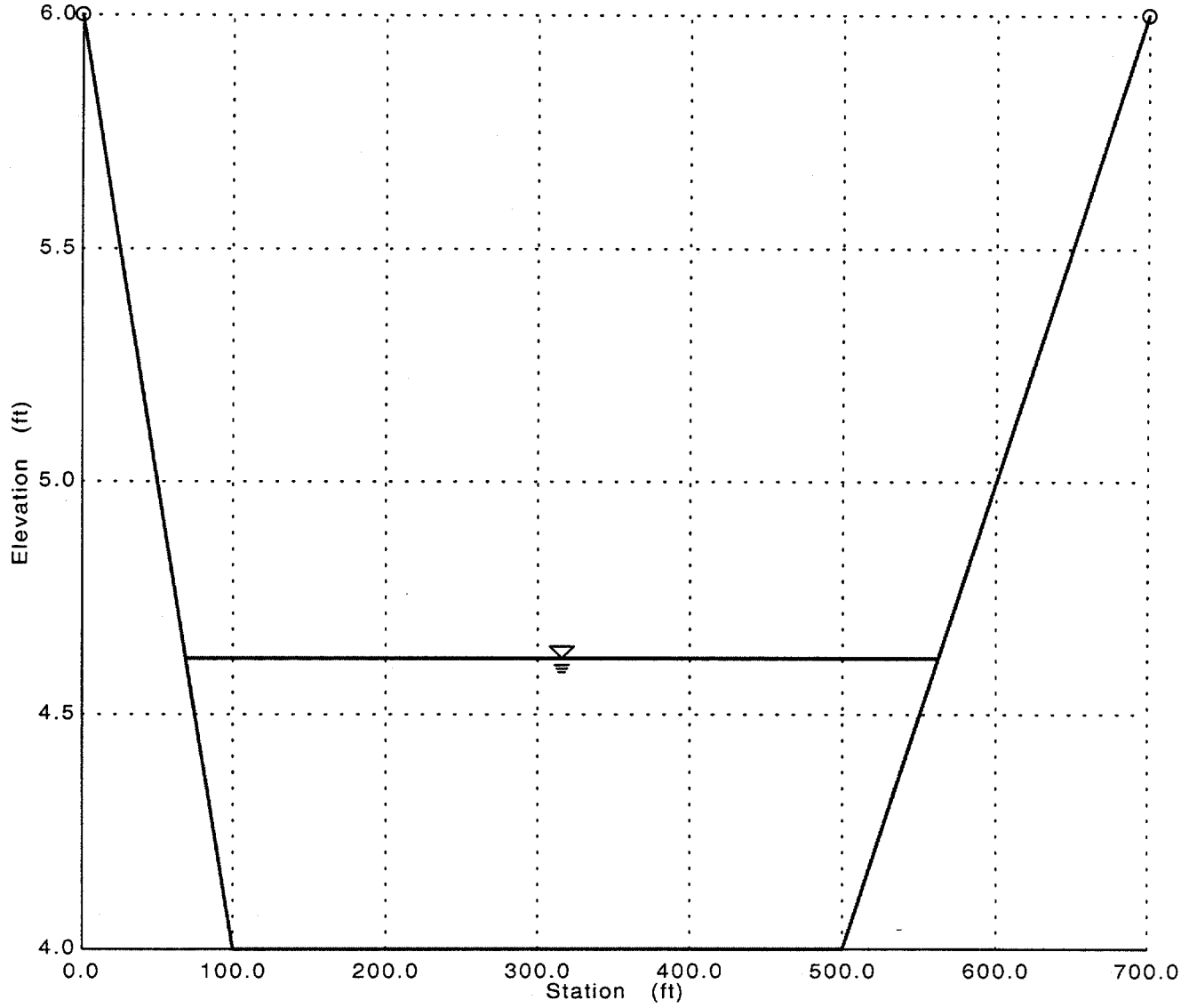
Section Data		
Wtd. Mannings Coefficient	0.060	
Channel Slope	0.012500	ft/ft
Water Surface Elevation	6.45	ft
Discharge	419.00	cfs



Cross Section 100 ALT 1
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSS SECTIO 100 ALT 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.060	
Channel Slope	0.008000	ft/ft
Water Surface Elevation	4.62	ft
Discharge	419.00	cfs



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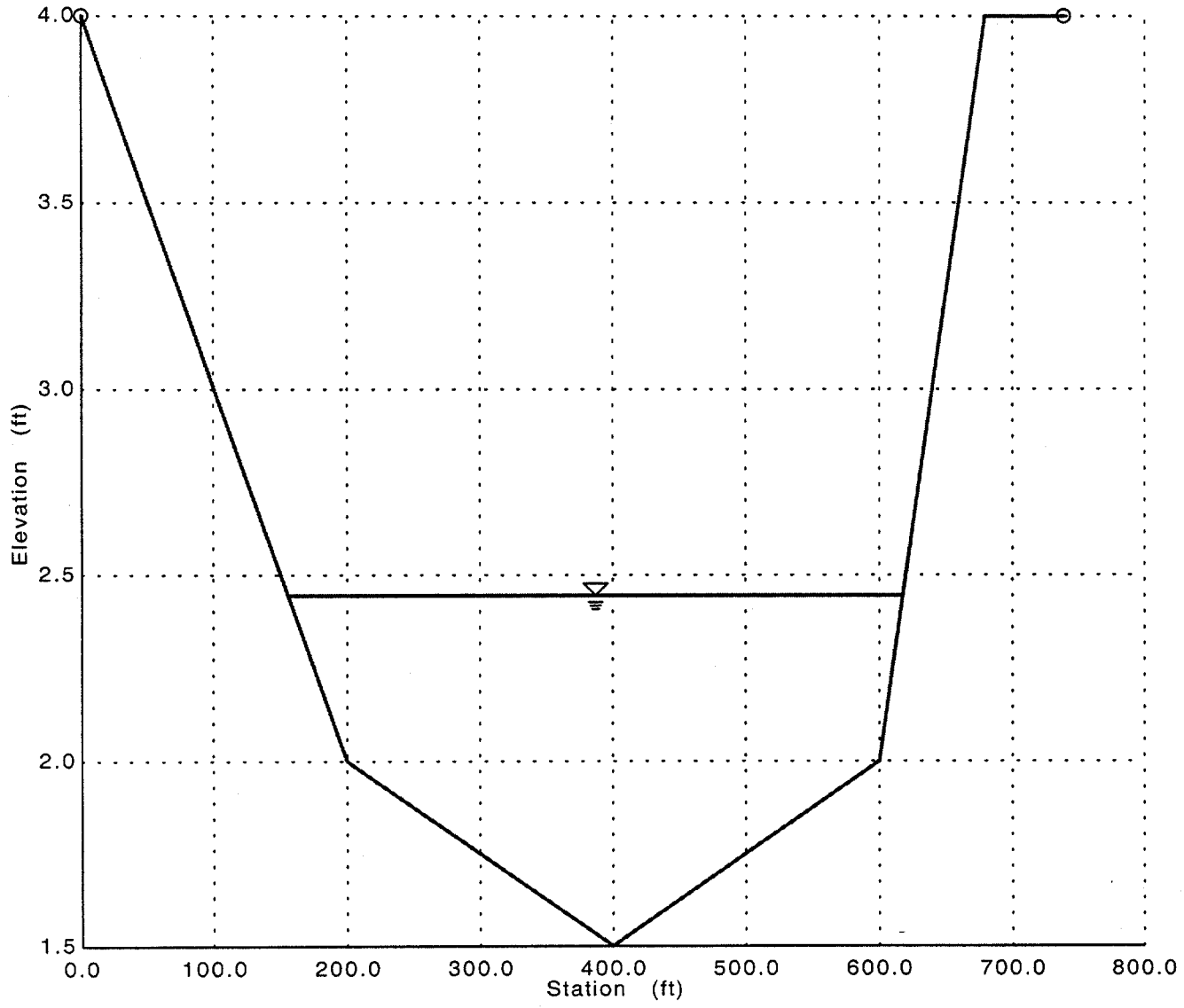
Cross Section 110 ALT 1
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\ewalt1.fm2
Worksheet	CROSS SECTIO 110 ALT 1 DETENTION BASIN
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.065	
Channel Slope	0.007300	ft/ft
Water Surface Elevation	2.44	ft
Discharge	419.00	cfs



Pima County Assessor Property Inquiry

PARCEL 140300180 Search Genealogy Summary Tax

Book-Map-Parcel: 140-30-0180 **TaxArea: 1200** **TaxYear: 1999**

TaxPayer Information
KOCIS JOHN SR TR OF KOCIS TRUST
3600 E MILTON RD SPACE 26
TUCSON AZ

85706 0000

Legal Description
LOS RANCHITOS NUMBER 7 LOT 292

(FORMERLY 139-28-0180)

Recording Information
Docket 9012 **Page** 538 **Date** Apr-08-1
Zoning Information MU

Miscellaneous
Section 9 **Twn**15.0**S Rng**14.0**E**
Map&Plat 8 / 71 **LandMeasure**
MarketArea: SUNNYSIDE(111)
Tract Block0 **Lot** 0292 **Grou**
CensusTract 4104 **UseCode** 0840
Date of Last Change Aug-10-1993

Property Address 3600 E MILTON RD **MOBILE HOME PARK 4 O**

Secondary Valuation Data	LegislativeClass	FullCash	Percentage
Land	RES RENTAL (6 5)	$45,000	10.0
Improvements	RES RENTAL (6 5)	$46,168	10.
1998 Personal Property			
Gross Value Totals		$91,168	
1998 LMTD/SCND Exemptions			
Net Value Totals		$91,168	

PriorLimitedValue: $92,217 **CurrentLimitedValue:** $91,16

Owner's Estimate: 1998=$62,835 1998~Petition

Valuation Data is Subject to Change until August of 1999!

Pima County Assessor ~ 115 N. Church ~ Tucson Az. 85701

APPENDIX C-2

Structural Alternatives 2a Earthen Channel with Concrete Culverts

CURRENT DATE: 03-09-1999
CURRENT TIME: 11:53:37

FILE DATE: 03-04-1999
FILE NAME: ALVORD1

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	608.90	608.78	30.00	2 IRCP	8.00	5.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: ALVORD1 DATE: 03-04-1999

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
608.90	0	0	0	0	0	0	0	0	1
610.40	72	72	0	0	0	0	0	0	1
611.27	143	143	0	0	0	0	0	0	1
611.98	215	215	0	0	0	0	0	0	1
612.55	286	286	0	0	0	0	0	0	1
613.04	358	358	0	0	0	0	0	0	1
613.50	430	430	0	0	0	0	0	0	1
613.96	501	501	0	0	0	0	0	0	1
614.46	573	573	0	0	0	0	0	0	1
614.98	644	641	0	0	0	0	0	2	4
615.36	716	687	0	0	0	0	0	28	3
614.90	631	631	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: ALVORD1 DATE: 03-04-1999

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
608.90	0.00	0	0	0.00
610.40	0.00	72	0	0.00
611.27	0.00	143	0	0.00
611.98	0.00	215	0	0.00
612.55	0.00	286	0	0.00
613.04	0.00	358	0	0.00
613.50	0.00	430	0	0.00
613.96	0.00	501	0	0.00
614.46	0.00	573	0	0.00
614.98	-0.01	644	1	0.20
615.36	-0.00	716	1	0.10

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

PERFORMANCE CURVE FOR CULVERT # 1 - 2 (8 BY 5) IRCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	608.90	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
72	610.40	1.50	1.50	1-S2n	0.72	0.84	5.89	0.76	5.29	1.21
143	611.27	2.37	2.37	1-S2n	1.14	1.35	7.43	1.21	6.64	1.82
215	611.98	3.08	3.08	1-S2n	1.48	1.77	8.46	1.60	7.55	2.31
286	612.55	3.65	3.65	1-S2n	1.78	2.15	9.27	1.94	8.23	2.73
358	613.04	4.14	4.14	1-S2n	2.07	2.50	9.93	2.27	8.80	3.10
430	613.50	4.60	4.60	1-S2n	2.33	2.82	10.41	2.60	9.27	3.44
501	613.96	5.06	5.06	5-S2n	2.74	3.12	10.68	2.96	9.69	3.76
573	614.46	5.56	5.56	5-S2n	3.18	3.41	11.10	3.26	10.06	4.05
641	614.97	6.07	6.07	5-S2n	3.46	3.65	11.56	3.51	10.41	4.32
687	615.35	6.45	6.45	5-S2n	3.66	3.81	11.93	3.66	10.71	4.58

El. inlet face invert	608.90 ft	El. outlet invert	608.78 ft
El. inlet throat invert	0.00 ft	El. inlet crest	0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	608.90
OUTLET STATION (FT)	30.00
OUTLET ELEVATION (FT)	608.78
NUMBER OF BARRELS	2
SLOPE (V-FT/H-FT)	0.0040
CULVERT LENGTH ALONG SLOPE (FT)	30.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	USER DEFINED
BARREL SPAN	8.00 FT
BARREL RISE	5.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012 FOR SIDES AND TOP
	0.012 FOR BOTTOM
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	BEVELED
INLET DEPRESSION	NONE

***** USER DEFINED CULVERT CROSS-SECTION - CULVERT # 1

COORDINATE NUMBER	X (FT)	Y-TOP (FT)	Y-BOTTOM (FT)
1	0.00	0.00	0.00
2	0.20	3.62	0.00
3	0.60	4.20	0.00
4	0.91	4.50	0.00
5	1.10	4.60	0.00
6	1.50	4.74	0.00
7	2.12	4.85	0.00
8	3.10	4.97	0.00
9	4.00	5.00	0.00
10	5.20	4.94	0.00
11	5.95	4.84	0.00
12	6.50	4.74	0.00
13	7.00	4.54	0.00
14	7.40	4.25	0.00
15	7.68	3.88	0.00
16	7.80	3.68	0.00
17	7.96	3.20	0.00
18	8.00	2.80	0.00
19	8.00	0.00	0.00

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

BOTTOM WIDTH (FT)	10.00
SIDE SLOPE H/V (X:1)	1.0
CHANNEL SLOPE V/H (FT/FT)	0.005
MANNING'S N (.01-0.1)	0.020
CHANNEL INVERT ELEVATION (FT)	608.78
CULVERT NO.1 OUTLET INVERT ELEVATION	608.78 FT

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	608.78	0.000	0.00	0.00	0.00
71.60	609.99	0.848	1.21	5.29	0.38
143.20	610.60	0.867	1.82	6.64	0.57
214.80	611.09	0.875	2.31	7.55	0.72
286.40	611.51	0.878	2.73	8.23	0.85
358.00	611.89	0.880	3.10	8.80	0.97
429.60	612.22	0.881	3.44	9.27	1.08
501.20	612.54	0.881	3.76	9.69	1.17
572.80	612.83	0.881	4.05	10.06	1.26
644.40	613.10	0.882	4.32	10.41	1.35
716.00	613.36	0.882	4.58	10.71	1.43

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	30.00
CREST LENGTH (FT)	30.00
OVERTOPPING CREST ELEVATION (FT)	614.90

CURRENT DATE: 03-09-1999
CURRENT TIME: 11:52:56

FILE DATE: 03-09-1999
FILE NAME: MILTON1

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	608.90	608.74	40.00	4 IRCP	8.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: MILTON1 DATE: 03-09-1999

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
608.90	0	0	0	0	0	0	0	0	1
610.08	77	77	0	0	0	0	0	0	1
610.77	153	153	0	0	0	0	0	0	1
611.33	230	230	0	0	0	0	0	0	1
611.83	307	307	0	0	0	0	0	0	1
612.35	384	384	0	0	0	0	0	0	1
612.89	460	460	0	0	0	0	0	0	1
613.43	537	537	0	0	0	0	0	0	1
613.85	614	572	0	0	0	0	0	37	3
614.18	690	586	0	0	0	0	0	102	3
614.28	716	590	0	0	0	0	0	125	3
613.50	543	543	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: MILTON1 DATE: 03-09-1999

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
608.90	0.00	0	0	0.00
610.08	0.00	77	0	0.00
610.77	0.00	153	0	0.00
611.33	0.00	230	0	0.00
611.83	0.00	307	0	0.00
612.35	0.00	384	0	0.00
612.89	0.00	460	0	0.00
613.43	0.00	537	0	0.00
613.85	-0.01	614	5	0.74
614.18	-0.00	690	2	0.35
614.28	-0.00	716	1	0.09

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

PERFORMANCE CURVE FOR CULVERT # 1 - 4 (8 BY 3) IRCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	608.90	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
77	610.08	1.02	1.18	3-M1t	0.49	0.56	1.96	1.24	5.52	1.24
153	610.77	1.61	1.87	3-M1t	0.79	0.89	2.63	1.87	6.93	1.87
230	611.33	2.07	2.43	3-M1t	1.05	1.17	3.19	2.36	7.87	2.36
307	611.83	2.44	2.93	3-M1t	1.27	1.42	3.77	2.79	8.58	2.79
384	612.35	2.77	3.45	4-FFt	1.48	1.64	4.55	3.00	9.17	3.17
460	612.89	3.11	3.99	4-FFt	1.69	1.85	5.46	3.00	9.66	3.52
537	613.43	3.48	4.53	4-FFt	1.90	2.04	6.37	3.00	10.10	3.84
572	613.85	3.66	4.95	4-FFt	1.99	2.12	6.78	3.00	10.48	4.14
586	614.17	3.74	5.27	4-FFt	2.03	2.15	6.95	3.00	10.84	4.42
590	614.28	3.76	5.38	4-FFt	2.04	2.16	7.00	3.00	10.95	4.51

El. inlet face invert 608.90 ft El. outlet invert 608.74 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	608.90
OUTLET STATION (FT)	40.00
OUTLET ELEVATION (FT)	608.74
NUMBER OF BARRELS	4
SLOPE (V-FT/H-FT)	0.0040
CULVERT LENGTH ALONG SLOPE (FT)	40.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	USER DEFINED
BARREL SPAN	8.00 FT
BARREL RISE	3.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012 FOR SIDES AND TOP
	0.012 FOR BOTTOM
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	BEVELED
INLET DEPRESSION	NONE

***** USER DEFINED CULVERT CROSS-SECTION - CULVERT # 1

COORDINATE NUMBER	X (FT)	Y-TOP (FT)	Y-BOTTOM (FT)
1	0.00	0.00	0.00
2	0.20	1.62	0.00
3	0.60	2.20	0.00
4	0.91	2.50	0.00
5	1.10	2.60	0.00
6	1.50	2.74	0.00
7	2.12	2.85	0.00
8	3.10	2.97	0.00
9	4.00	3.00	0.00
10	5.20	2.94	0.00
11	5.95	2.84	0.00
12	6.50	2.74	0.00
13	7.00	2.54	0.00
14	7.40	2.25	0.00
15	7.68	1.88	0.00
16	7.80	1.68	0.00
17	7.96	1.20	0.00
18	8.00	0.80	0.00
19	8.00	0.00	0.00

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

BOTTOM WIDTH (FT)	10.00
SIDE SLOPE H/V (X:1)	1.0
CHANNEL SLOPE V/H (FT/FT)	0.004
MANNING'S N (.01-0.1)	0.018
CHANNEL INVERT ELEVATION (FT)	608.74
CULVERT NO.1 OUTLET INVERT ELEVATION	608.74 FT

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	608.74	0.000	0.00	0.00	0.00
76.70	609.98	0.875	1.24	5.52	0.33
153.40	610.61	0.894	1.87	6.93	0.50
230.10	611.10	0.902	2.36	7.87	0.63
306.80	611.53	0.905	2.79	8.58	0.75
383.50	611.91	0.907	3.17	9.17	0.85
460.20	612.26	0.908	3.52	9.66	0.94
536.90	612.58	0.908	3.84	10.10	1.03
613.60	612.88	0.908	4.14	10.48	1.11
690.30	613.16	0.909	4.42	10.84	1.19
716.00	613.25	0.909	4.51	10.95	1.21

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	100.00
CREST LENGTH (FT)	60.00
OVERTOPPING CREST ELEVATION (FT)	613.50

ALVORD RD EARHT DITCH BANK PROTECTED
Worksheet for Irregular Channel

Project Description	
Project File	untitled.fm2
Worksheet	EARTHEN DITCH 2
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.004000	ft/ft
Elevation range: 0.00 ft to 6.00 ft.		
Discharge	633.00	cfs

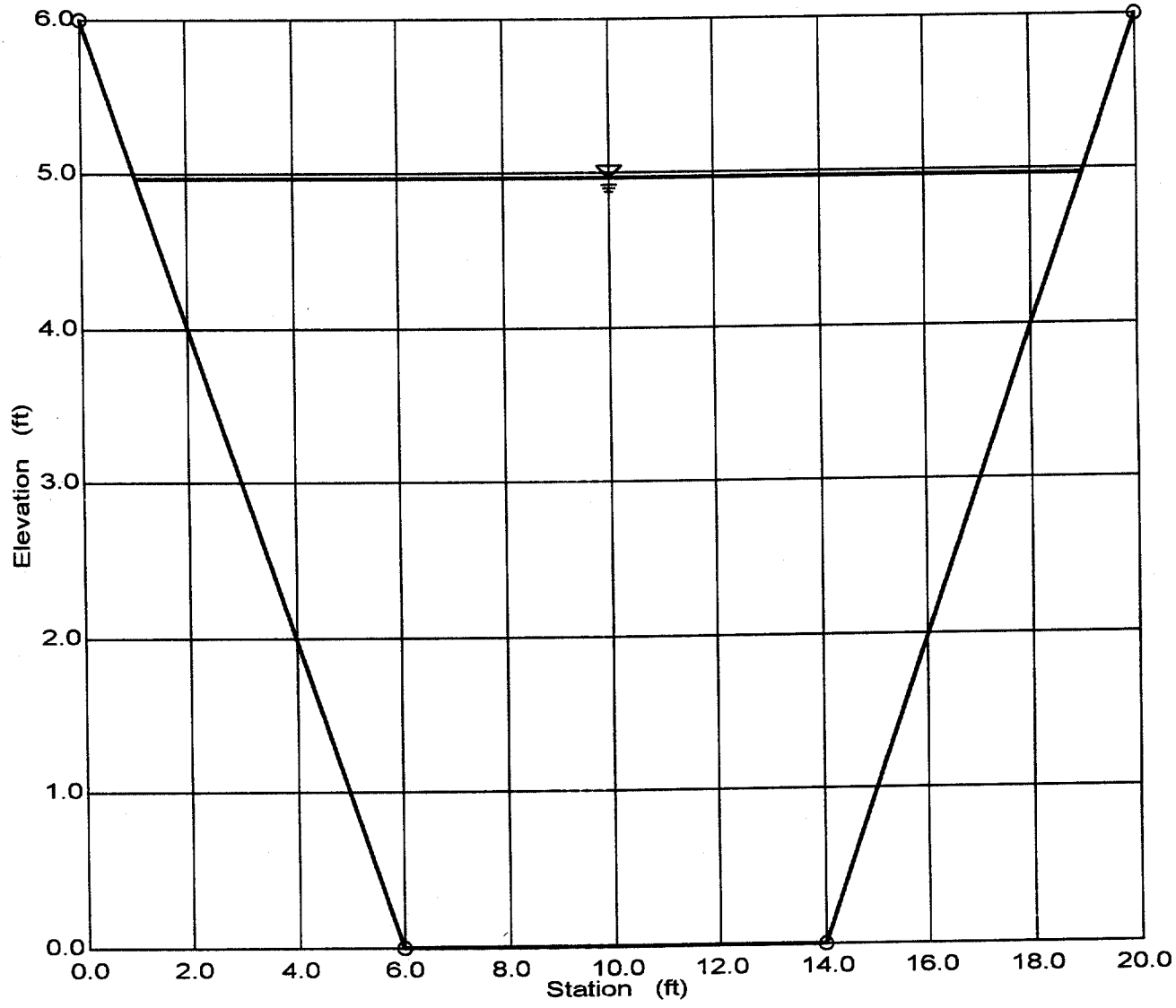
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	6.00	0.00	6.00	0.016
6.00	0.00	6.00	14.00	0.025
14.00	0.00	14.00	20.00	0.016
20.00	6.00			

Results		
Wtd. Mannings Coefficient	0.020	
Water Surface Elevation	4.96	ft
Flow Area	64.32	ft^2
Wetted Perimeter	22.04	ft
Top Width	17.92	ft
Height	4.96	ft
Critical Depth	4.72	ft
Critical Slope	0.004860	ft/ft
Velocity	9.84	ft/s
Velocity Head	1.50	ft
Specific Energy	6.47	ft
Froude Number	0.92	
Flow is subcritical.		

Cross Section earthen ditch bank protected
Cross Section for Irregular Channel

Project Description	
Project File	untitled.fm2
Worksheet	EARTHEN DITCH 2
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.020	
Channel Slope	0.004000	ft/ft
Water Surface Elevation	4.96	ft
Discharge	633.00	cfs



SCHOOL ACCES LANE WEIR FLOW
Worksheet for Rectangular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	SCHOOL ACCESS LANE WEIR FLOW
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

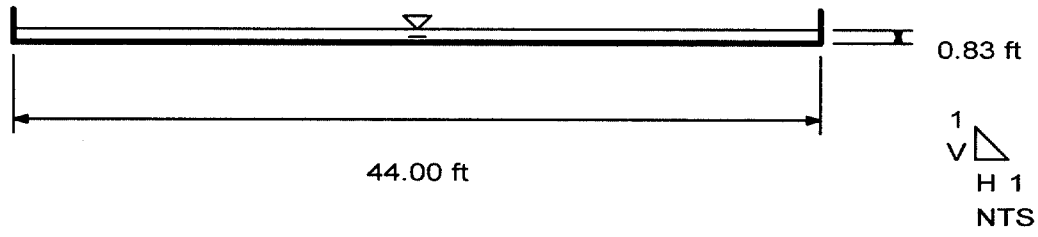
Input Data		
Mannings Coefficient	0.020	
Channel Slope	0.005000	ft/ft
Depth	0.83	ft
Bottom Width	44.00	ft

Results		
Discharge	165.31	cfs
Flow Area	36.52	ft²
Wetted Perimeter	45.66	ft
Top Width	44.00	ft
Critical Depth	0.76	ft
Critical Slope	0.006683	ft/ft
Velocity	4.53	ft/s
Velocity Head	0.32	ft
Specific Energy	1.15	ft
Froude Number	0.88	
Flow is subcritical.		

Cross Section Weir flow
Cross Section for Rectangular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	SCHOOL ACCESS LANE WEIR FLOW
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.020	
Channel Slope	0.005000	ft/ft
Depth	0.83	ft
Bottom Width	44.00	ft
Discharge	165.31	cfs



ALT-ALV MAX
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\alvord.fm2
Worksheet	ALV-GUTTER
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.004000	ft/ft
Water Surface Elevation	14.83	ft

Elevation range: 14.00 ft to 15.00 ft.

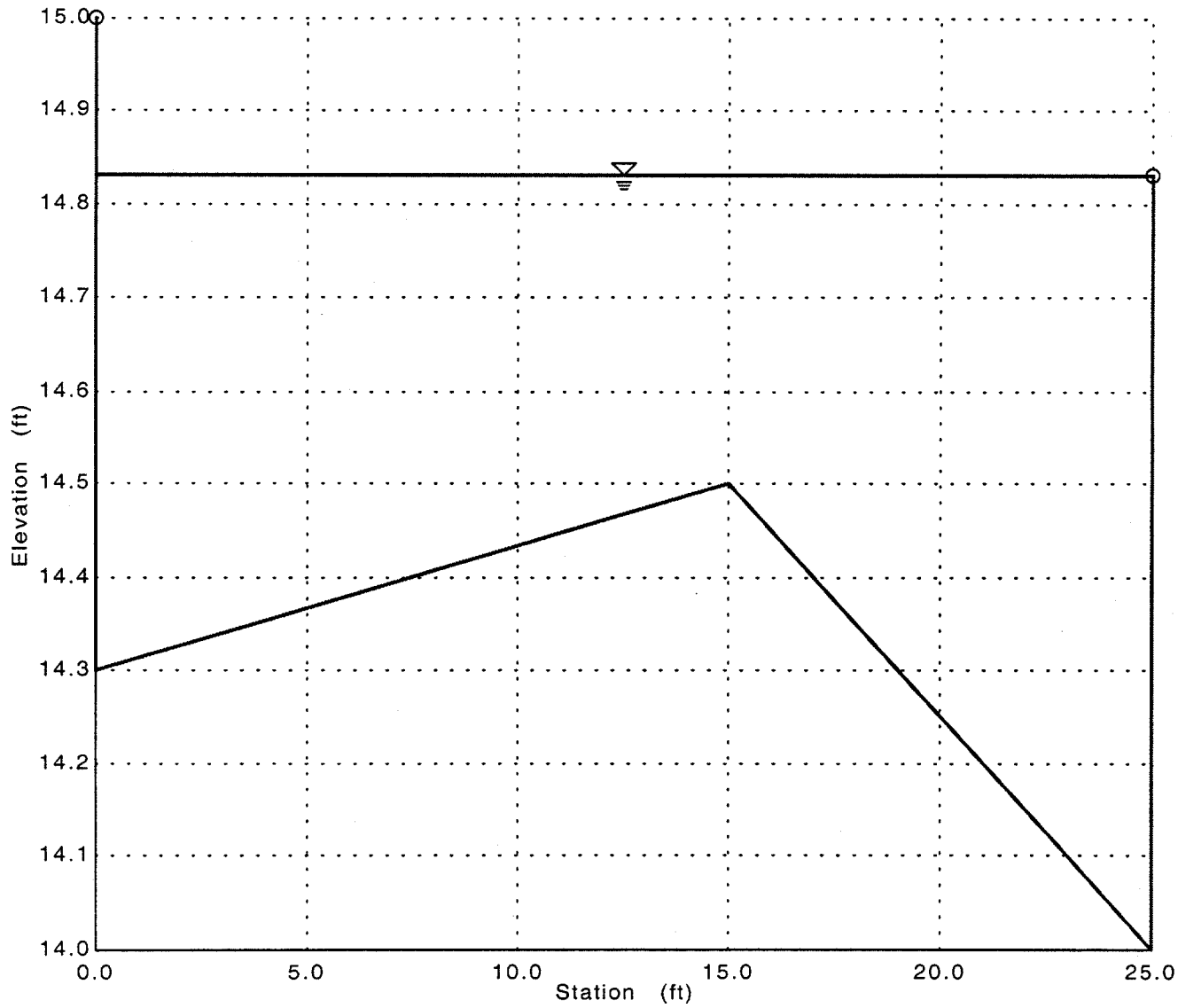
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	15.00	0.00	25.00	0.016
0.00	14.30			
15.00	14.50			
25.00	14.00			
25.00	14.83			

Results		
Wtd. Mannings Coefficient	0.016	
Discharge	43.15	cfs
Flow Area	12.25	ft²
Wetted Perimeter	26.37	ft
Top Width	25.00	ft
Height	0.83	ft
Critical Depth	14.79	ft
Critical Slope	0.005199	ft/ft
Velocity	3.52	ft/s
Velocity Head	0.19	ft
Specific Energy	15.02	ft
Froude Number	0.89	
Flow is subcritical.		

ALT ALV MAX
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\ew-fllowmasterr\alvord.fm2
Worksheet	ALV-GUTTER
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.016	
Channel Slope	0.004000	ft/ft
Water Surface Elevation	14.83	ft
Discharge	43.15	cfs



Earthen Channel
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	EARHEN CHANNEL
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.004000	ft/ft
Water Surface Elevation	10.00	ft

Elevation range: 5.00 ft to 12.00 ft.

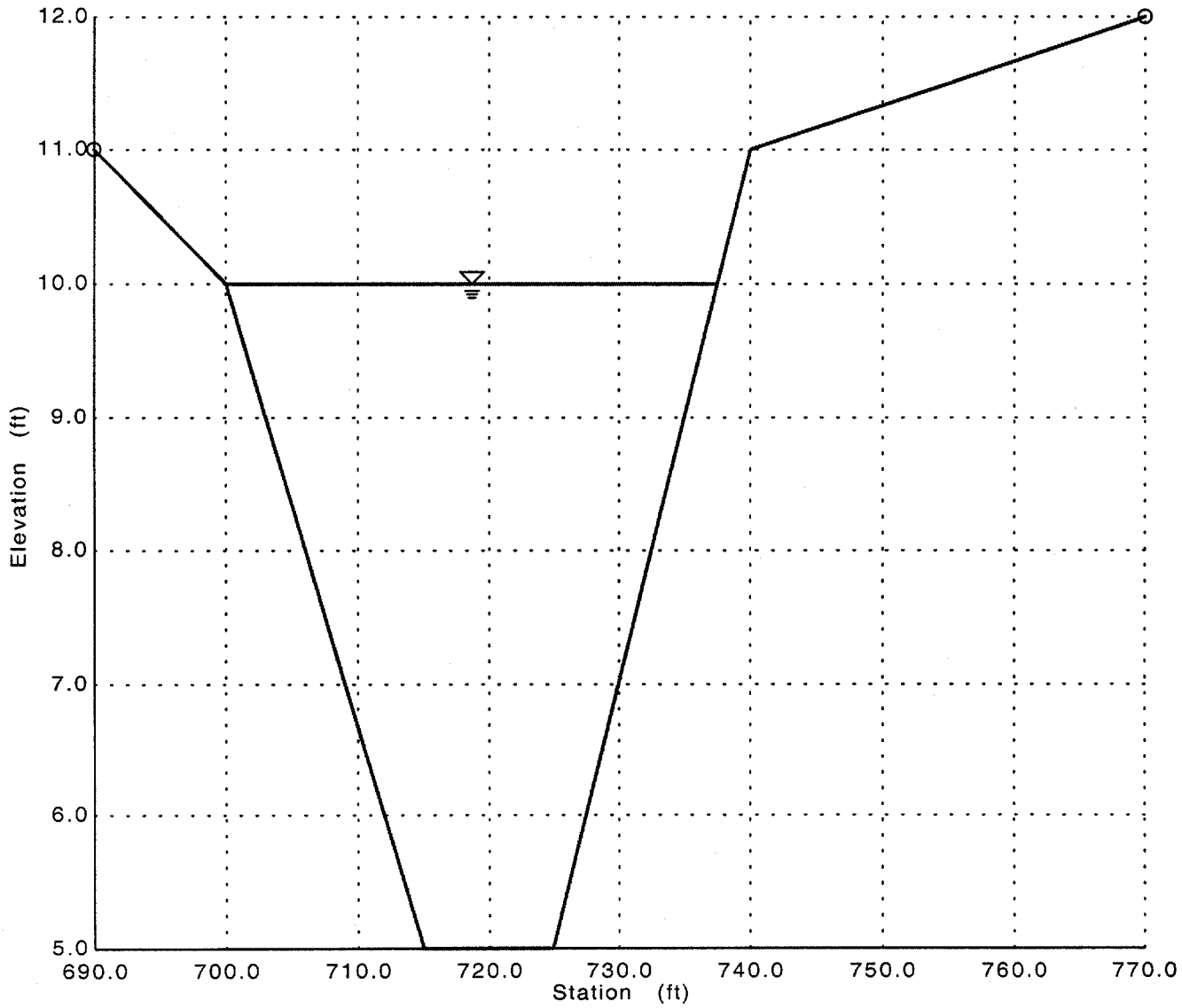
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
690.00	11.00	690.00	770.00	0.030
700.00	10.00			
715.00	5.00			
725.00	5.00			
740.00	11.00			
770.00	12.00			

Results		
Wtd. Mannings Coefficient	0.030	
Discharge	777.84	cfs
Flow Area	118.75	ft^2
Wetted Perimeter	39.27	ft
Top Width	37.50	ft
Height	5.00	ft
Critical Depth	9.02	ft
Critical Slope	0.010063	ft/ft
Velocity	6.55	ft/s
Velocity Head	0.67	ft
Specific Energy	10.67	ft
Froude Number	0.65	
Flow is subcritical.		

EARTHEN CHANNEL @ Cross Section 70
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	EARHEN CHANNEL
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.030	
Channel Slope	0.004000	ft/ft
Water Surface Elevation	10.00	ft
Discharge	777.84	cfs



Worksheet Berm @ X-section 80
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	BERM @ CROSS-SECTION 80
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.010000	ft/ft

Elevation range: 6.00 ft to 11.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	11.00	0.00	38.00	0.030
15.00	6.00			
20.00	6.00			
35.00	11.00			
38.00	11.00			

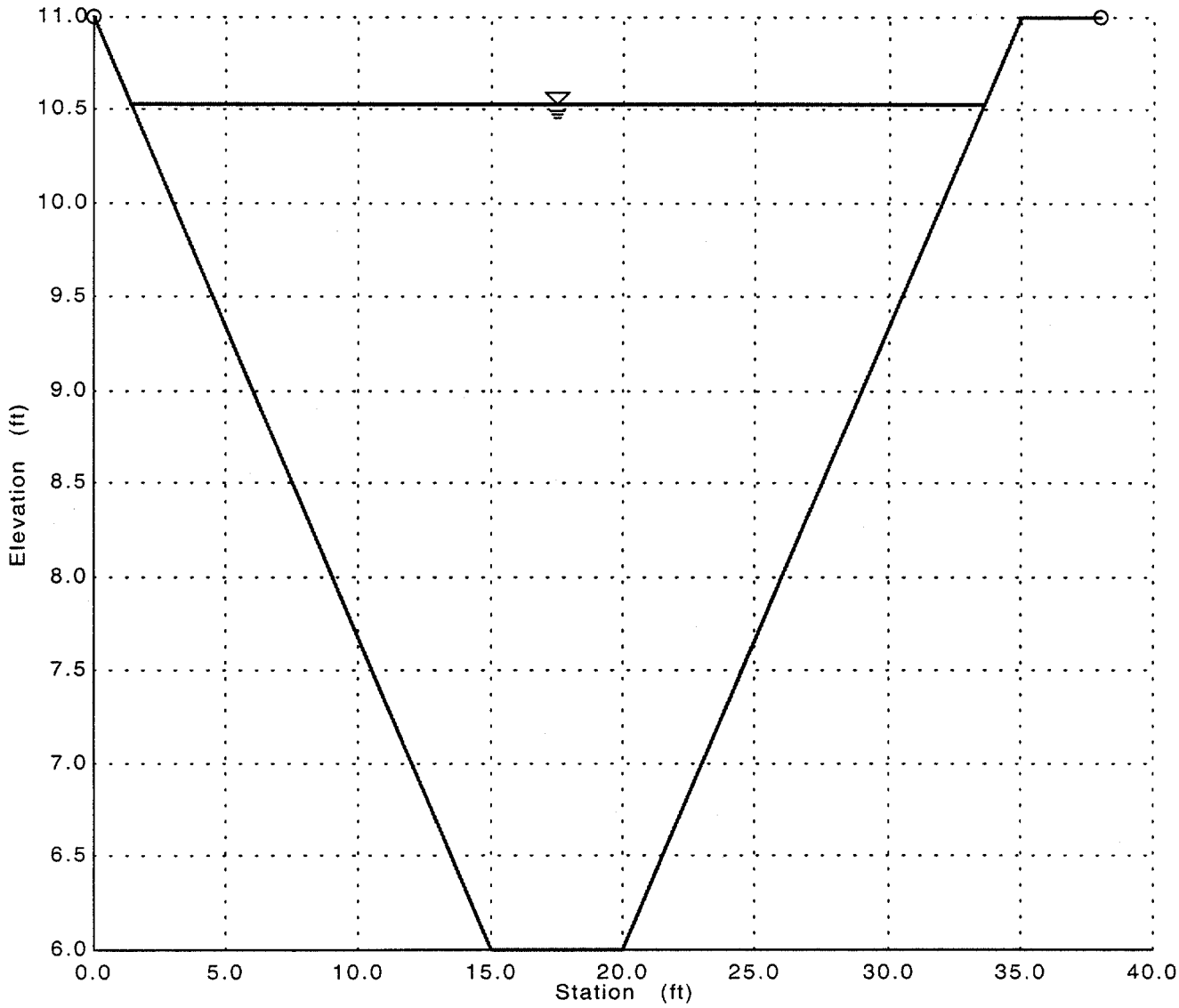
Discharge	767.00	cfs

Results		
Wtd. Mannings Coefficient	0.030	
Water Surface Elevation	10.53	ft
Flow Area	84.06	ft^2
Wetted Perimeter	33.62	ft
Top Width	32.15	ft
Height	4.53	ft
Critical Depth	10.51	ft
Critical Slope	0.010111	ft/ft
Velocity	9.12	ft/s
Velocity Head	1.29	ft
Specific Energy	11.82	ft
Froude Number	0.99	
Flow is subcritical.		

Cross Section 80 W/Berm
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	BERM @ CROSS-SECTION 80
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.030	
Channel Slope	0.010000	ft/ft
Water Surface Elevation	10.53	ft
Discharge	767.00	cfs



MILTON ROAD W/ CHANNEL @ S. RofW
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	MILTON CHANNEL W/S CHANNEL
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.005000	ft/ft
Elevation range: 0.00 ft to 5.33 ft.		
Discharge	767.00	cfs

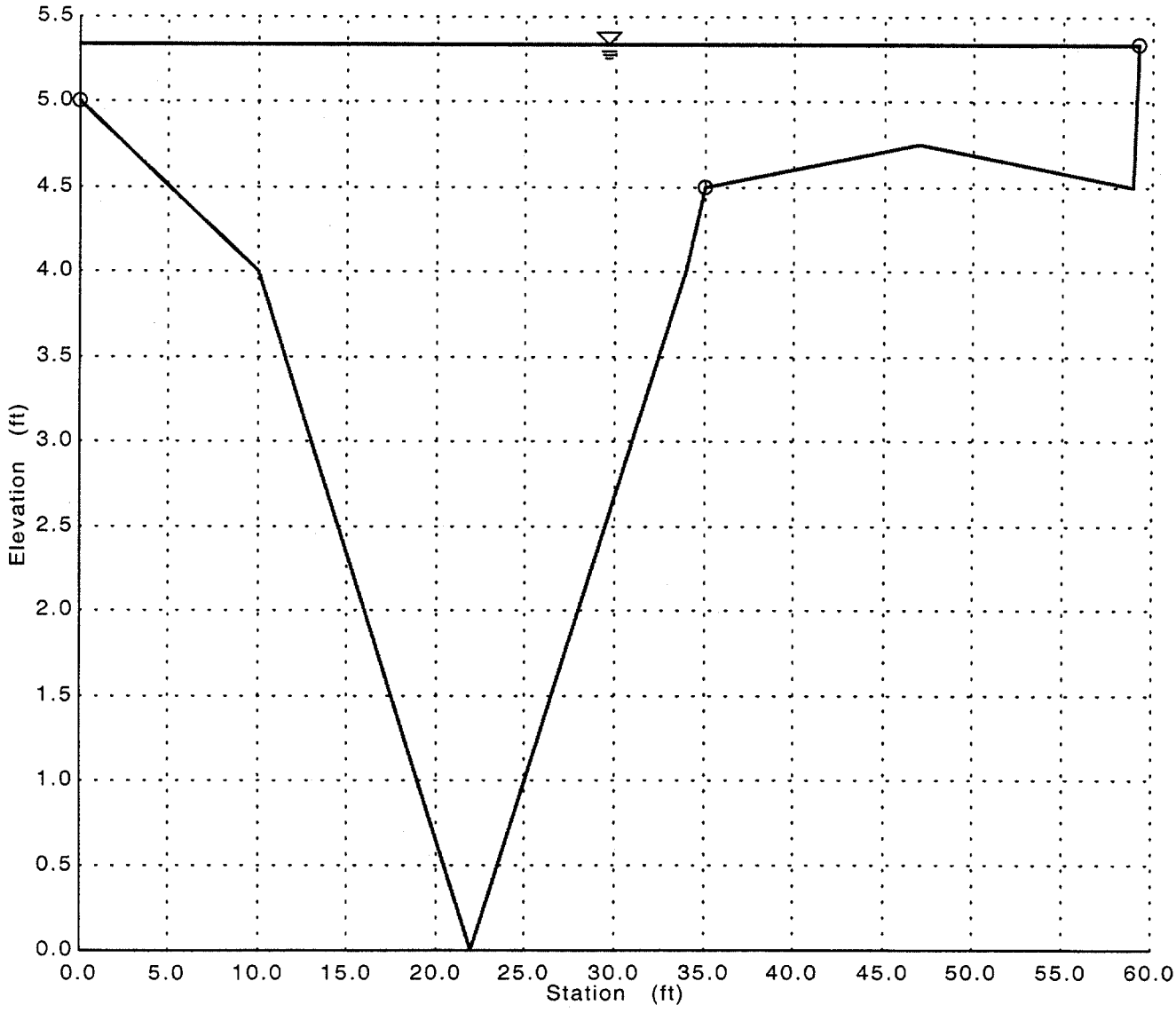
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5.00	0.00	35.00	0.025
10.00	4.00	35.00	59.30	0.016
22.00	0.00			
34.00	4.00			
35.00	4.50			
47.00	4.75			
59.00	4.50			
59.30	5.33			

Results		
Wtd. Mannings Coefficient	0.021	
Water Surface Elevation	5.33	ft
Flow Area	106.55	ft²
Wetted Perimeter	61.69	ft
Top Width	59.30	ft
Height	5.33	ft
Critical Depth	5.27	ft
Critical Slope	0.005573	ft/ft
Velocity	7.20	ft/s
Velocity Head	0.81	ft
Specific Energy	6.14	ft
Froude Number	0.95	
Flow is subcritical.		
Water elevation exceeds lowest end station by 0.33 ft.		

Cross Section Milton RD. w/Channel @ S. RofW
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	MILTON CHANNEL W/S CHANNEL
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.021	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.33	ft
Discharge	767.00	cfs



MILTON ROAD
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	MILTON ROAD
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.33	ft

Elevation range: 4.50 ft to 5.50 ft.

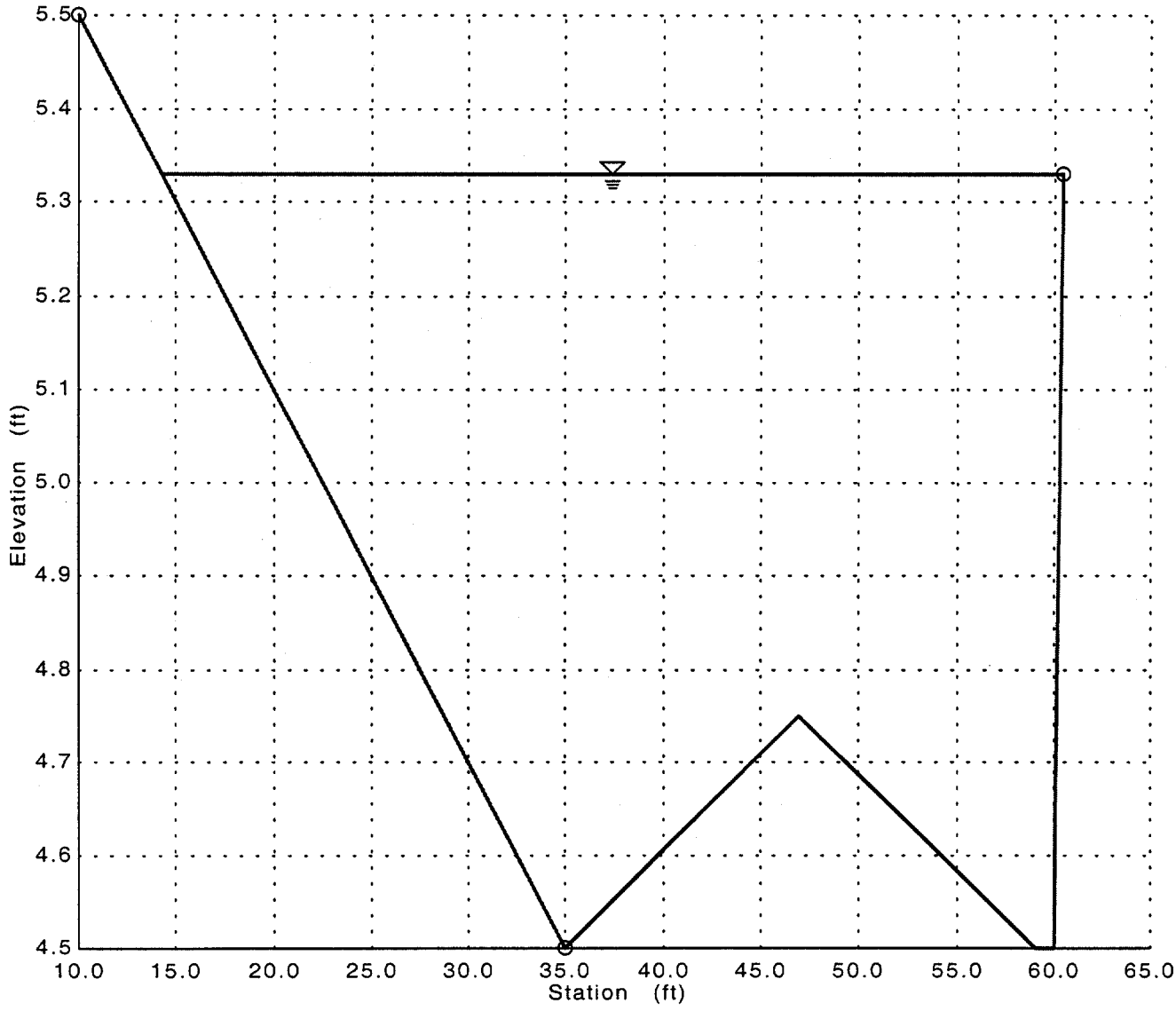
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
10.00	5.50	10.00	35.00	0.030
35.00	4.50	35.00	60.50	0.016
47.00	4.75			
59.00	4.50			
60.00	4.50			
60.50	5.33			

Results		
Wtd. Mannings Coefficient	0.018	
Discharge	108.97	cfs
Flow Area	26.57	ft²
Wetted Perimeter	46.74	ft
Top Width	46.25	ft
Height	0.83	ft
Critical Depth	5.31	ft
Critical Slope	0.005524	ft/ft
Velocity	4.10	ft/s
Velocity Head	0.26	ft
Specific Energy	5.59	ft
Froude Number	0.95	
Flow is subcritical.		

Cross Section Milton RD.
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	MILTON ROAD
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.018	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.33	ft
Discharge	108.97	cfs



CHANNEL @ N. RofW MILTON ROAD
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	N CHANNEL @ MILTON RD
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.00	ft

Elevation range: 1.00 ft to 5.83 ft.

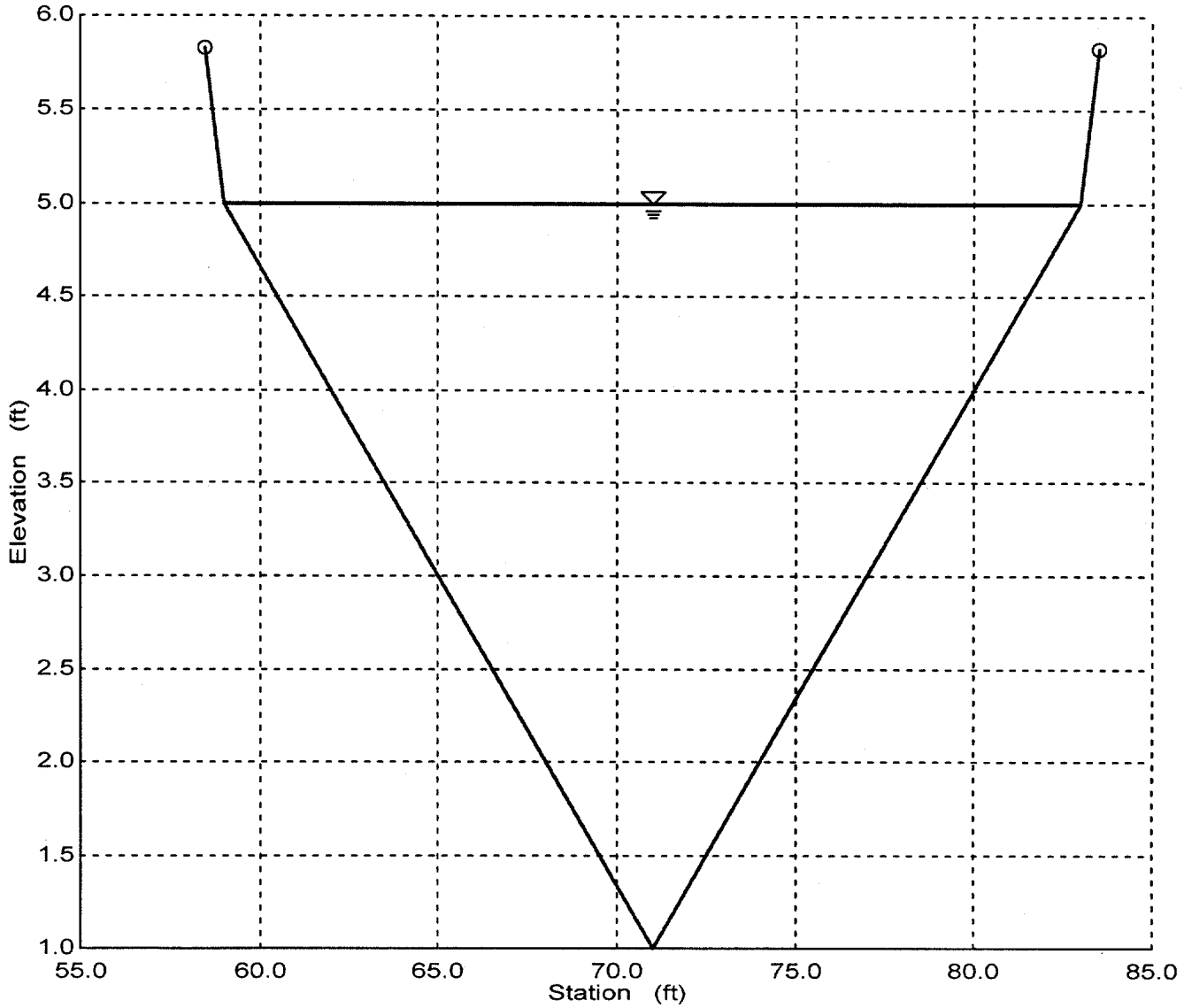
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
58.50	5.83	58.50	83.50	0.025
59.00	5.00			
71.00	1.00			
83.00	5.00			
83.50	5.83			

Results		
Wtd. Mannings Coefficient	0.025	
Discharge	309.18	cfs
Flow Area	48.00	ft²
Wetted Perimeter	25.30	ft
Top Width	24.00	ft
Height	4.00	ft
Critical Depth	4.66	ft
Critical Slope	0.007985	ft/ft
Velocity	6.44	ft/s
Velocity Head	0.64	ft
Specific Energy	5.64	ft
Froude Number	0.80	
Flow is subcritical.		

Cross Section Channel @ N. RofW Milton RD.
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	N CHANNEL @ MILTON RD
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.025	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.00	ft
Discharge	309.18	cfs



2A SHEET FLOW @ X-SECTION 110
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	SHEET FLOW @ X-SECTION 110
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

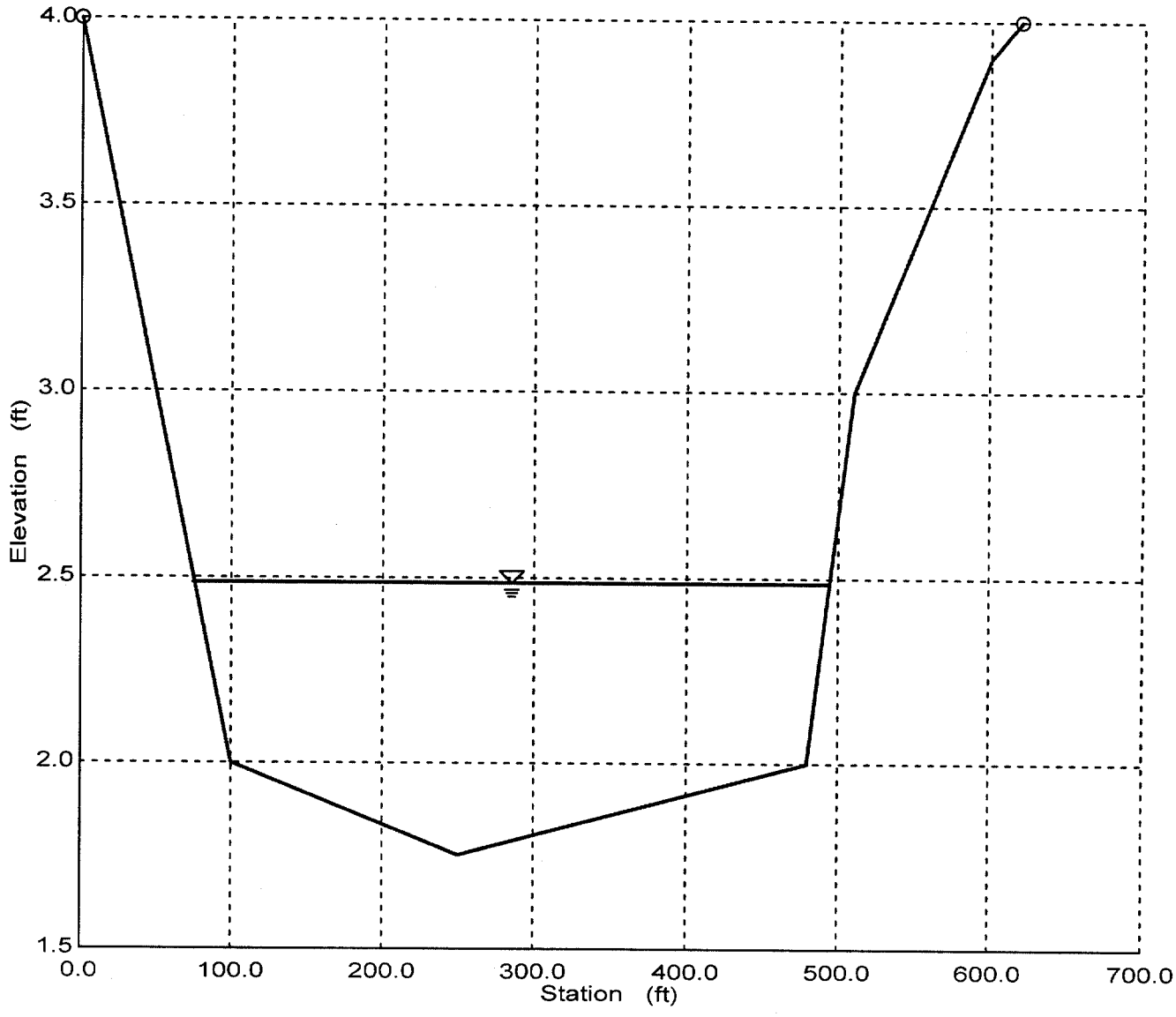
Input Data				
Channel Slope	0.005000 ft/ft			
Elevation range: 1.75 ft to 4.00 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	4.00	0.00	620.00	0.050
100.00	2.00			
250.00	1.75			
480.00	2.00			
510.00	3.00			
600.00	3.90			
620.00	4.00			
Discharge	349.00 cfs			

Results		
Wtd. Mannings Coefficient	0.050	
Water Surface Elevation	2.48	ft
Flow Area	240.40	ft²
Wetted Perimeter	418.66	ft
Top Width	418.65	ft
Height	0.73	ft
Critical Depth	2.17	ft
Critical Slope	0.055035	ft/ft
Velocity	1.45	ft/s
Velocity Head	0.03	ft
Specific Energy	2.52	ft
Froude Number	0.34	
Flow is subcritical.		

2A Sheet Flow @ Cross Section 110
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	SHEET FLOW @ X-SECTION 110
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.050	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	2.48	ft
Discharge	349.00	cfs



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APPENDIX C-3

Structural Alternatives 2b Street net Improved with Conc. Curbs

(Surface flow)

2BImproved Alvord @ Cross section 50 (S)
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B @ CROSS-SECTION 50 SOUTH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.007000	ft/ft
Water Surface Elevation	12.83	ft

Elevation range: 12.00 ft to 14.00 ft.

Station (ft)	Elevation (ft)
0.00	14.00
60.00	12.44
104.00	12.00
129.00	12.00
159.00	12.00
160.00	12.83

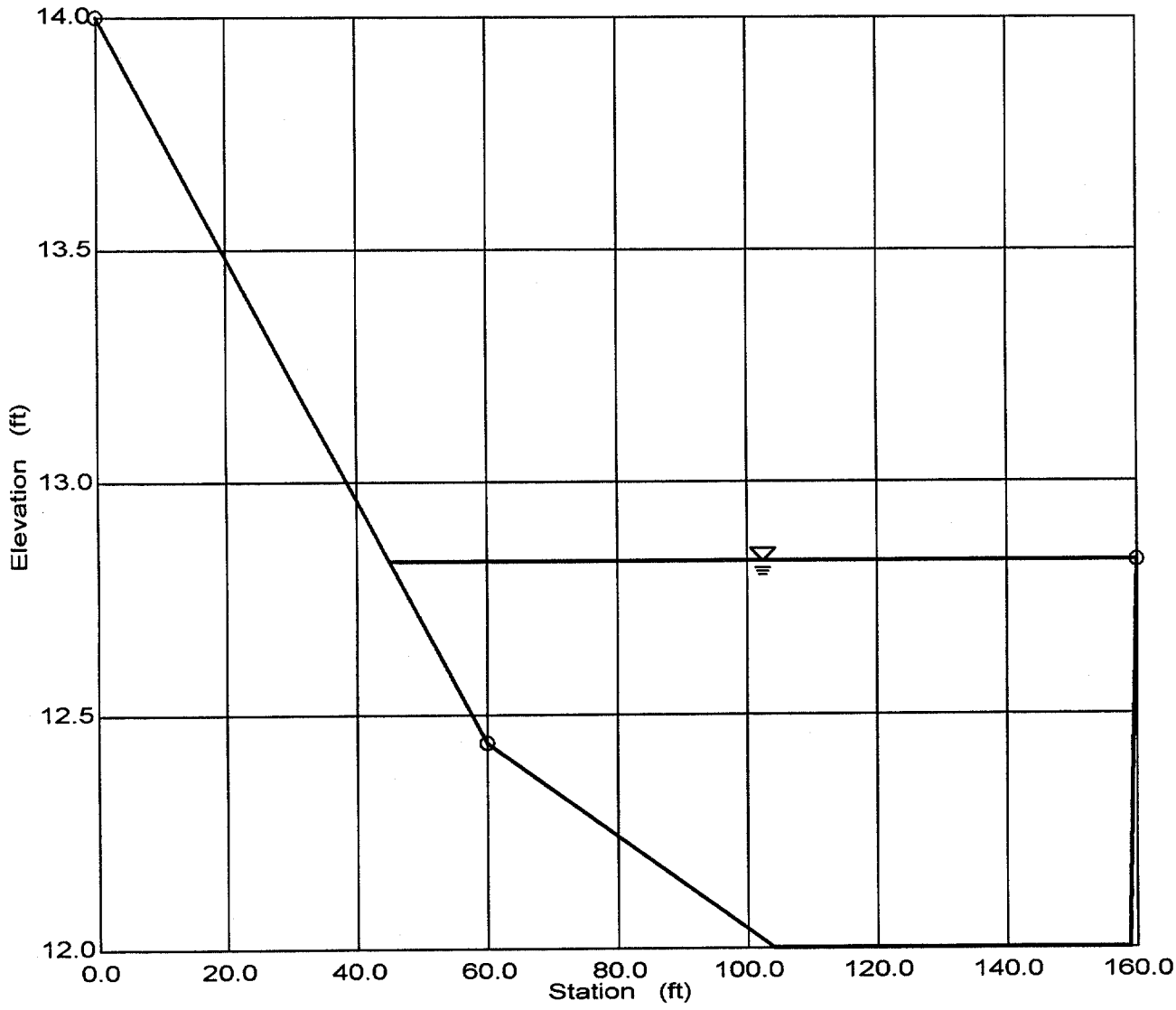
Start Station	End Station	Roughness
0.00	60.00	0.025
60.00	160.00	0.016

Results		
Wtd. Mannings Coefficient	0.017	
Discharge	412.16	cfs
Flow Area	75.83	ft^2
Wetted Perimeter	115.31	ft
Top Width	115.00	ft
Height	0.83	ft
Critical Depth	12.91	ft
Critical Slope	0.005007	ft/ft
Velocity	5.44	ft/s
Velocity Head	0.46	ft
Specific Energy	13.29	ft
Froude Number	1.18	
Flow is supercritical.		

2B IMPROVED ALVORD @ Cross Section 50 (S)
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B @ CROSS-SECTION 50 SOUTH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.017	
Channel Slope	0.007000	ft/ft
Water Surface Elevation	12.83	ft
Discharge	412.16	cfs



2B GARRET AVE IMPROVED
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B Garret Avenue Improved
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.004000	ft/ft
Water Surface Elevation	1.03	ft

Elevation range: 0.00 ft to 1.03 ft.

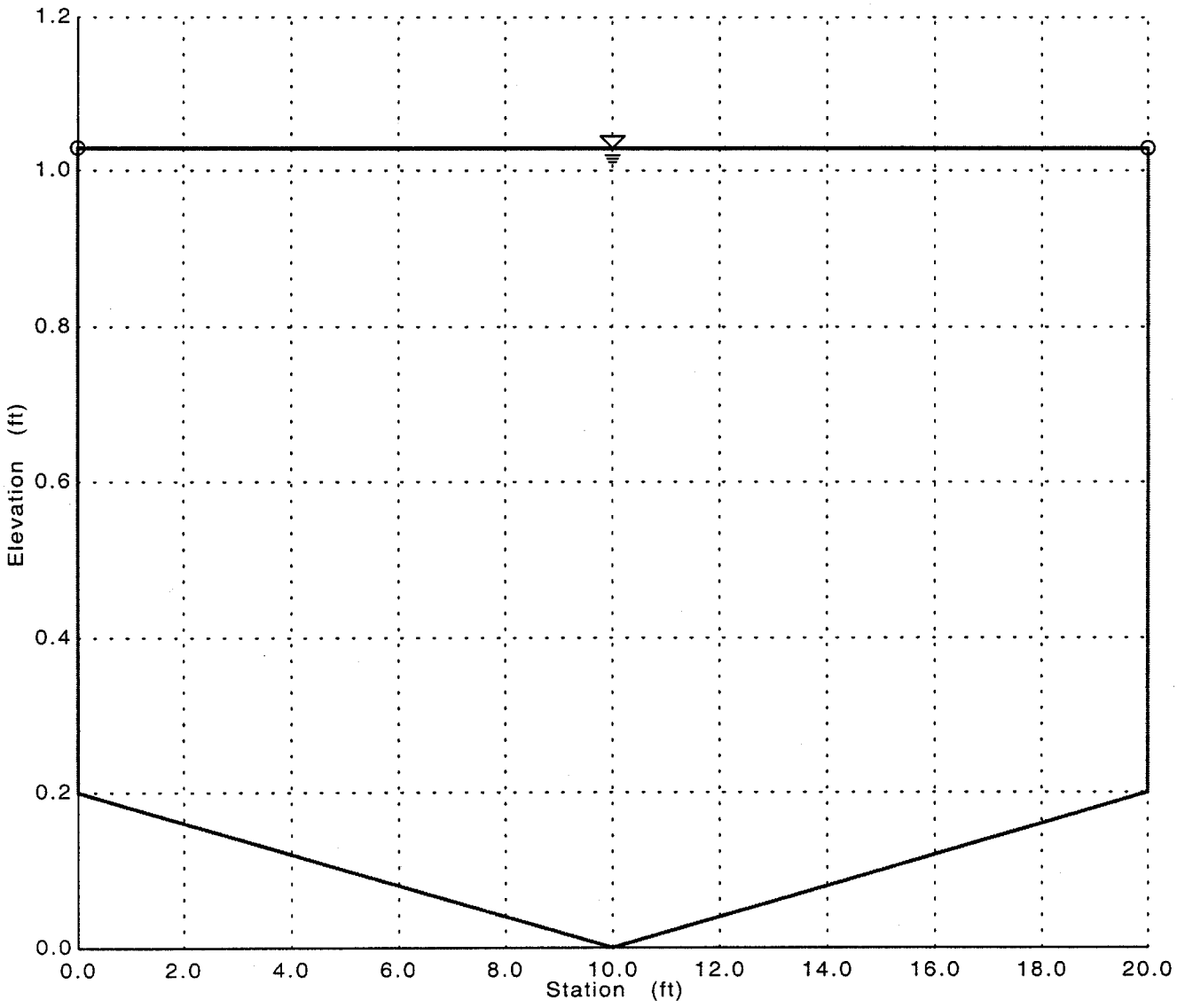
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1.03	0.00	20.00	0.016
0.00	0.20			
10.00	0.00			
20.00	0.20			
20.00	1.03			

Results		
Wtd. Mannings Coefficient	0.016	
Discharge	98.69	cfs
Flow Area	18.60	ft^2
Wetted Perimeter	21.66	ft
Top Width	20.00	ft
Height	1.03	ft
Critical Depth	1.01	ft
Critical Slope	0.004271	ft/ft
Velocity	5.31	ft/s
Velocity Head	0.44	ft
Specific Energy	1.47	ft
Froude Number	0.97	
Flow is subcritical.		

2B Cross Section Garret Ave Improved
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B Garret Avenue Improved
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.016	
Channel Slope	0.004000	ft/ft
Water Surface Elevation	1.03	ft
Discharge	98.69	cfs



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2BImproved Alvord @ Cross section 50 (N)
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B @ CROSS-SECTION 50 NORTH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.007000	ft/ft
Elevation range: 12.00 ft to 14.00 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
160.00	13.83	160.00	530.00	0.060
160.00	12.00			
370.00	13.00			
530.00	14.00			

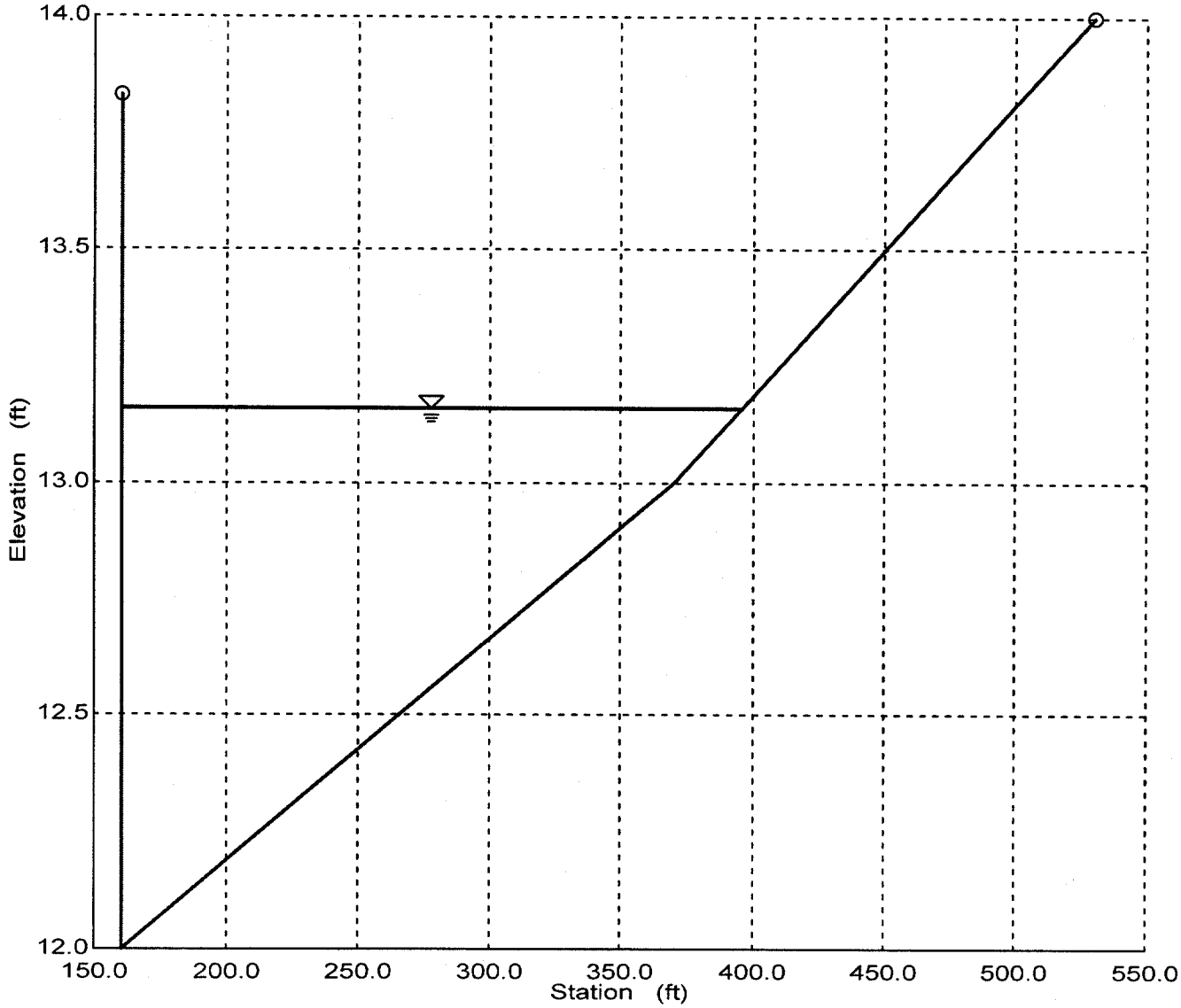
Discharge	206.00	cfs

Results		
Wtd. Mannings Coefficient	0.060	
Water Surface Elevation	13.16	ft
Flow Area	140.68	ft²
Wetted Perimeter	236.78	ft
Top Width	235.62	ft
Height	1.16	ft
Critical Depth	12.75	ft
Critical Slope	0.073167	ft/ft
Velocity	1.46	ft/s
Velocity Head	0.03	ft
Specific Energy	13.19	ft
Froude Number	0.33	
Flow is subcritical.		

2B Improved Alvord @ Cross Section 50
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B @ CROSS-SECTION 50 NORTH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.060	
Channel Slope	0.007000	ft/ft
Water Surface Elevation	13.16	ft
Discharge	206.00	cfs



Berm @ Cross section 70
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B BERM @ CROSS-SECTION 70
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.007000	ft/ft
Water Surface Elevation	11.00	ft

Elevation range: 7.00 ft to 11.00 ft.

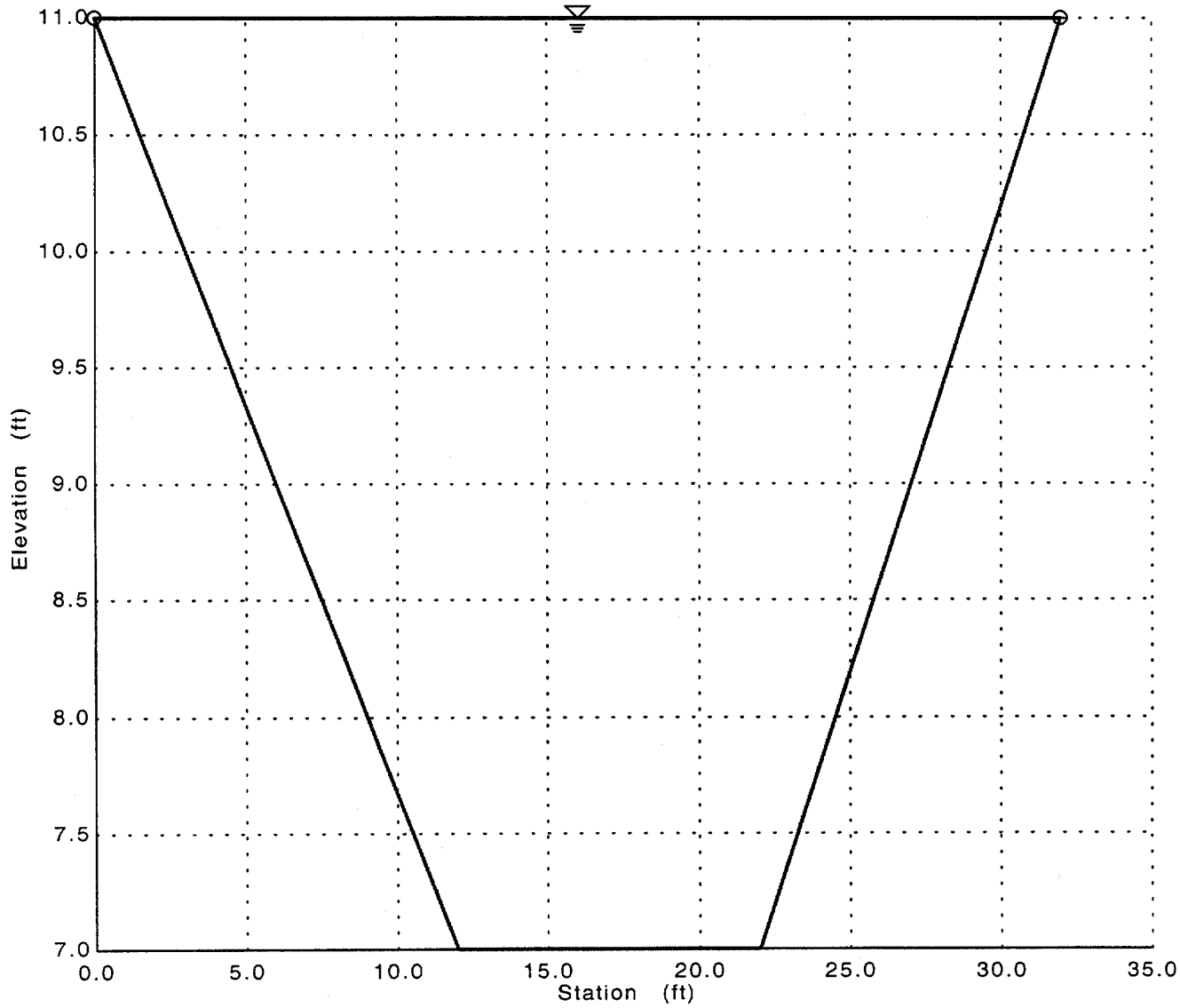
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	11.00	0.00	32.00	0.030
12.00	7.00			
22.00	7.00			
32.00	11.00			

Results		
Wtd. Mannings Coefficient	0.030	
Discharge	643.51	cfs
Flow Area	84.00	ft^2
Wetted Perimeter	33.42	ft
Top Width	32.00	ft
Height	4.00	ft
Critical Depth	10.64	ft
Critical Slope	0.010324	ft/ft
Velocity	7.66	ft/s
Velocity Head	0.91	ft
Specific Energy	11.91	ft
Froude Number	0.83	
Flow is subcritical.		

Berm @ Cross section 70
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B BERM @ CROSS-SECTION 70
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.030	
Channel Slope	0.007000	ft/ft
Water Surface Elevation	11.00	ft
Discharge	643.51	cfs



2B Ray Rd Improved
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B Ray RD Improved
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.004000	ft/ft
Water Surface Elevation	1.03	ft

Elevation range: 0.00 ft to 0.20 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.20	0.00	20.00	0.016
10.00	0.00			
20.00	0.20			

Results		
Wtd. Mannings Coefficient	0.016	
Discharge	98.69	cfs
Flow Area	18.60	ft^2
Wetted Perimeter	21.66	ft
Top Width	20.00	ft
Height	1.03	ft
Critical Depth	1.01	ft
Critical Slope	0.004271	ft/ft
Velocity	5.31	ft/s
Velocity Head	0.44	ft
Specific Energy	1.47	ft
Froude Number	0.97	

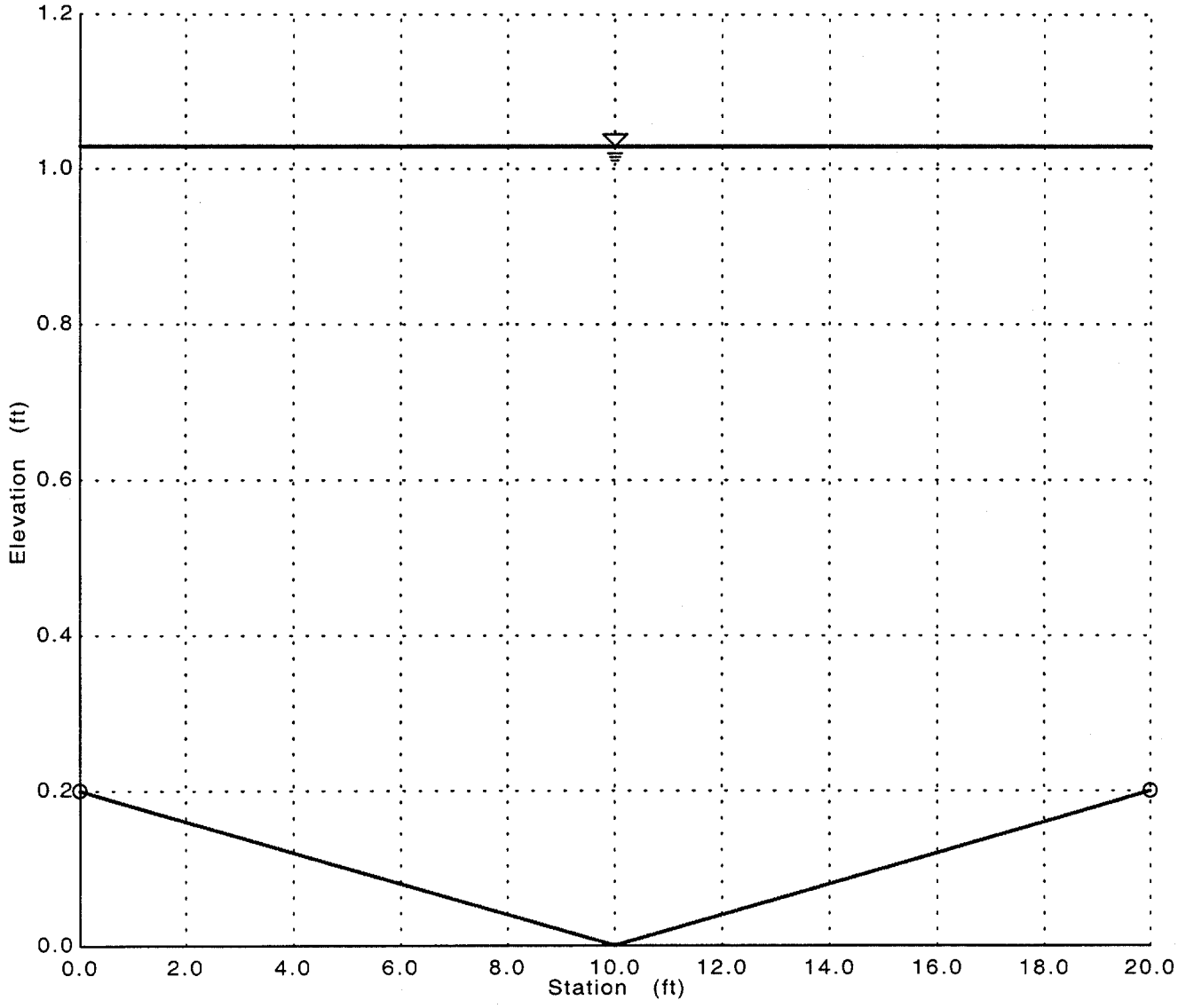
Flow is subcritical.

Water elevation exceeds lowest end station by 0.83 ft.

2B Cross Section Ray Rd Improved
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B Ray RD Improved
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.016	
Channel Slope	0.004000	ft/ft
Water Surface Elevation	1.03	ft
Discharge	98.69	cfs



2B MILTON ROAD W/ CHANNEL @ S. RofW
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B MILTON CHANNEL W/S CHANNEL
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

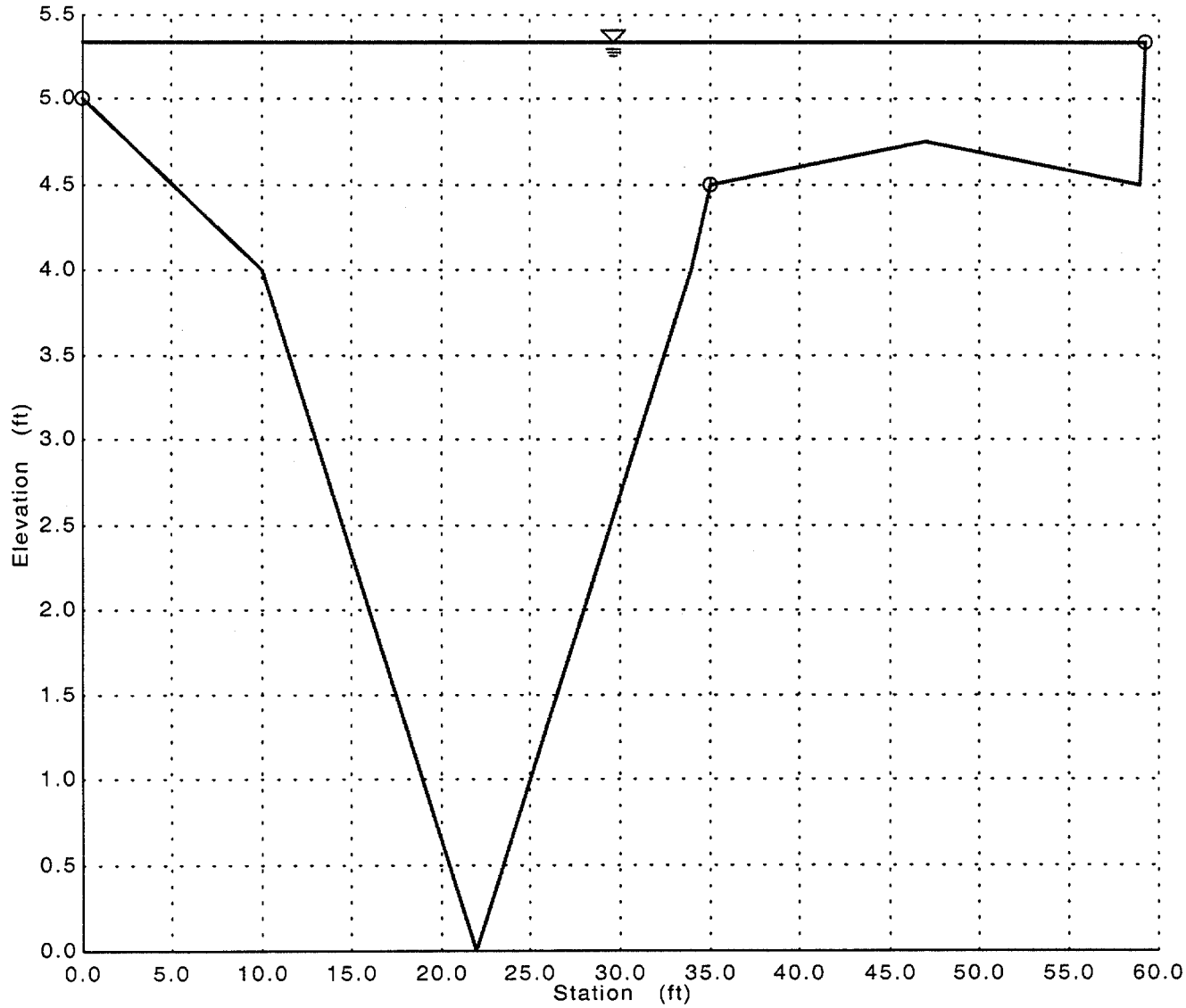
Input Data				
Channel Slope	0.005000 ft/ft			
Elevation range: 0.00 ft to 5.33 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5.00	0.00	35.00	0.025
10.00	4.00	35.00	59.30	0.016
22.00	0.00			
34.00	4.00			
35.00	4.50			
47.00	4.75			
59.00	4.50			
59.30	5.33			
Discharge	767.00 cfs			

Results		
Wtd. Mannings Coefficient	0.021	
Water Surface Elevation	5.33	ft
Flow Area	106.55	ft^2
Wetted Perimeter	61.69	ft
Top Width	59.30	ft
Height	5.33	ft
Critical Depth	5.27	ft
Critical Slope	0.005573	ft/ft
Velocity	7.20	ft/s
Velocity Head	0.81	ft
Specific Energy	6.14	ft
Froude Number	0.95	
Flow is subcritical.		
Water elevation exceeds lowest end station by 0.33 ft.		

2B Cross Section Milton RD. w/Channel @ S. RofW
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B MILTON CHANNEL W/S CHANNEL
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.021	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.33	ft
Discharge	767.00	cfs



2B MILTON ROAD
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B MILTON ROAD
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.33	ft

Elevation range: 4.50 ft to 5.50 ft.

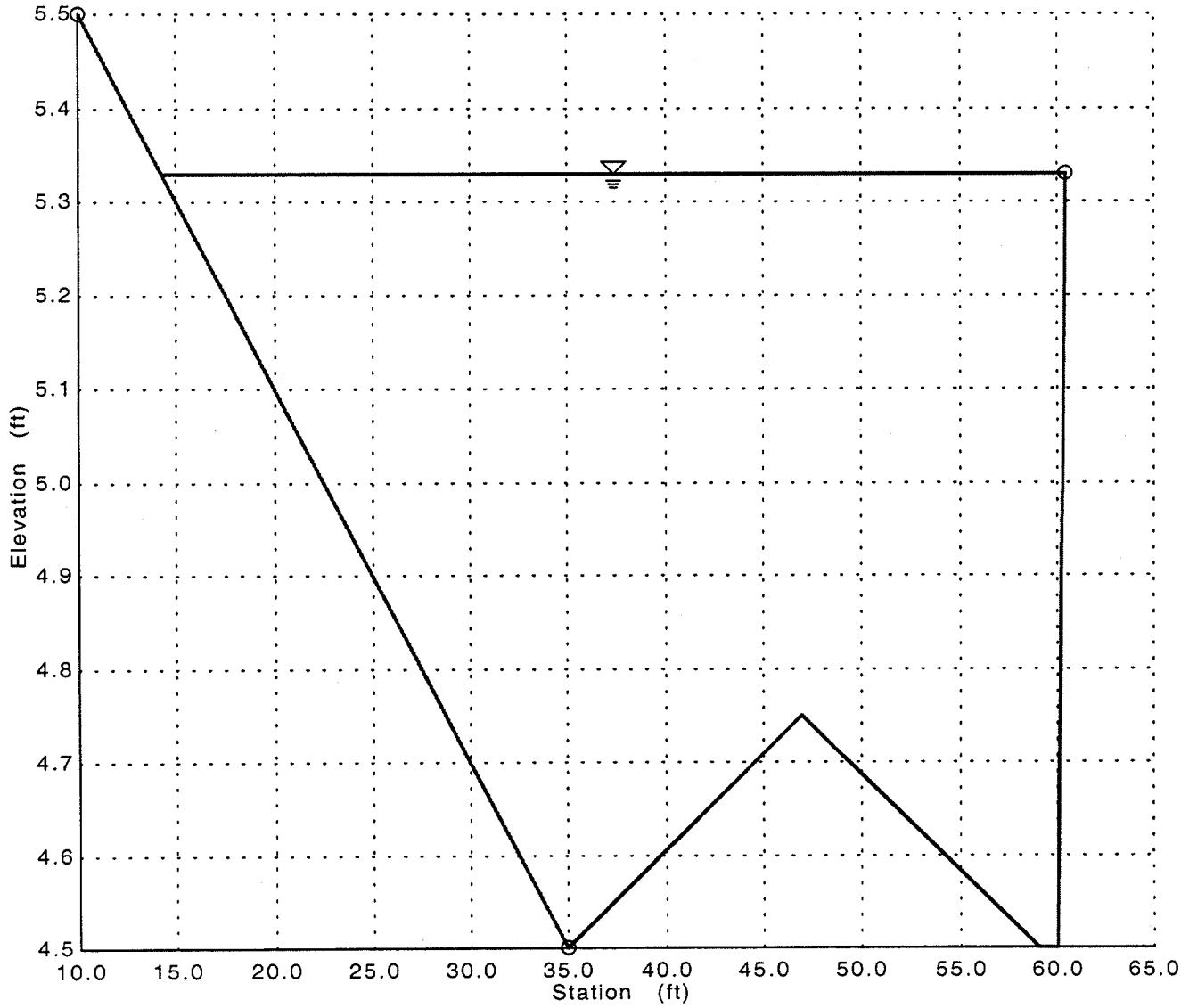
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
10.00	5.50	10.00	35.00	0.030
35.00	4.50	35.00	60.50	0.016
47.00	4.75			
59.00	4.50			
60.00	4.50			
60.50	5.33			

Results		
Wtd. Mannings Coefficient	0.018	
Discharge	108.97	cfs
Flow Area	26.57	ft²
Wetted Perimeter	46.74	ft
Top Width	46.25	ft
Height	0.83	ft
Critical Depth	5.31	ft
Critical Slope	0.005524	ft/ft
Velocity	4.10	ft/s
Velocity Head	0.26	ft
Specific Energy	5.59	ft
Froude Number	0.95	
Flow is subcritical.		

2B Cross Section Milton RD.
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B MILTON ROAD
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.018	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.33	ft
Discharge	108.97	cfs



2B MILTON ROAD W/ CHANNEL @ N. RofW
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B MILTON CHANNEL W/N CHANNEL
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.00	ft

Elevation range: 1.00 ft to 5.83 ft.

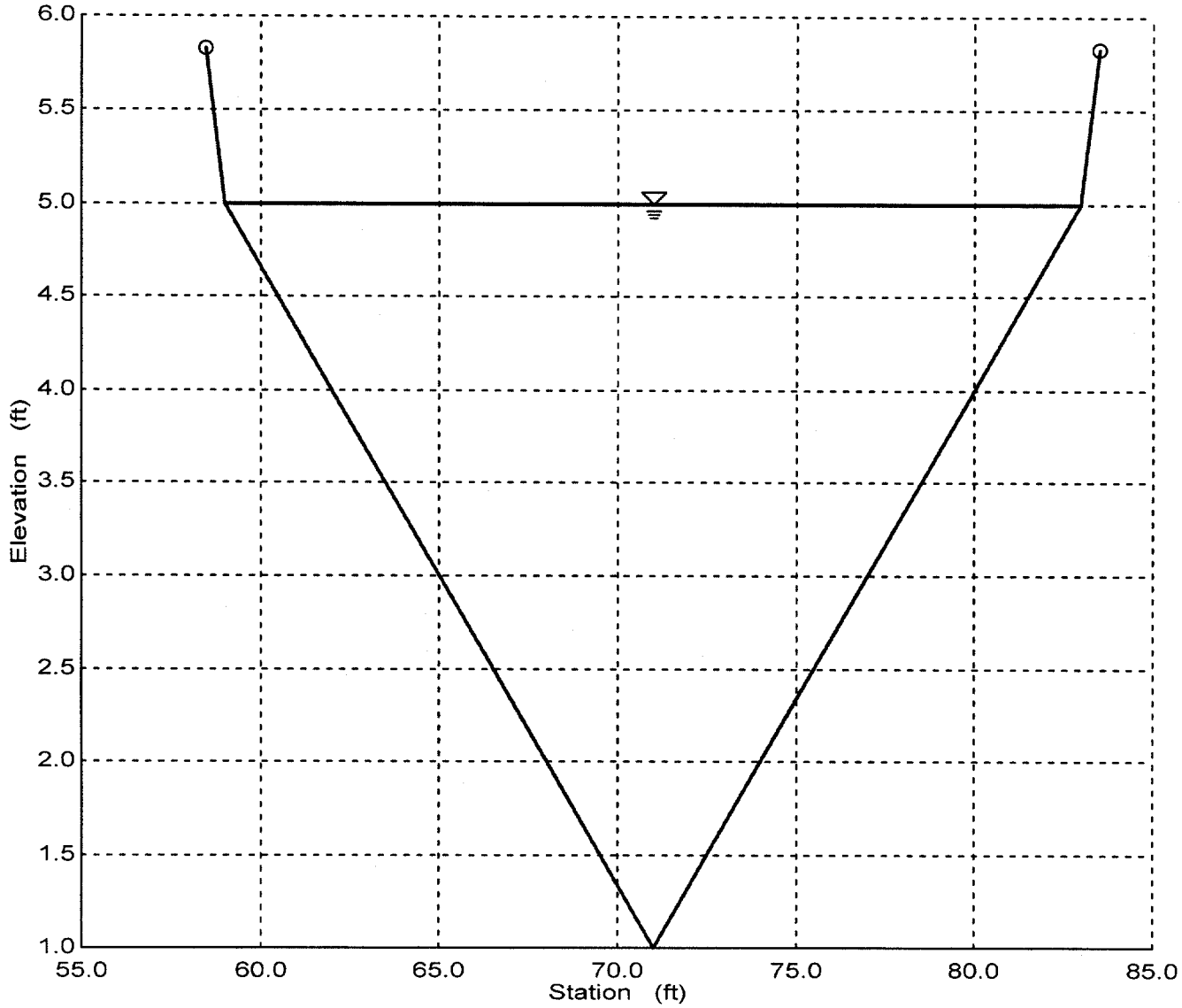
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
58.50	5.83	58.50	83.50	0.025
59.00	5.00			
71.00	1.00			
83.00	5.00			
83.50	5.83			

Results		
Wtd. Mannings Coefficient	0.025	
Discharge	309.18	cfs
Flow Area	48.00	ft^2
Wetted Perimeter	25.30	ft
Top Width	24.00	ft
Height	4.00	ft
Critical Depth	4.66	ft
Critical Slope	0.007985	ft/ft
Velocity	6.44	ft/s
Velocity Head	0.64	ft
Specific Energy	5.64	ft
Froude Number	0.80	
Flow is subcritical.		

2B Milton RD. w/Channel @ N. RofW
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B MILTON CHANNEL W/N CHANNEL
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.025	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.00	ft
Discharge	309.18	cfs



2B SHEET FLOW @ X-SECTION 110
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B SHEET FLOW @ X-SECTION 110
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

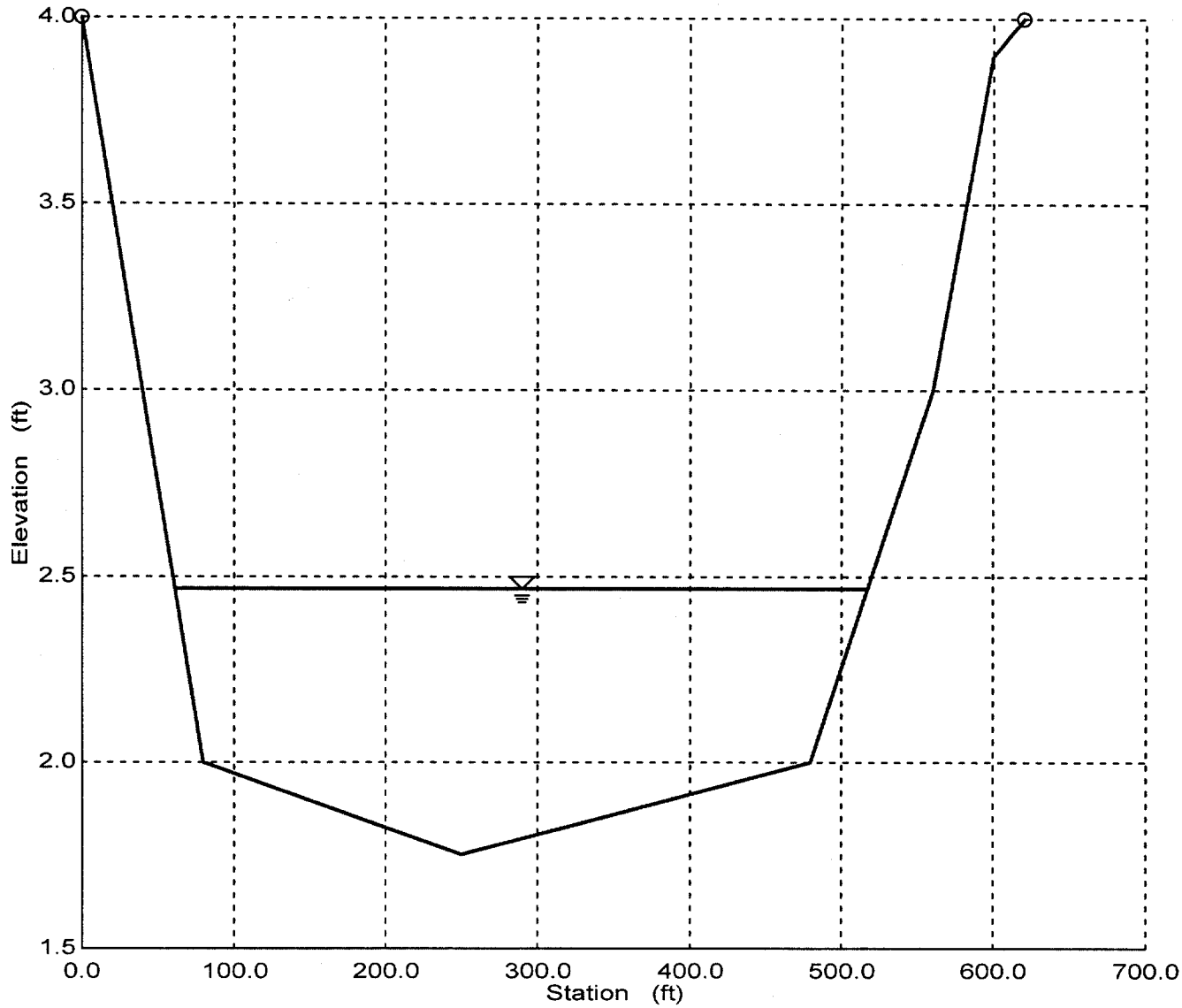
Input Data				
Channel Slope	0.005000 ft/ft			
Elevation range: 1.75 ft to 4.00 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	4.00	0.00	620.00	0.050
80.00	2.00			
250.00	1.75			
480.00	2.00			
560.00	3.00			
600.00	3.90			
620.00	4.00			
Discharge	349.00 cfs			

Results		
Wtd. Mannings Coefficient	0.050	
Water Surface Elevation	2.46	ft
Flow Area	248.70	ft²
Wetted Perimeter	455.74	ft
Top Width	455.73	ft
Height	0.71	ft
Critical Depth	2.16	ft
Critical Slope	0.055814	ft/ft
Velocity	1.40	ft/s
Velocity Head	0.03	ft
Specific Energy	2.50	ft
Froude Number	0.33	
Flow is subcritical.		

2B Sheet Flow @ Cross Section 110
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2b.fm2
Worksheet	2B SHEET FLOW @ X-SECTION 110
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.050	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	2.46	ft
Discharge	349.00	cfs



APPENDIX C-4

Structural Alternatives 2c Street net Fully (Including R.O.W.)

Improved with Conc. Curbs

(Surface Flow)

2CImproved Alvord @ Cross section 50 (S)
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C @ CROSS-SECTION 50 SOUTH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.007000	ft/ft
Water Surface Elevation	12.83	ft

Elevation range: 12.00 ft to 14.00 ft.

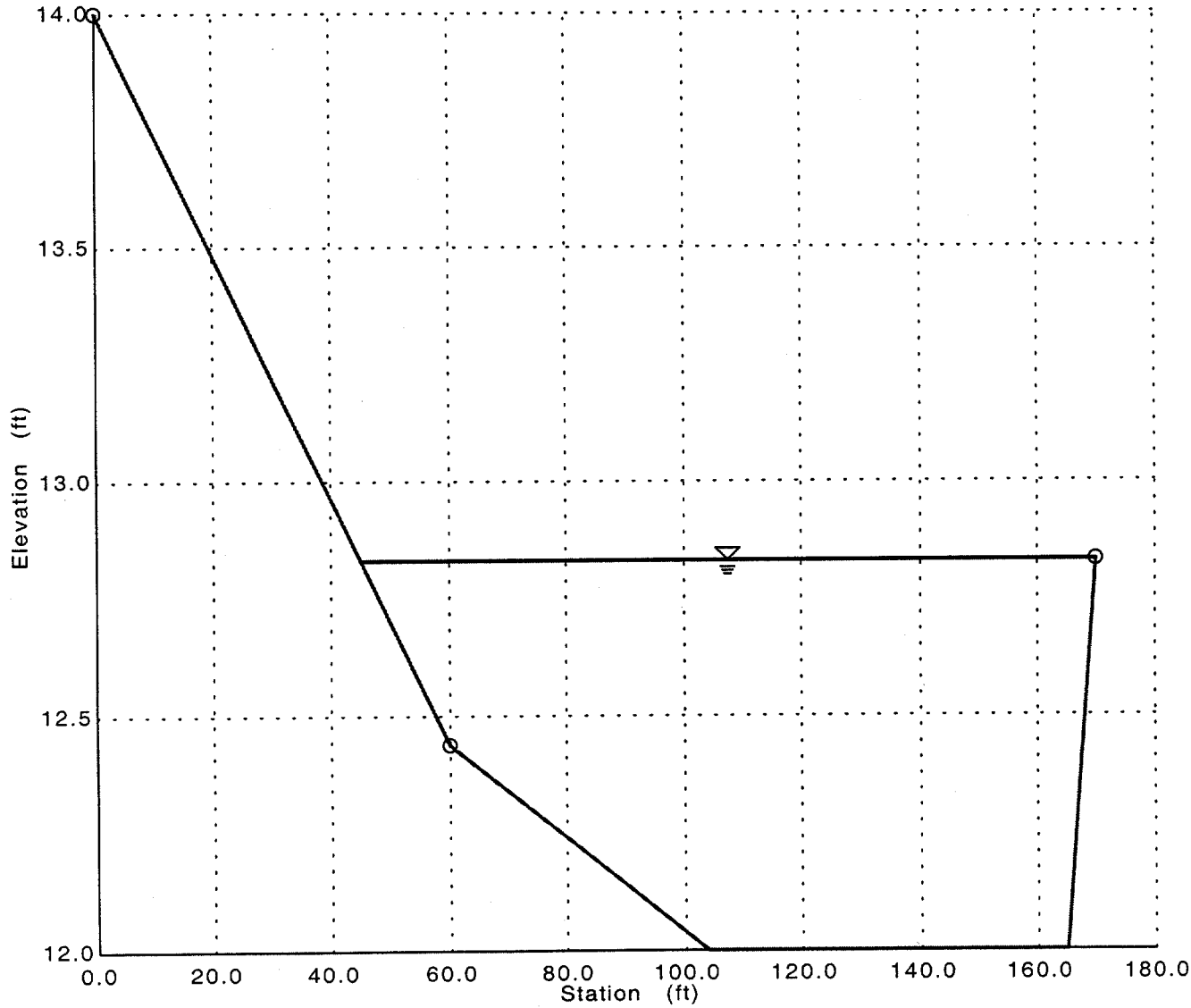
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	14.00	0.00	60.00	0.025
60.00	12.44	60.00	170.00	0.016
104.00	12.00			
129.00	12.00			
165.00	12.00			
170.00	12.83			

Results		
Wtd. Mannings Coefficient	0.017	
Discharge	451.64	cfs
Flow Area	82.47	ft^2
Wetted Perimeter	125.08	ft
Top Width	125.00	ft
Height	0.83	ft
Critical Depth	12.92	ft
Critical Slope	0.004924	ft/ft
Velocity	5.48	ft/s
Velocity Head	0.47	ft
Specific Energy	13.30	ft
Froude Number	1.19	
Flow is supercritical.		

2C IMPROVED ALVORD @ Cross Section 50 (S)
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C @ CROSS-SECTION 50 SOUTH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.017	
Channel Slope	0.007000	ft/ft
Water Surface Elevation	12.83	ft
Discharge	451.64	cfs



2C Garret Avenue Improved
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C Garret Ave Improved
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.004000	ft/ft
Water Surface Elevation	1.13	ft

Elevation range: 0.00 ft to 1.13 ft.

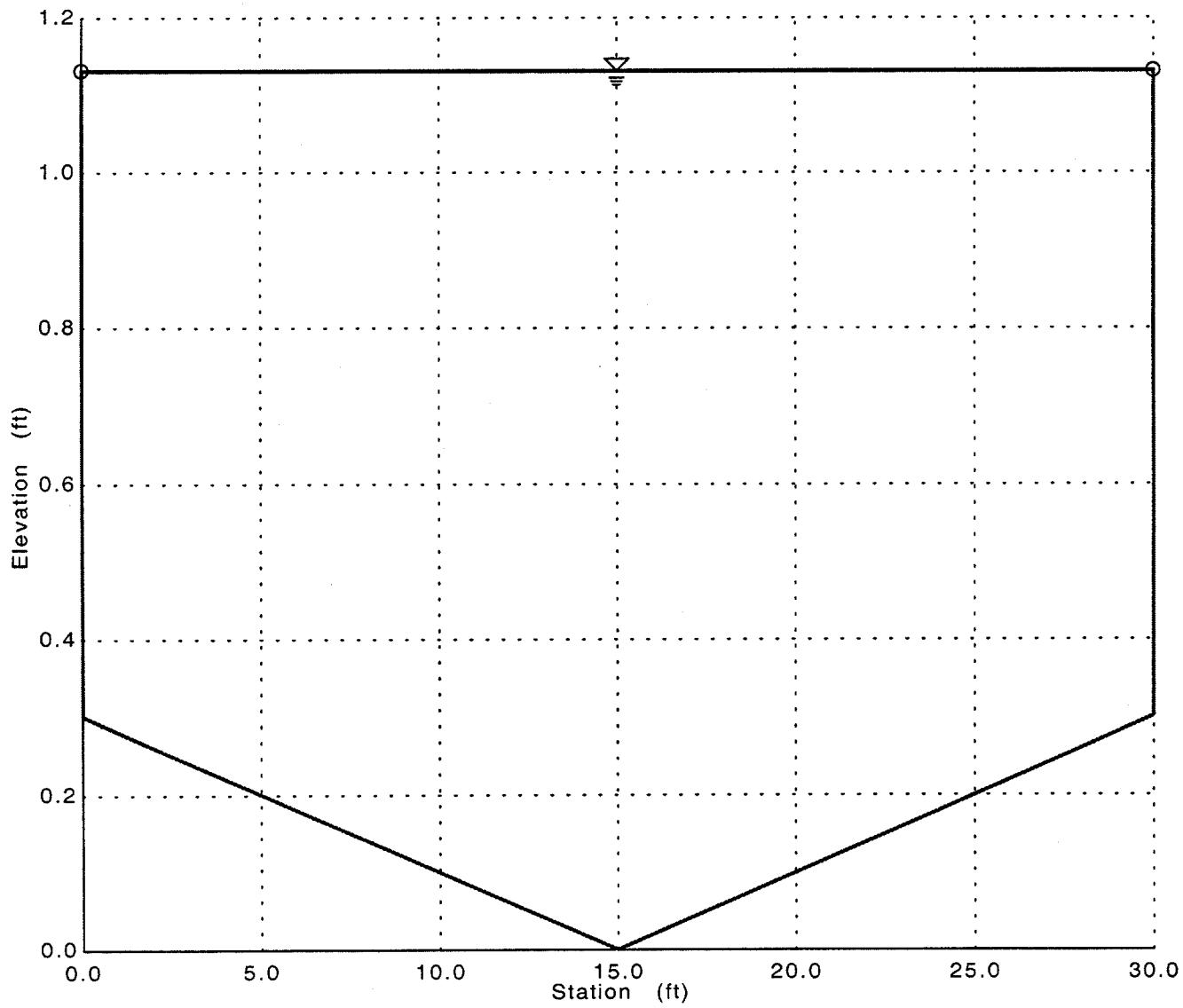
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1.13	0.00	30.00	0.016
0.00	0.30			
15.00	0.00			
30.00	0.30			
30.00	1.13			

Results		
Wtd. Mannings Coefficient	0.016	
Discharge	164.34	cfs
Flow Area	29.40	ft^2
Wetted Perimeter	31.67	ft
Top Width	30.00	ft
Height	1.13	ft
Critical Depth	1.13	ft
Critical Slope	0.004039	ft/ft
Velocity	5.59	ft/s
Velocity Head	0.49	ft
Specific Energy	1.62	ft
Froude Number	1.00	
Flow is subcritical.		

2C Cross Section Garret Ave
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C Garret Ave Improved
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.016	
Channel Slope	0.004000	ft/ft
Water Surface Elevation	1.13	ft
Discharge	164.34	cfs



2CImproved Alvord @ Cross section 50 (N)
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C @ CROSS-SECTION 50 NORTH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.007000	ft/ft

Elevation range: 12.00 ft to 14.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
160.00	13.83	160.00	530.00	0.060
160.00	12.00			
370.00	13.00			
530.00	14.00			

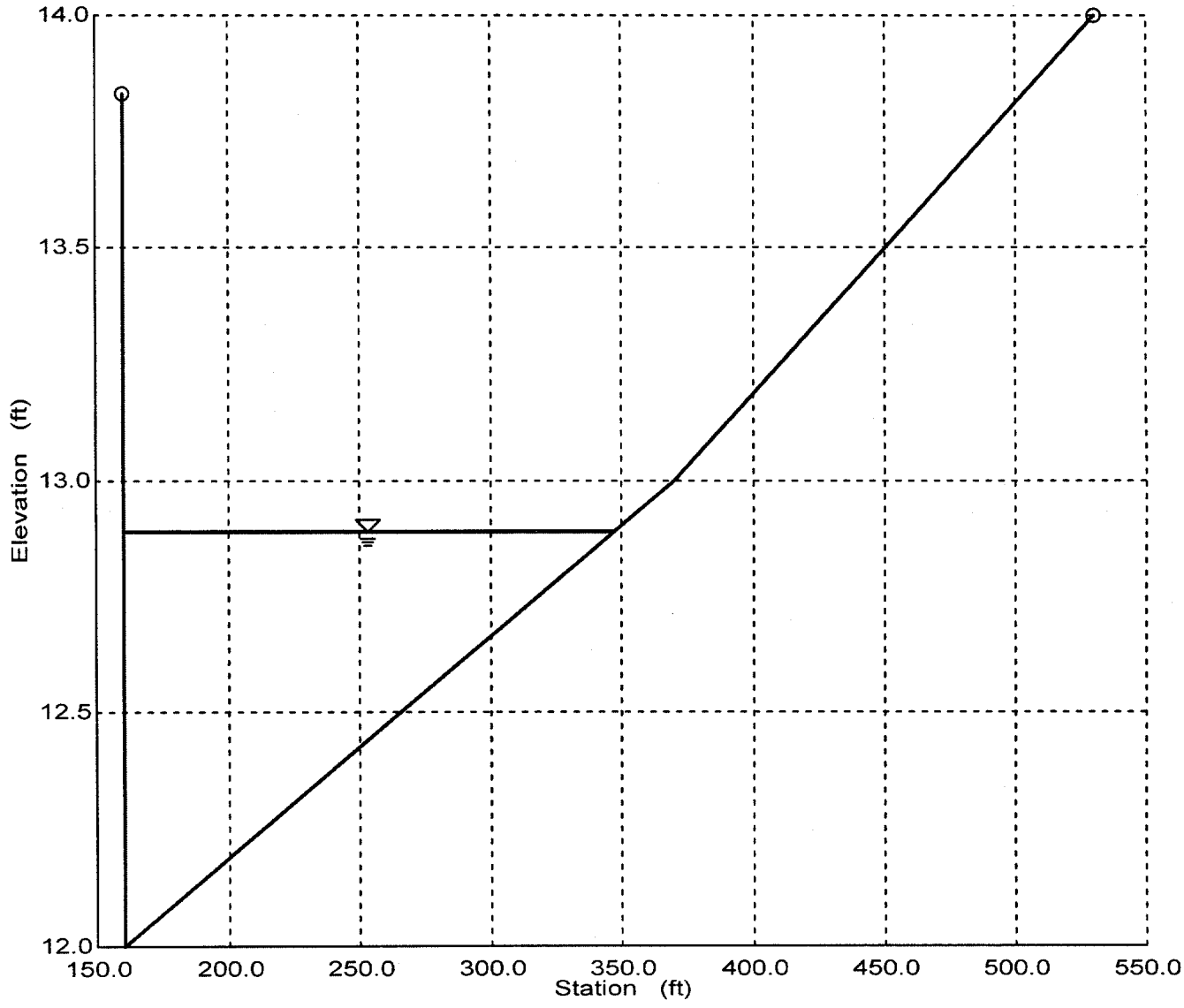
Discharge	100.00	cfs

Results		
Wtd. Mannings Coefficient	0.060	
Water Surface Elevation	12.89	ft
Flow Area	83.09	ft²
Wetted Perimeter	187.70	ft
Top Width	186.81	ft
Height	0.89	ft
Critical Depth	12.56	ft
Critical Slope	0.080574	ft/ft
Velocity	1.20	ft/s
Velocity Head	0.02	ft
Specific Energy	12.91	ft
Froude Number	0.32	
Flow is subcritical.		

2C Improved Alvord @ Cross Section 50
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C @ CROSS-SECTION 50 NORTH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.060	
Channel Slope	0.007000	ft/ft
Water Surface Elevation	12.89	ft
Discharge	100.00	cfs



2C Ray RD Improved
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2c Ray Rd Improved
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.004000	ft/ft
Water Surface Elevation	1.13	ft

Elevation range: 0.00 ft to 0.30 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.30	0.00	30.00	0.016
15.00	0.00			
30.00	0.30			

Results		
Wtd. Mannings Coefficient	0.016	
Discharge	164.34	cfs
Flow Area	29.40	ft^2
Wetted Perimeter	31.67	ft
Top Width	30.00	ft
Height	1.13	ft
Critical Depth	1.13	ft
Critical Slope	0.004039	ft/ft
Velocity	5.59	ft/s
Velocity Head	0.49	ft
Specific Energy	1.62	ft
Froude Number	1.00	

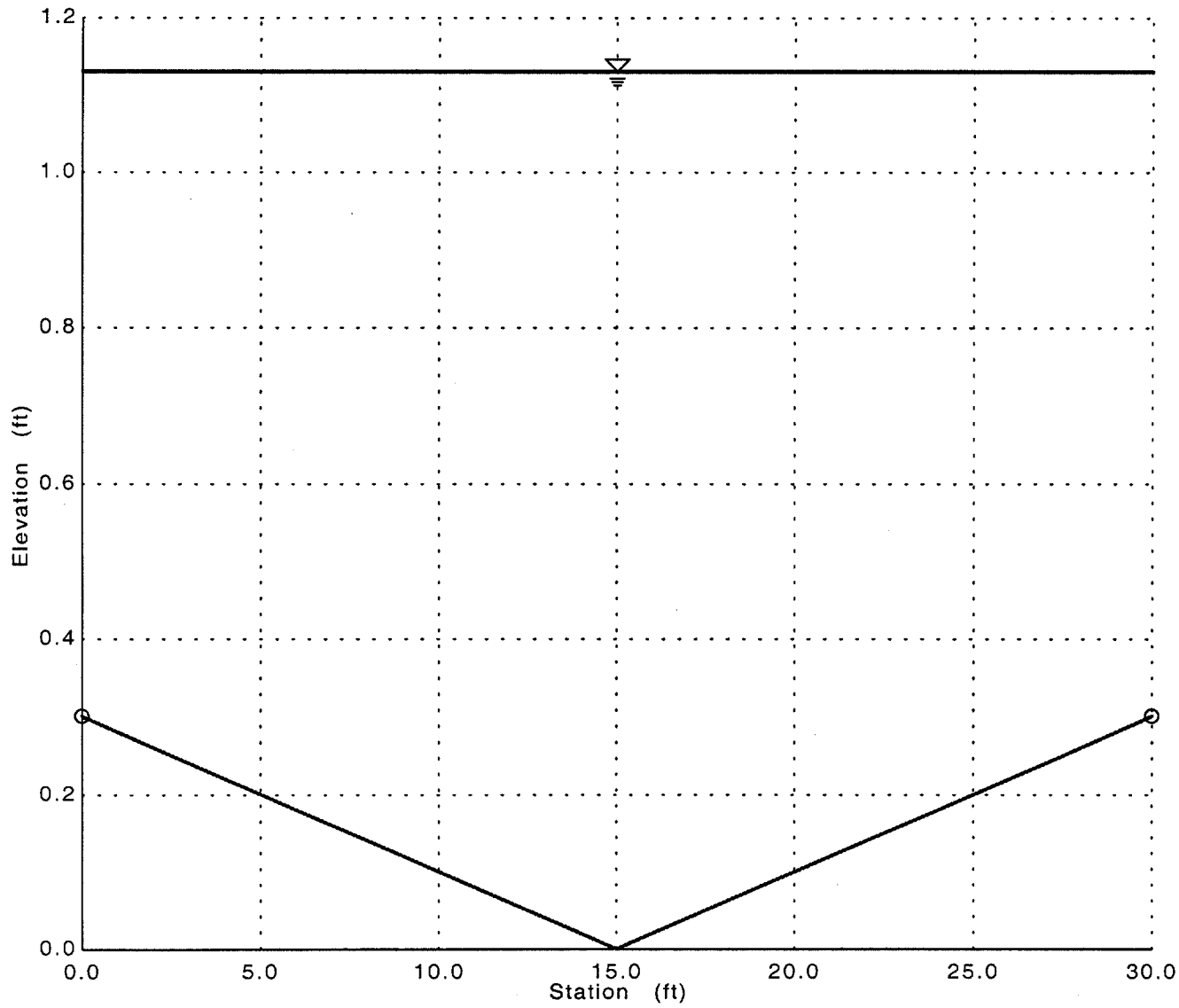
Flow is subcritical.

Water elevation exceeds lowest end station by 0.83 ft.

2C Cross Section Ray Rd Improved
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2c Ray Rd Improved
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.016	
Channel Slope	0.004000	ft/ft
Water Surface Elevation	1.13	ft
Discharge	164.34	cfs



2C Berm @ Cross section 70
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C BERM @ CROSS-SECTION 70
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.007000	ft/ft
Water Surface Elevation	11.00	ft

Elevation range: 7.00 ft to 11.00 ft.

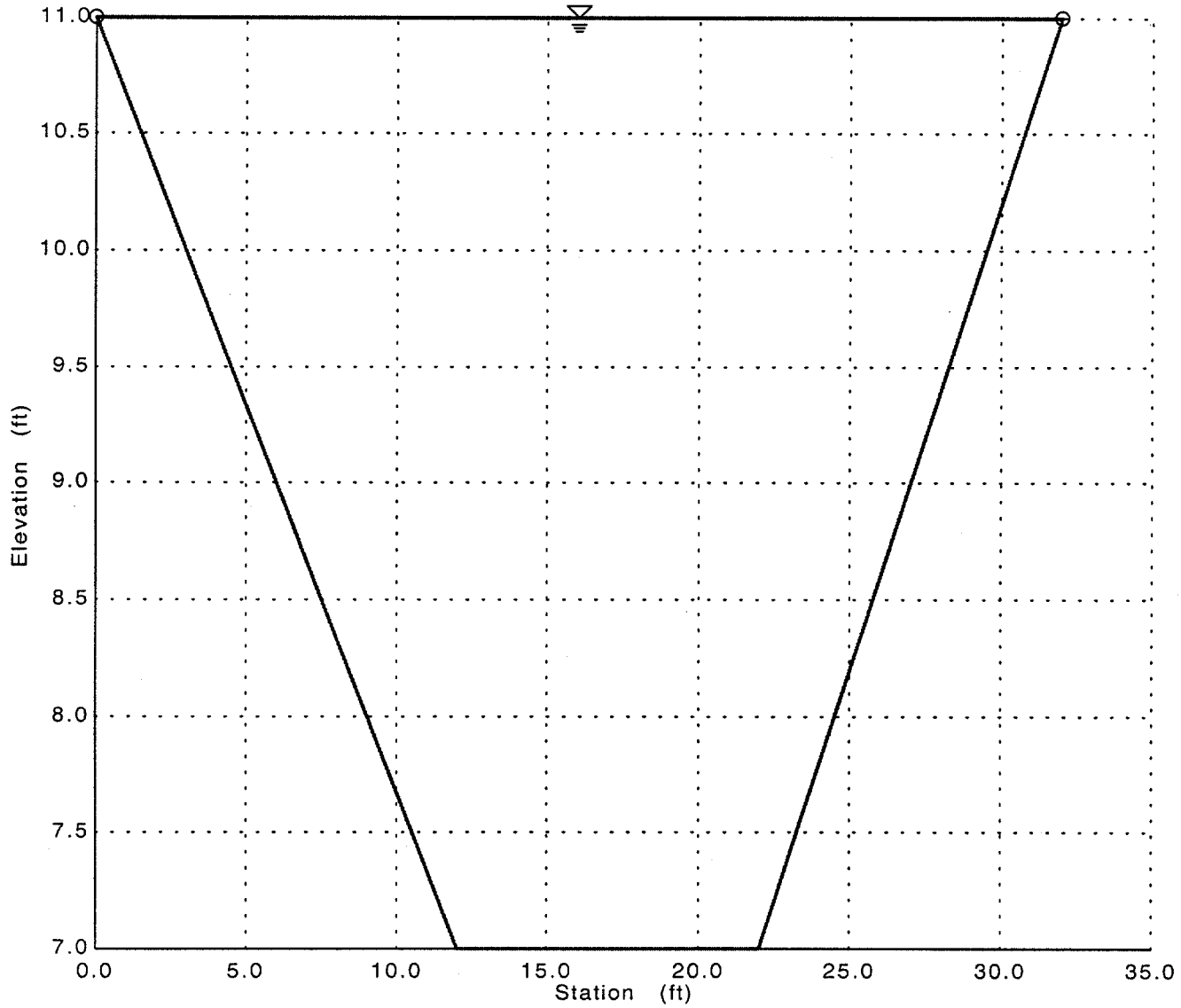
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	11.00	0.00	32.00	0.030
12.00	7.00			
22.00	7.00			
32.00	11.00			

Results		
Wtd. Mannings Coefficient	0.030	
Discharge	643.51	cfs
Flow Area	84.00	ft²
Wetted Perimeter	33.42	ft
Top Width	32.00	ft
Height	4.00	ft
Critical Depth	10.64	ft
Critical Slope	0.010324	ft/ft
Velocity	7.66	ft/s
Velocity Head	0.91	ft
Specific Energy	11.91	ft
Froude Number	0.83	
Flow is subcritical.		

2c Berm @ Cross section 70
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C BERM @ CROSS-SECTION 70
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.030	
Channel Slope	0.007000	ft/ft
Water Surface Elevation	11.00	ft
Discharge	643.51	cfs



2C MILTON ROAD W/ CHANNEL @ S. RofW
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C MILTON CHANNEL W/S CHANNEL
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

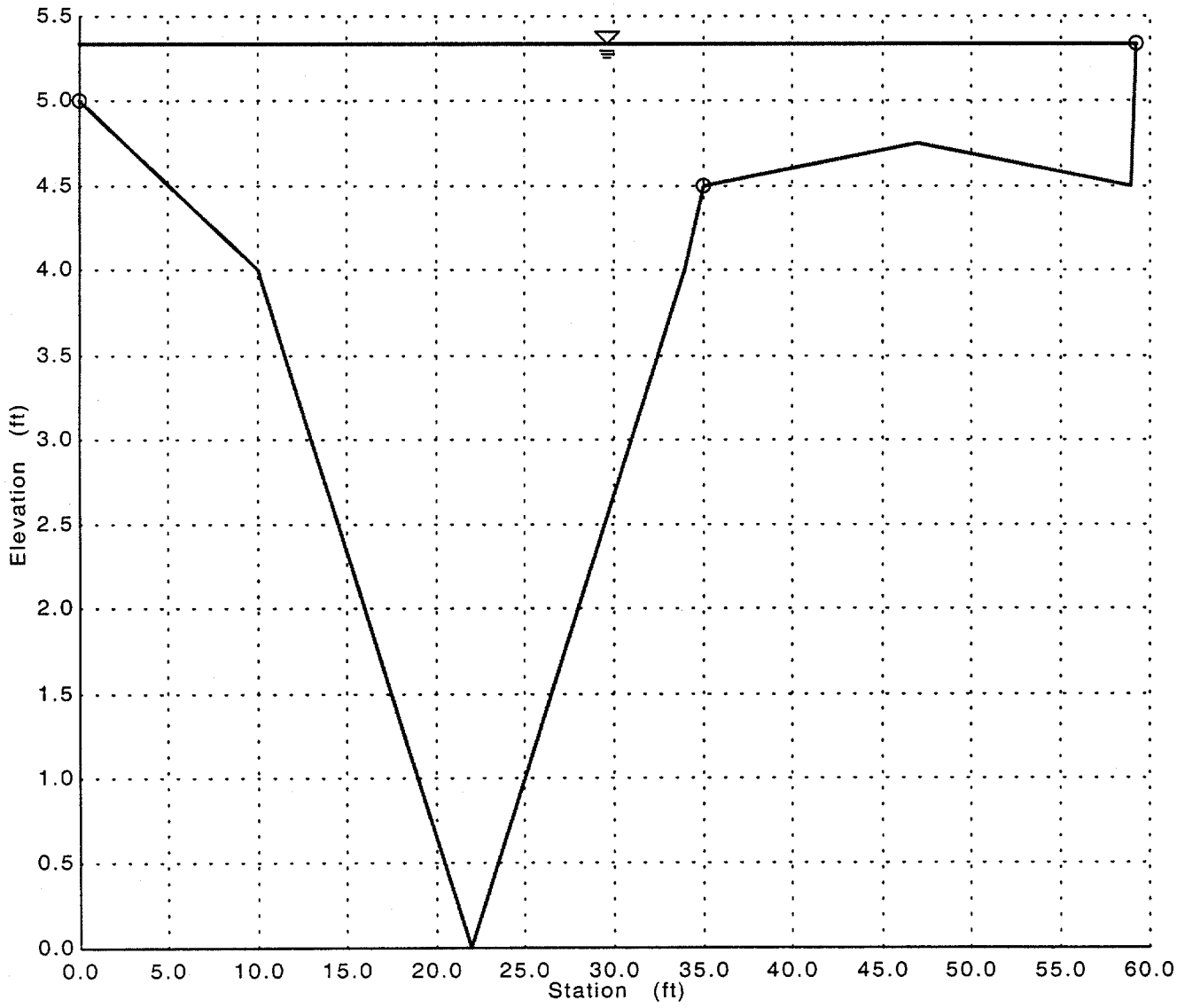
Input Data				
Channel Slope	0.005000 ft/ft			
Elevation range: 0.00 ft to 5.33 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5.00	0.00	35.00	0.025
10.00	4.00	35.00	59.30	0.016
22.00	0.00			
34.00	4.00			
35.00	4.50			
47.00	4.75			
59.00	4.50			
59.30	5.33			
Discharge	767.00 cfs			

Results		
Wtd. Mannings Coefficient	0.021	
Water Surface Elevation	5.33	ft
Flow Area	106.55	ft²
Wetted Perimeter	61.69	ft
Top Width	59.30	ft
Height	5.33	ft
Critical Depth	5.27	ft
Critical Slope	0.005573	ft/ft
Velocity	7.20	ft/s
Velocity Head	0.81	ft
Specific Energy	6.14	ft
Froude Number	0.95	
Flow is subcritical.		
Water elevation exceeds lowest end station by 0.33 ft.		

2C Cross Section Milton RD. w/Channel @ S. RofW
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C MILTON CHANNEL W/S CHANNEL
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.021	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.33	ft
Discharge	767.00	cfs



2C MILTON ROAD
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C MILTON ROAD
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.33	ft

Elevation range: 4.50 ft to 5.50 ft.

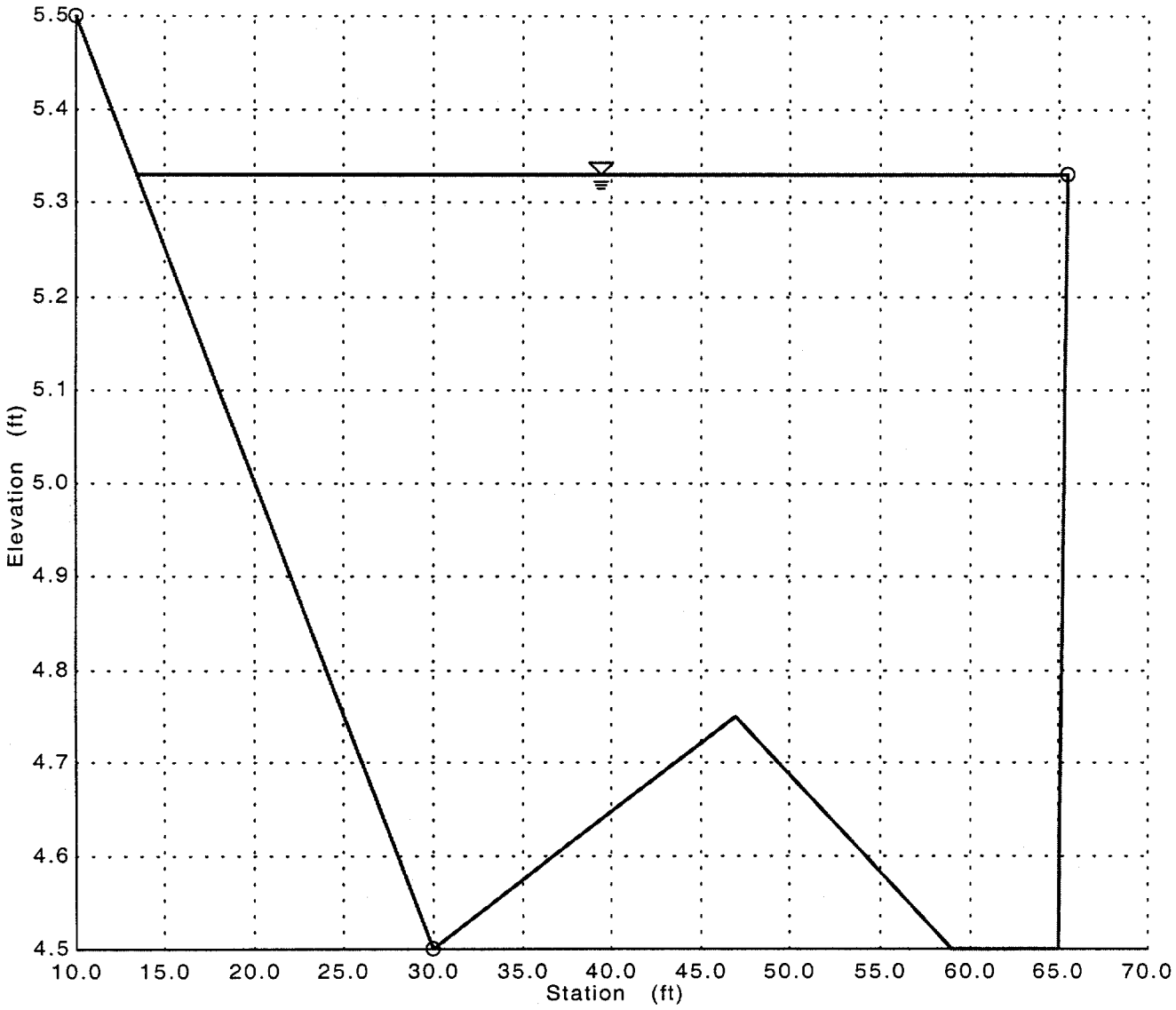
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
10.00	5.50	10.00	30.00	0.025
30.00	4.50	30.00	65.50	0.016
47.00	4.75			
59.00	4.50			
65.00	4.50			
65.50	5.33			

Results		
Wtd. Mannings Coefficient	0.016	
Discharge	150.38	cfs
Flow Area	32.52	ft²
Wetted Perimeter	52.59	ft
Top Width	52.10	ft
Height	0.83	ft
Critical Depth	5.34	ft
Critical Slope	0.004673	ft/ft
Velocity	4.62	ft/s
Velocity Head	0.33	ft
Specific Energy	5.66	ft
Froude Number	1.03	
Flow is supercritical.		

2C Cross Section Milton RD.
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C MILTON ROAD
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.016	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.33	ft
Discharge	150.38	cfs



CHANNEL @ N. RofW MILTON ROAD
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2a.fm2
Worksheet	N CHANNEL @ MILTON RD
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.00	ft

Elevation range: 1.00 ft to 5.83 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
58.50	5.83	58.50	83.50	0.025
59.00	5.00			
71.00	1.00			
83.00	5.00			
83.50	5.83			

Results		
Wtd. Mannings Coefficient	0.025	
Discharge	309.18	cfs
Flow Area	48.00	ft²
Wetted Perimeter	25.30	ft
Top Width	24.00	ft
Height	4.00	ft
Critical Depth	4.66	ft
Critical Slope	0.007985	ft/ft
Velocity	6.44	ft/s
Velocity Head	0.64	ft
Specific Energy	5.64	ft
Froude Number	0.80	
Flow is subcritical.		

2C MILTON ROAD W/ CHANNEL @ N. RofW
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C MILTON CHANNEL W/N CHANNEL
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.00	ft

Elevation range: 1.00 ft to 5.83 ft.

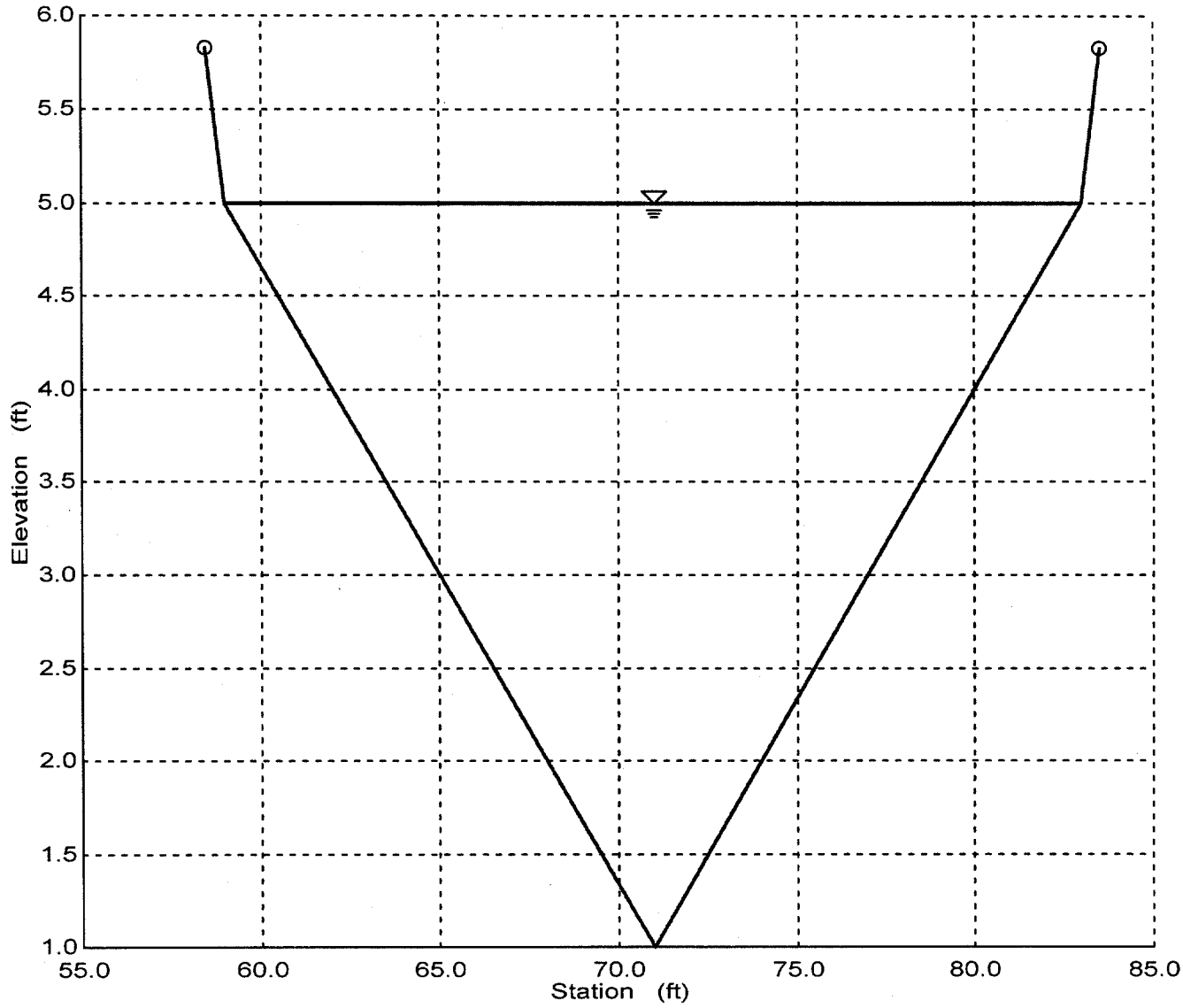
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
58.50	5.83	58.50	83.50	0.025
59.00	5.00			
71.00	1.00			
83.00	5.00			
83.50	5.83			

Results		
Wtd. Mannings Coefficient	0.025	
Discharge	309.18	cfs
Flow Area	48.00	ft²
Wetted Perimeter	25.30	ft
Top Width	24.00	ft
Height	4.00	ft
Critical Depth	4.66	ft
Critical Slope	0.007985	ft/ft
Velocity	6.44	ft/s
Velocity Head	0.64	ft
Specific Energy	5.64	ft
Froude Number	0.80	
Flow is subcritical.		

2C Milton RD. w/Channel @ N. RofW
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C MILTON CHANNEL W/N CHANNEL
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.025	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	5.00	ft
Discharge	309.18	cfs



2C SHEET FLOW @ X-SECTION 110
Worksheet for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C SHEET FLOW @ X-SECTION 110
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

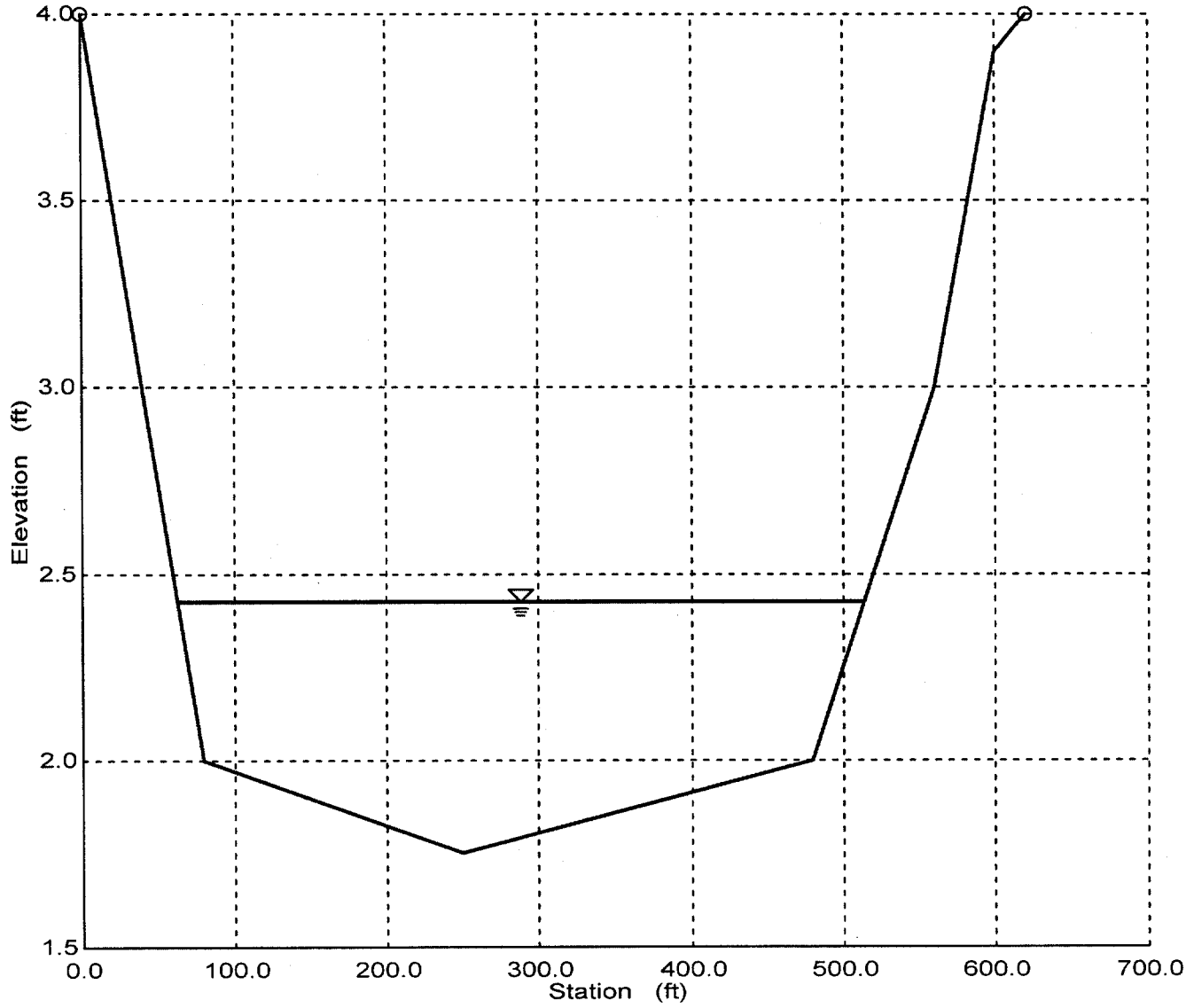
Input Data					
Channel Slope	0.005000 ft/ft				
Elevation range: 1.75 ft to 4.00 ft.					
Station (ft)	Elevation (ft)		Start Station	End Station	Roughness
0.00	4.00		0.00	620.00	0.050
80.00	2.00				
250.00	1.75				
480.00	2.00				
560.00	3.00				
600.00	3.90				
620.00	4.00				
Discharge	308.00	cfs			

Results		
Wtd. Mannings Coefficient	0.050	
Water Surface Elevation	2.42	ft
Flow Area	229.71	ft²
Wetted Perimeter	450.71	ft
Top Width	450.70	ft
Height	0.67	ft
Critical Depth	2.14	ft
Critical Slope	0.057303	ft/ft
Velocity	1.34	ft/s
Velocity Head	0.03	ft
Specific Energy	2.45	ft
Froude Number	0.33	
Flow is subcritical.		

2C Sheet Flow @ Cross Section 110
Cross Section for Irregular Channel

Project Description	
Project File	d:\active-98\pcdto16-earph wash3-99\alt2c.fm2
Worksheet	2C SHEET FLOW @ X-SECTION 110
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.050	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	2.42	ft
Discharge	308.00	cfs



APPENDIX D

Drainage Complaints

A HISTORICAL REVIEW

OF

DRAINAGE COMPLAINTS

WITHIN

THE EARP WASH

A brief historical review of drainage complaints along the Earp Wash.

8-10-76 John Kocis (3600 E. Milton) called to complain his mobile home park has flooded. Flows were going through the middle of the park. He wanted permission to construct a ditch along the east property line to intercept the flood flow and release it near the northeast corner of his property. The call came in on a Tuesday. The message indicates if he did not hear back he would do the work on Wednesday.

9-30-76 John Kocias (Kocis) called to request a drain is installed for Milton. He also complained that the paving of Garrett Avenue has caused more flow to be directed to his trailer park.

8-23-77 Pima County received floodplain maps from the Department of Housing and Urban Development. Panel 115 does not indicate a floodplain for the Earp Wash.

3-24-78 In a detailed letter, Mr. Huckelberry, Director of the Pima County Highway Department, informed Mr. Kocis:

5. His property lies in a well-defined floodprone area.
6. Fill on parcels to the north block the natural drainage and ponds water back onto Milton Road and the Kocis property.
7. Development upstream has increased discharge values.
8. The developments around his property were developed prior to specific development requirements for drainage.
9. The fill and developments were installed prior to the first Floodplain Management Ordinance (#1974-86).
10. Mr. Huckelberry suggested an improvement district be formed. He also suggested that Mr. Kocis purchase flood insurance.

10-11-78 Staff recommended Mr. Kocis hire a private engineer.

9-13-78 A letter was sent to Mr. Kocis from Chuck Huckelberry. In that letter, Mr. Huckelberry stated additional engineering is needed to develop the property. Mr. Huckelberry further states, "the facts quite clearly indicate that you do have a definite and serious problem with flooding."

12-2-78 Mr. Bolton complained of a flooding problem located southwest of the intersection of South Garrett and Milton and north of Alvord Roads. Dikes were found in the floodplain and inadequate drainage through the property. Ground photographs were shot and highlighted to indicate a four-foot dike on the (Kocis) property.

6-7-79 Lawyer Robert Wolkin wrote to John Cochis (Kocis) and Quality paving, requesting them

to remove a dike which he ledges has increased the depth of flow on his client's (Henry Reed) property by two feet.

6-28-79 In a memorandum from Mike Zeller, Manager of the Floodplain Management Section, to Chuck Huckelberry, Mr. Zeller recommends we ask Mr. Kocis to remove the levee he constructed.

7-6-79 In a letter to Robert Vorholzer and John Kocis, Chuck Huckelberry states the area around 3600 East Milton is in a floodplain. The letter also states the dike on the Kocis property has an insignificant effect on adjacent properties because of the backwater impacts associated with the fill placed on downstream parcels.

12-7-79 Pima County receives USGS "Workmaps." Sheet 97 shows a floodplain delineation along the Earp Wash (not named on the map).

1-24-80 Tom Bruder of Floodplain Management provided review comments to John Oder, Subdivision Review Coordinator for the Chaparral Junior High School. Those comments included a requirement to map the floodplain and to elevate any chain link fencing within the floodplain.

6-7-80 The County received a petition letter from several property owners on Garret and Alvord. The residents disagreed with their area being mapped as a "Flow Zone" and also voiced concerns regarding the paving of Alvord Road and the change in the flow path as a result of the construction of the (Chaparral Junior High) school.

7-3-80 Field investigation revealed fill was placed in the Earp Wash Floodplain as a result of the construction of the Chaparral Junior High School. The fill was in the northeast corner of the school site within the flow area for the Earp Wash.

7-14-80 In a letter to the Sunnyside School District, Mike Zeller of Floodplain Management requested the school site be modified to correct the flow diversion.

9-9-80 Mrs. Arbenowski (3707 E. Alvord) complained the Sunnyside School caused flooding on her property. Phil Lowe, of Floodplain Management, informed her she was flooding because hr property was in the floodplain. Mr. Lowe did note the chain link fence at the school may have diverted some flow. The school agreed to make some modifications to the fence.

9-29-80 An investigation by Phil Lowe, indicated the Chaparral Junior High school had removed the fill and corrected the pavement grades to restore the natural drainage. The school representative stated they would elevate the chain link fence.

3-16-81	A field visit by Phil Lowe during a flow event indicated not all of the drainage problems caused by the school had been corrected.
9-19-84	(Complaint 84-396) A complaint was made about a yard flooding at 5808 South Garrett.
6-7-85	(Complaint 1985-112). Mr. Kocis was concerned the Alvernon Road project would increase the runoff. Terry Hendricks, of Floodplain Management, informed him the project included a diversion ditch which removed a large portion of the Earp Wash watershed (about half) and diverted it into the Rodeo Wash Detention Basin.
7-20-88	(Complaint 88-168) A chain link fence was constructed across the entrance to the Earp Wash box culvert under Palo Verde Road. The fence was a violation and was removed.
9-26-88	(Complaint 88-346) Mr. Hays called and complained that the owner (Mr. Kocis) of the trailer park to the west from him was elevating the dike near his property boundary and that this work was increasing the potential for flood damages.
12-5-88	A certified letter was sent to Mr. Kocis requesting the dikes along the west side of the drainage ditch be lowered.
1-11-89	A meeting was held with David Anderson of Anderson Passarelli & Associates, Bill Howells, Director, Pima County Department of Transportation, Mr. Kocis and Terry Hendricks. During this meeting Mr. Kocis produced receipts from 1971 which he stated indicates the dike and ditch are grand-fathered.
1-11-89	David Anderson of Anderson Passarelli & Associates, wrote to Bill Howells, Director, Pima County Department of Transportation. The purpose of that letter was to recap a meeting earlier in the day with Mr. Kocis, Bill Howells, and Terry Hendricks. The letter also argued against the removal of the dike for several reasons.
May 1989	Mr. Hays wrote a letter in response to Mr. Hendricks' April 28, 1989 letter to H.D. Reed. He states the dike was constructed in 1975 and originally was six to eight inches high. He stated the dike has continually been raised over the years. He also recounted some of the flood damages he received.
7-9-90	(Complaint 90-90) At 3636 E. Milton, space #3 the area does not drain.
10-3-90	(Complaint 90-416) the area at 3520 E. Milton does not drain and there are mosquitos.
10-15-93	(Complaint 93-427) Operations personal called to complain of individuals blocking flow.

Investigation reveals the drainage ditch on the Kocis is in need of maintenance. A letter was sent to the property owner recommending the ditch is cleaned.

12-16-97 (Complaint 97-547) William Hays complained that a proposed housing development (in the city) would increase flooding to his area.

4-21-98 (Complaint 98-141) John Kocis called stating the development within the city upstream is increasing the flow on his property.

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