# DRAINAGE REPORT
# HUNT HIGHWAY
# AUGUST, 1996

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**PLANNING - CIVIL ENGINEERING - LAND DEVELOPMENT**

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# DRAINAGE REPORT
# HUNT HIGHWAY
# AUGUST, 1996

PREPARED BY:

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## EXECUTIVE SUMMARY

The purpose of this report is to investigate existing flooding problems at Alma School and Dobson Roads north of Hunt Highway. At the present time there is an existing channel on the north side of Hunt Highway which conveys drainage from Sun Lakes Section 32 and 33 (between Arizona Avenue - Dobson Road and Riggs Road - Hunt Highway) to the west. Because of grading and maintenance conditions, flow in the Hunt Highway channel stormwater backs up on Alma School and Dobson Roads to the north of Hunt Highway. Drainage floods these roads and the stormwater backs up on these roadway areas for a period of several days following significant rainstorms in the area.

The recommended solution to this flooding situation includes the following proposals:

1. Lower the Hunt Highway channel immediately downstream of Alma School and Dobson Roads and regrade the downstream channel in these areas to daylite to existing channel grade approximately 1400' west of these roads.
2. Construct a berm on the north side of the Hunt Highway channel at the east side of Alma School and Dobson Roads where swales along the roads are supposed to drain into the Hunt Highway channel. This berm will prevent storm drainage from the Hunt Highway channel east of Alma School and Dobson Roads backing up to the north and flooding Alma School and Dobson Roads.
3. Replace existing CMP culverts under Alma School and Dobson Roads with larger RCP culverts.
4. Install a separate 24" culvert under Alma School and Dobson Roads at the northeast corner of Hunt Highway to drain the east side swales of these roads to the lowered Hunt Highway channel on the west side of the intersections.
5. Regrade the Alma School/Dobson Roads east and west side swales to promote drainage flow away from the flooded areas to the lowered Hunt Highway channel.

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**APPENDIX "A"**

HEC 1 50 YEAR INPUT AND OUTPUT FILES:
SECTION 32 FILES:
- SEC32B.1 INPUT FILE
- SEC32B.0H1 OUTPUT FILE

SECTION 33 FILES:
- SEC33B.1 INPUT FILE
- SEC33B.0H1 OUTPUT FILE

**APPENDIX "B"**

HEC 2 WATER SURFACE PROFILES
A. HUNT HIGHWAY CHANNEL
B. ALMA SCHOOL ROAD SWALES
C. DOBSON ROAD SWALES

## INTRODUCTION

This Drainage Report will investigate the stormwater flows impacting the proposed drainage improvements along Hunt Highway in the vicinity of the intersections of Dobson and Alma School Roads located in the Southwest and Southeast quarter corner of Section 32, Township 2 South, Range 5 East, Gila and Salt River Base and Meridian in Maricopa County, Arizona (see Figure 1, page 2). Evaluating these flows will provide the basis for design of the drainage improvements proposed in this report.

Data in this report has been gathered from past approved Master Drainage Reports and grading plans of the individual subdivisions within Sections 32 and 33.

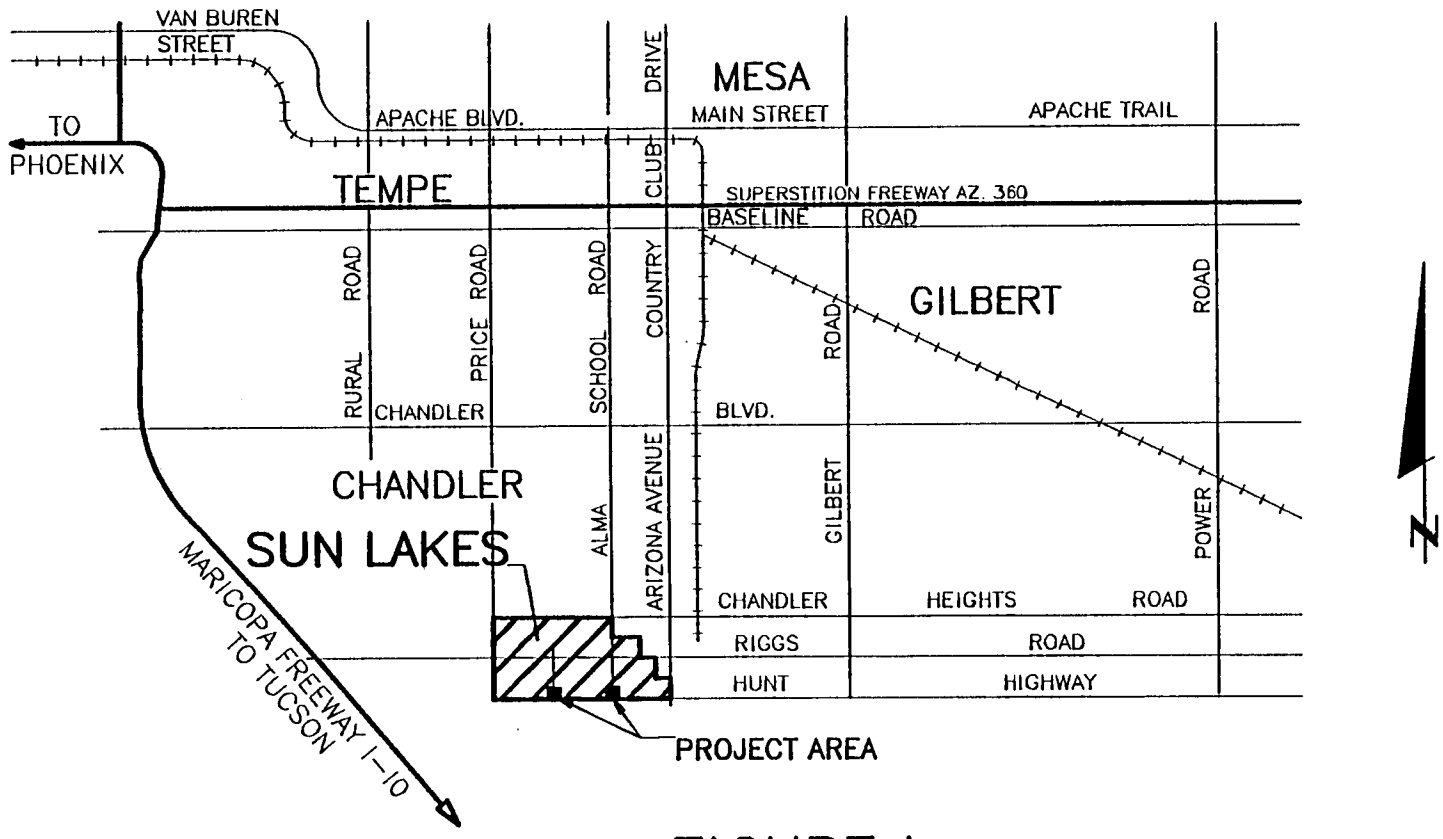
## HYDROLOGIC MODELING

Stormwater runoff peak quantities were estimated using Dodson and Associates' ProHEC-1 Hydrologic Model. The proposed drainage improvements involve designing a series of culverts under Dobson and Alma School at the intersection of these roads with Hunt Highway and reshaping channels along applicable portions of these roadways to adequately convey runoff away from these intersections without flooding of the pavement within the project area (see Figure 2, pg. 9). Consequently, the design storm used for the proposed improvements will be the 50-year, 2-hour event storm.

Values used for precipitation have been obtained from the "Sun Lakes Sections 29 and 30 Master Drainage Plan - May 1996". Rainfall depth for the design storm has been calculated using the rainfall maps and formulas outlined in the Drainage Design Manual, Hydrology Volume 1 (Flood Control District of Maricopa County, 1992 and 1995 revisions). The 50-year, 2-hour design storm depth is 2.31 inches. The Flood Control District of Maricopa County (FCDMC) 2-hour storm distribution is used in the HEC-1 storm runoff models (Appendix A).

The Soil Conservation Service Curve Number Method has been used in the HEC-1 models (Appendix A) to evaluate rainfall losses. This method was selected because the curve number and storm rainfall procedure for estimating peak runoff was used in the TR-20 Hydrology Computer Models of past approved Master Drainage Reports for Sections 32 and 33. Curve number data was obtained from these reports.

The Clark Unit Hydrograph method has been used to determine the time of concentration (Tc) and storage coefficient (R) as specified within the FCDMC. The resulting values for Tc and storage coefficient (R) for the 50-year, 2-hour storm are shown on Table 1a, pages 11 through 13. The time versus drainage area relations for the Clark Unit Hydrograph are taken from Table 5.2 under "urban watersheds" (FCDMC - Vol. 1, Hydrology). All of the sub-basins are assumed to drain in this manner.




# FIGURE 1

**VICINITY MAP**

NTS

Sub-basin areas were measured from a 1:500 scale Watershed Delineation Map and verified in AutoCad. A representation of the Watershed Delineation Map is shown on Figure 2 (pg. 9).

## DRAINAGE PLAN

Routing - General

The routing scheme of all drainage areas affecting the project improvements is shown on the Watershed Delineation Map (Figure 2, pg. 9). Flow arrows illustrated on the map indicate the general direction of flow for the individual sub-basins. In addition, HEC-1 models (Appendix A) give a schematic representation of routing of drainage areas and detention/retention facilities within Sections 32 and 33 that impact the project area.

A series of concentration points (see Figure 2, pg. 9 and Figure 3, pg. 10) along the north side of Hunt Highway and at the intersection of Hunt Highway with Dobson and Alma School Roads represent the design discharge locations directly impacting the proposed channel and culvert improvements within the project area. The 50-year, 2-hour peak discharge at some of these concentration points are a summation of flows entering the project area from the applicable sub-basins and storage facilities of Sections 32 and 33. A Water Surface Profile analysis (Appendix B) of the channel along Hunt Highway and the culverts under Dobson and Alma School Roads will use the peak discharges at these concentration points to determine water surface elevations. This analysis was performed using the Army Corps of Engineer's HEC-2 program which analyzes variations of subcritical and supercritical flows in a channel and through pipe culverts. A total of 23 sections at various stations along the channel have been analyzed for flow depth and velocity (see Figure 3, pg. 10). Sections 5, 6 and 18, 19 are the outlet and inlet sections of the proposed culverts. All other sections represent various points along the drainageway. Conveyance within the channel is to the west. Table 2 on page 15 is a summation of flow depths and water surface elevations at each section and concentration points that apply to a particular section. The 50-year, 2-hour flow depth will not exceed channel banks or overtop roadways at proposed culvert crossings.

Existing Conditions

At the present time, there is an existing channel along the north side of Hunt Highway which conveys drainage from Sun Lakes Sections 33 and 32 westerly. The subdivisions within these Sections drain to the adjacent golf course areas and runoff is detained within a series of lakes and detention areas within the golf course or open space areas. Drainage is conveyed to the Hunt Highway channel either by pumping through outlet pipes from the downstream lakes, or gravity flow through an outlet pipe or by overland flow from Alma School Road, Dobson Road or Hunt Highway.

Hunt Highway Upstream From Alma School Road : Drainage from Sun Lakes Section 33 flows to the Hunt Highway channel from the following sources:

1. Gravity flow from Detention Basin 30 - Concentration Point 1 (see Fig. 2)
2. Pump flow from Lake 28 - Concentration Point 2.
3. Pump flow from Lake 12 - Concentration Point 3.
4. Surface runoff from Hunt Highway - Concentration Point 4.
5. Surface flow from the east side of Alma School Road - Concentration Point 5.

Drainage flows west in the Hunt Highway channel picking up contributions from Detention Areas 30, 28 and 12 and Drainage Areas 163 and 155. There are presently 5 - 21" x 18" CMP storm drain culverts under Alma School Road. Also a swale exists along the east side of Alma School Road which is supposed to flow south into the Hunt Highway channel and drain through the culvert system. A low point on Alma School Road approximately 700' - 800' north of Hunt Highway with an existing pavement elevation of approximately 1197.25. The east side swale elevation in this area is approximately 1196.8. As the drainage from the east in the Hunt Highway channel builds up to pass through the existing culvert system, it causes stormwater back-up in the Alma School Road east side swale and flows north to the aforementioned low point on Alma School Road. The east side swale overflows at this point and tops the existing roadway pavement. There is also a swale on the west side of Alma School Road. Because there is not enough elevation drop between the point where the drainage runoff tops the road and the area where the west side swale enters the Hunt Highway channel west of Alma School Road, drainage is trapped in the vicinity of the low point on Alma School Road until drainage from the east has passed through the culvert system and the downstream channel depth has dropped enough to allow the flooded area on Alma School Road to meter out to the Hunt Highway channel. Since the Hunt Highway drainage east of Alma School Road is metered from Sun Lakes Section 33, this process can take several days to dissipate. The result is that there is a flooded area along Alma School Road for this time period. The solution to this will be presented below.

Hunt Highway at Dobson Road:
The situation at Dobson Road is similar but not as severe as that at Alma School Road. There is a low point in Dobson Road and the corresponding swale along its east side approximately 180' north of Hunt Highway. Drainage from the east consists mainly from that drainage from Section 33 flowing through the culverts at Alma School Road plus drainage from Hunt Highway for this reach. Drainage in the swale on the east side of Dobson Road consists of runoff pumped from Lake 1 in Sun Lakes Section 32 and whatever runoff is contributed by the east side of Dobson Road south of Cochise Drive. Once again, drainage from the east breeches the high point in the east side swale and collects at the low point. It then tops Dobson Road and is held there until the downstream Hunt Highway channel on the west side of Dobson Road is low enough to permit the collected flood waters north of Hunt Highway to meter back to this channel.

Solution to flooding of Alma School and Dobson Roads:
The solution consists of the following recommendations:

1. Build up a berm on the north side of the Hunt Highway channel at the upstream end of the culverts under Alma School and Dobson Roads (see Figures 4 & 5) to block drainage from the Hunt Highway channel from backing up in the swales on the east sides of the above mentioned roads.
2. Replace the existing CMP culverts under Alma School and Dobson Road with:
   A. 3 - 30" RCP culverts at Alma School Road
   B. 3 - 36" RCP culverts at Dobson Road.
   The existing culverts are too shallow and become easily clogged with debris and are hard to clean out because of the corrugations.
3. Lower the channel elevations on the outlet side of the respective culvert system and regrade the downstream channel to daylite with the existing channel approximately 1400' west of the intersections. This will lower the water surface elevation downstream of the culverts and provide a hydraulic drop to allow Alma School and Dobson roads to drain while the channel is flowing. The amount the channel can be lowered west of Alma School Road is limited by the presence of existing water transmission and distribution mains which are located under the existing bottom of the Hunt Highway channel. There is presently about 3' of cover over these lines.
4. Install a separate 24" RCP culvert under Alma School and Dobson Roads north of their intersection with Hunt Highway (see Fig. 4 and 5). This will allow the east side swale along the roads to drain west to the lowered channel elevations.
5. It is recommended that an ongoing maintenance program be maintained to insure that the Hunt Highway channel and culvert system be kept clean and to grade. Since the channel grade is so flat in this area, there is an occasion for both sediment buildup and weed growth within the channel. Both these factors have a detrimental effect of the hydraulics of the system. It is also recommended that 10' x 3' concrete strips be installed on the channel bottom at approximate 400 foot intervals in the channel to be used as future grade controls for regrading the channel during maintenance if necessary.

Hydrology/Hydraulics for Solution to Flooding:

Solution of the flooding of Alma School and Dobson Roads was addressed by the following process:

1. Hydrology analysis (HEC 1 Program) to determine contributing drainage to the Hunt Highway channel and swales along Alma School and Dobson Roads. (See Appendix "A" and Tables 1a and 1b).
2. Water Surface Profile Analysis (HEC 2 Program) to determine water surface elevations in the Hunt Highway channel. (See Appendix "B" and Table 2).
3. Using the results from the HEC 2 analysis of the Hunt Highway channel, do a HEC-5 analysis for the respective 24" storm drain culverts under Alma School and Dobson Roads. (See Appendix "B")

CURRENT DATE: 10-02-1996 FILE DATE: 10/2/96
CURRENT TIME: 13:27:16 FILE NAME: HUNTALM

FHWA CULVERT ANALYSIS
HY-8, VERSION

SITE DATA

| CULVERT NO. | INLET ELEV. (ft) | OUTLET ELEV. (ft) | CULVERT LENGTH (ft) |
|---|---|---|---|
| 1 | 1195.90 | 1195.60 | 70.00 |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |

CULVERT SHAPE, MATERIAL, INLET

| BARRELS | SHAPE MATERIAL | SPAN (ft) | RISE (ft) | MANNING n | INLET TYPE |
|---|---|---|---|---|---|
| 5 | CSP | 1.50 | 1.50 | .024 | CONVENTIONAL |

SUMMARY OF CULVERT FLOWS (cfs) FILE: HUNTALM DATE: 10/2/96

| ELEV (ft) | TOTAL | 1 | 2 | 3 | 4 | 5 | 6 | ROADWAY | ITR |
|---|---|---|---|---|---|---|---|---|---|
| 1195.90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1196.69 | 8 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1197.05 | 16 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1197.42 | 24 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1198.12 | 32 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1198.96 | 40 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1198.44 | 48 | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1199.00 | 56 | 56 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1202.48 | 64 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1202.65 | 65 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1205.56 | 80 | 80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | OVERTOPPING | |

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: HUNTALM DATE: 10/2/96

| HEAD ELEV (ft) | HEAD ERROR (ft) | TOTAL FLOW (cfs) | FLOW ERROR (cfs) | % ERROR |
|---|---|---|---|---|
| 1195.90 | 0.00 | 0 | 0 | 0.00 |
| 1196.69 | 0.00 | 0 | 0 | 0.00 |
| 1197.05 | 0.00 | 0 | 0 | 0.00 |
| 1197.42 | 0.00 | 0 | 0 | 0.00 |
| 1198.12 | 0.00 | 0 | 0 | 0.00 |
| 1198.96 | 0.00 | 0 | 0 | 0.00 |
| 1199.44 | 0.00 | 0 | 0 | 0.00 |
| 1199.00 | 0.00 | 0 | 0 | 0.00 |
| 1202.48 | 0.00 | 0 | 0 | 0.00 |
| 1202.65 | 0.00 | 0 | 0 | 0.00 |
| 1205.56 | 0.00 | 0 | 0 | 0.00 |

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



CURRENT DATE: 10-02-1996 FILE DATE: 10/2/96
CURRENT TIME: 13:27:16 FILE NAME: HUNTALM

PERFORMANCE CURVE FOR CULVERT # 1 - 5 ( 1.5 ft BY 1.5 ft) CSP

| 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. (f/s) | OUTLET DEPTH (ft) | TAILWATER VEL. (f/s) | TAILWATER DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1195.90 | 0.00 | 0.00 | 0-NF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 |
| 8 | 1196.69 | 0.71 | 0.79 | 3-M2t | 0.68 | 0.47 | 2.79 | 0.54 | 1.19 | 0.54 |
| 16 | 1197.05 | 1.05 | 1.15 | 3-M2t | 1.07 | 0.68 | 3.25 | 0.82 | 1.46 | 0.82 |
| 24 | 1197.42 | 1.36 | 1.52 | 3-M2t | 1.50 | 0.84 | 3.67 | 1.04 | 1.65 | 1.04 |
| 32 | 1198.12 | 1.69 | 2.22 | 3-M2t | 1.50 | 0.97 | 4.14 | 1.22 | 1.80 | 1.22 |
| 40 | 1198.96 | 2.07 | 3.06 | 3-M2t | 1.50 | 1.09 | 4.55 | 1.39 | 1.92 | 1.39 |
| 48 | 1198.44 | 2.54 | 2.37 | 3-M1f | 1.50 | 1.20 | 5.43 | 1.50 | 2.02 | 1.55 |
| 56 | 1199.00 | 3.10 | 2.69 | 3-M1f | 1.50 | 1.27 | 6.34 | 1.50 | 2.11 | 1.68 |
| 64 | 1202.48 | 3.78 | 6.58 | 4-FFt | 1.50 | 1.34 | 7.24 | 1.50 | 2.19 | 1.81 |
| 65 | 1202.65 | 3.87 | 6.75 | 4-FFt | 1.50 | 1.35 | 7.36 | 1.50 | 2.20 | 1.83 |
| 80 | 1205.56 | 5.46 | 9.66 | 4-FFt | 1.50 | 1.49 | 9.05 | 1.50 | 2.34 | 2.04 |

El. inlet face invert 1195.90 ft El. outlet invert 1195.60 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) | 1195.90 |
| OUTLET STATION (FT) | 70.00 |
| OUTLET ELEVATION (FT) | 1195.60 |
| NUMBER OF BARRELS | 5 |
| SLOPE (V-FT/H-FT) | 0.0043 |
| CULVERT LENGTH ALONG SLOPE (FT) | 70.00 |

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

| | |
|---|---|
| BARREL SHAPE | CIRCULAR |
| BARREL DIAMETER | 1.50 ft |
| BARREL MATERIAL | CORRUGATED STEEL |

INLET TYPE                CONVENTIONAL
INLET EDGE AND WALL       THIN EDGE PROJECTING
INLET DEPRESSION          NONE

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX



CURRENT DATE: 10-02-1996                                    FILE DATE: 10/2/96
CURRENT TIME: 13:27:16                                      FILE NAME: HUNTALM

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXX          TAILWATER          XXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

***** USER DEFINED CHANNEL CROSS-SECTION                    FILE NAME: HUNTALMA
      MAIN CHANNEL ONLY                                     FILE DATE: 10/2/96

| | |
|---|---|
| LEFT CHANNEL BOUNDARY | 0 |
| RIGHT CHANNEL BOUNDARY | 0 |
| MANNING n LEFT OVER BANK | 0.000 |
| MANNING n MAIN CHANNEL | 0.025 |
| MANNING n RIGHT OVER BAN | 0.000 |
| SLOPE OF CHANNEL (FT/FT) | 0.0009 |

| CROSS-SECTION COORD. NO. | X (ft) | Y (ft) |
|---|---|---|
| 1 | 18.00 | 1201.20 |
| 2 | 33.00 | 1195.50 |
| 3 | 43.00 | 1195.50 |
| 4 | 55.00 | 1199.30 |

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

| FLOW (cfs) | W.S.E. (ft) | FROUDE NUMBER | DEPTH (ft) | VEL. (f/s) | SHEAR (psf) |
|---|---|---|---|---|---|
| 0.00 | 1195.50 | 0.000 | -0.10 | 0.00 | 0.00 |
| 8.00 | 1196.14 | 0.282 | 0.54 | 1.19 | 0.03 |
| 16.00 | 1196.42 | 0.296 | 0.82 | 1.46 | 0.04 |
| 24.00 | 1196.64 | 0.305 | 1.04 | 1.65 | 0.05 |
| 32.00 | 1196.82 | 0.311 | 1.22 | 1.80 | 0.06 |
| 40.00 | 1196.99 | 0.316 | 1.39 | 1.93 | 0.06 |
| 48.00 | 1197.15 | 0.320 | 1.55 | 2.02 | 0.07 |
| 56.00 | 1197.28 | 0.323 | 1.68 | 2.11 | 0.07 |
| 64.00 | 1197.41 | 0.326 | 1.81 | 2.19 | 0.08 |
| 65.00 | 1197.43 | 0.326 | 1.83 | 2.20 | 0.08 |
| 80.00 | 1197.64 | 0.331 | 2.04 | 2.34 | 0.08 |

XXXXXXXXXXXXXXXXXXXXXXXXXXXX ROADWAY OVERTOPPING DATA XXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

| | |
|---|---|
| ROADWAY SURFACE | PAVED |
| EMBANKMENT TOP WIDTH | 70.00 ft |
| CREST LENGTH | 70.00 ft |
| OVERTOPPING CREST ELEVATION | 1200.00 ft |

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

4. Water Surface Profile Analysis (HEC 2 Program) to determine water surface elevations in the swales along the east and west sides of Alma School and Dobson Roads in relation to the water surface elevations in the Hunt Highway channel. (See Appendix "B" and Tables 3 and 4).

Alma School Road:

The process for analyzing Alma School Road was described in the previous paragraph. The following steps were taken to arrive at a solution:

1. A hydrograph for all flows to Concentration Point 6 (Fig. 2) is included in the analysis contained in Appendix "B". This is hydrograph "Sum 156". It indicates that the peak flow of 48 cfs will occur at time 1 hour, 50 minutes. From the HEC 2 run, this occurs at Section 17 at Station 112 + 32.48 (see Fig. 3). At this section the computed water surface elevation is 1197.23.
2. Using this as a downstream backwater, the following steps were taken:
   A. Use this backwater elevation and a HEC 5 analysis (see Appendix "B") to analyze flow through a 24" pipe under Alma School Road to drain the east side swale.
   B. Because the high water will flow over Alma School Road for a short time period, balance the HEC 2 runs for the east & west side swales along Alma School Road so that they will attain the same high water elevations upstream of Hunt Highway where water crosses the Alma School Road at Stations 8+00 to 9+18 (See Fig.3)
   C. Determine the duration of this flow over Alma School Road.

From the HEC 1 output, it is determined that the peak flows down the east and west side of Alma School Road are 11 cfs and 8 cfs respectively (from Drainage Areas "Sub 142" and "Sum 156"). By trial and error it was found that to balance high water surfaces that the total flow of 19 cfs would be redistributed so that 14 cfs would flow in the west side swale and 5 cfs would flow in the east side swale, through a 24" pipe to the Hunt Highway channel. This analysis is included in Appendix "B". The results of this analysis shows that the high water surface at Station 9+18 on Alma School Road is 1197.46. Since the pavement centerline elevation in this area is 1197.25, the flow depth for the peak flow duration is 0.21' over Alma School Road. This occurs at time 1 hour, 50 minutes when the flow in the Hunt Highway channel is at 48 cfs. At time period 2 hours, 50 minutes (see Hydrograph "Sum 156" - Appendix "B"), flow in the Hunt Highway channel has dropped to 36 cfs and the corresponding water surface has decreased to 1197.00. At the same time period flows down the east and west side of Alma School Road have decreased to 1 cfs and 1 cfs respectively. Therefore flow is now contained within the respective swales and there will be no flow over Alma School Road. Therefore flow over Alma School Road will occur for a duration of less than one hour at a peak depth of 0.21'.

Dobson Road:

The process for analyzing Dobson Road is the same as that for Alma School Road

described in the preceding paragraph. The following steps were taken:

1. A hydrograph for all flows to Concentration Point 11 is included in the analysis contained in Appendix "B". This is hydrograph "Sec 32". It indicated that the peak flow of 65 cfs will occur at time period 2 hours, 15 minutes. From the HEC 2 run this occurs at Section 4 at Station 59 + 40 (see Fig. 3). At this Section the computed water surface elevation is 1187.70.
2. Using this backwater elevation, use the HEC 5 analysis to compute flow through a 24" pipe from the east side swale and also a HEC 2 analysis to analyze flow in the east and west side swales along Dobson Road.

From the HEC 1 output it is determined that peak flows down the east and west side of Dobson Road at time period 2 hours, 15 minutes are 13 cfs and 3 cfs respectively (from Drainage Areas "Sum 198" and "Sub 199"). The runoff to the east side swale is a result of flow from the east side of Dobson Road from south of Cochise Drive plus pump flow of 12 cfs from Lake 1 in Sun Lakes Section 32 which enters the swale from an outlet structure south of Cochise Drive. The low pavement elevation on Dobson Road occurs approximately 220' north of Hunt Highway at elevation 1188.77. HEC 2 analysis of the east and west side swales indicate that drainage will be contained within the swales and will not overtop the road. Therefore by lowering the downstream channel on the Hunt Highway channel and draining the east side channel through a 24" pipe will effectively drain Dobson Road north of Hunt Highway.

## CONCLUSIONS

This report determines the impact of flows on the proposed improvements at the intersection of Dobson and Alma School Roads with Hunt Highway. A summary of sub-basin flows is provided in Table 1a (pgs. 11-13). Table 1b on page 14 is a summary of flows at concentration points affecting the project area. Table 2 on page 15 provides flow depth information at 23 sections within the channel along Hunt Highway.

The project area adheres to the drainage criteria as set forth by the Flood Control District of Maricopa County. The following proposals are made to address the flooding problems on Alma School and Dobson Roads:

1. Lower the Hunt Highway channel downstream of the Alma School and Dobson Roads culvert crossing by approximately one foot (1'). Regrade the Hunt Highway channel downstream of these points to daylite with the existing channel at approximately 1400' west of the respective intersections.
2. Construct a berm on the north side of the Hunt Highway channel to separate drainage flows from the Hunt Highway channel and the east side swales of Alma School and Dobson Roads.
3. Replace the existing culverts with 3-30" culverts (Alma School Road) and 3-36" culverts (Dobson Roads). Install gunite aprons 30' upstream and downstream of the inlet/outlet of these culverts.
4. Install 24" culverts under Alma School and Dobson Roads to drain east side swales.
5. Regrade Alma School and Dobson Road swales to promote drainage flow to the Hunt Highway channel.

Proposed channel improvements and culverts meet the design constraints of the 50-year, 2-hour event storm. Figure 3 on page 10 provides a detail of the channel cross-sections at the various points studied in this report. It was determined that 3-30" RCP storm drain culverts be used at Alma School Road and 3 - 36" RCP be used at Dobson Road. The 50-year, 2-hour flow depth at inlet culvert section 6 is 2.02' with a water surface elevation of 1188.52'. The low roadway elevation in this area (intersection of Dobson Road and Hunt Highway) is 1192.32, well above the 50-year, 2-hour water surface. The 50-year, 2-hour flow depth at inlet culvert section 19 is 1.76' with a water surface elevation of 1196.76'. The low roadway elevation in this area (intersection of Alma School Road and Hunt Highway) is 1200.72, well above the 50-year, 2-hour water surface. Maximum allowable flow depth within the Hunt Highway channel before exceeding channel banks is 3 feet. According to the results of the water surface profile analysis (Table 2 and Appendix B), maximum flow depth is 2.02 feet. Flows are adequately contained within the channel.

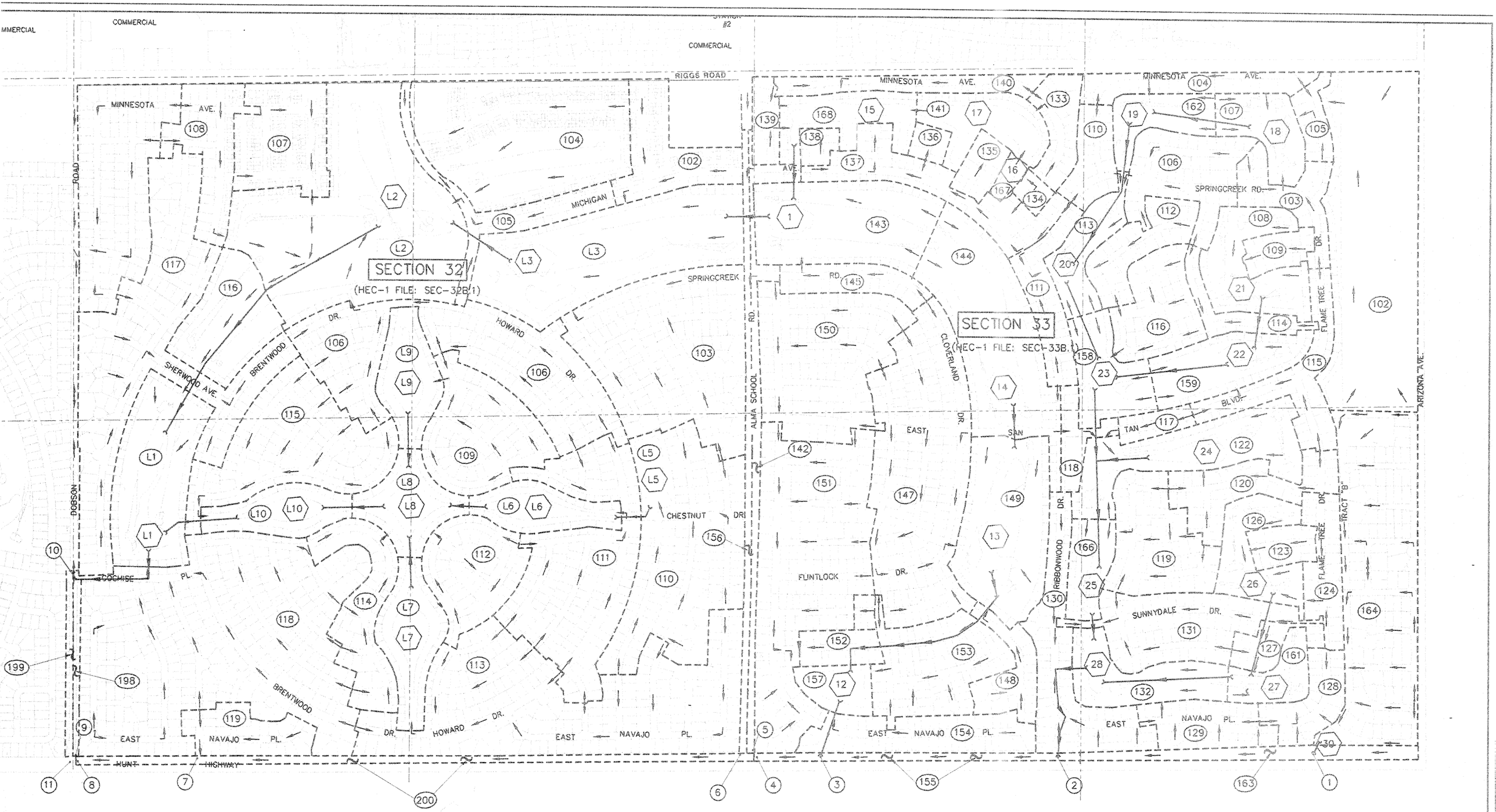
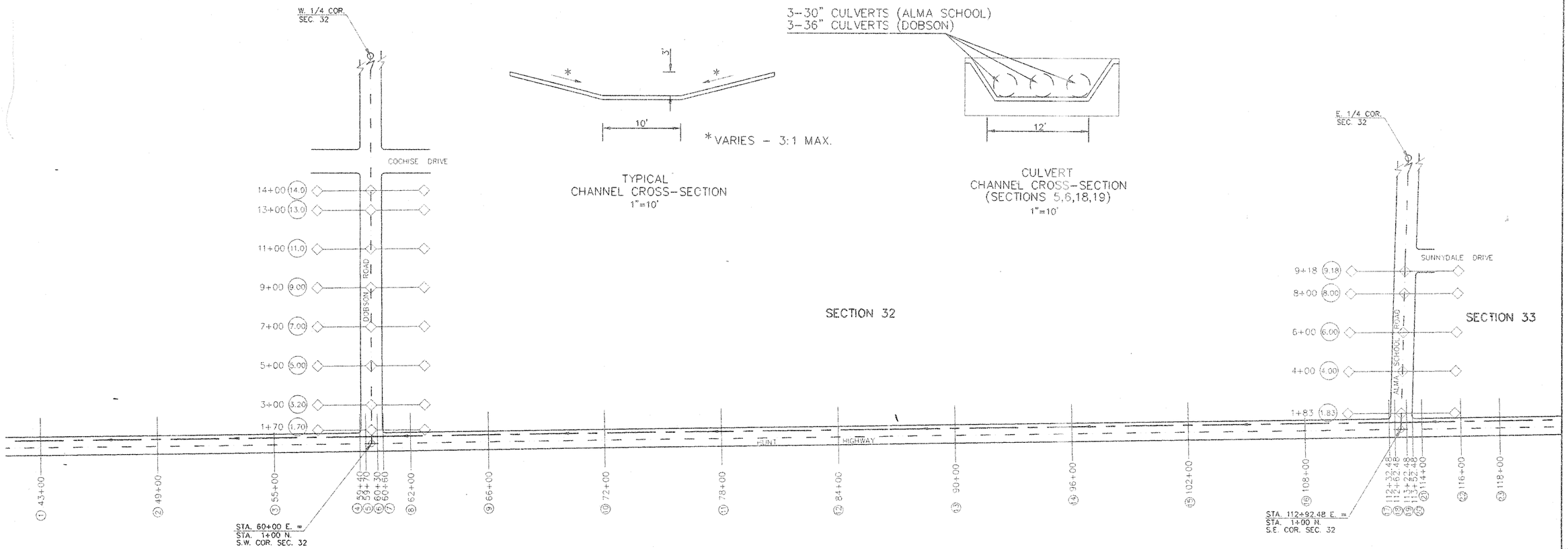



FIGURE 2
WATERSHED DELINEATION MAP




# FIGURE 3 - HUNT HIGHWAY WATER SURFACE PROFILE ANALYSIS

B&R ENGINEERING INC.

SHEET: 1 OF 1

10

**TABLE 1a**
SUB-BASIN RUNOFF SUMMARY
50 YEAR - 2 HOUR STORM

| SUB-BASIN | AREA (ac) | CN | Tc (hr.) | R (hr.) | Qpeak (cfs) |
|---|---|---|---|---|---|
| Section 33: | | | | | |
| 102 | 43.4 | 76.0 | 0.467 | 0.293 | 34 |
| 103 | 7.2 | 89.5 | 0.250 | 0.228 | 16 |
| 104 | 11.5 | 89.5 | 0.250 | 0.242 | 25 |
| 105 | 10.0 | 89.5 | 0.265 | 0.413 | 15 |
| 106 | 15.4 | 89.5 | 0.264 | 0.218 | 35 |
| 107 | 13.0 | 65.0 | 0.400 | 0.148 | 5 |
| 108 | 9.6 | 65.0 | 0.250 | 0.230 | 3 |
| 109 | 3.8 | 89.5 | 0.250 | 0.287 | 8 |
| 110 | 5.1 | 89.5 | 0.250 | 0.228 | 11 |
| 111 | 9.6 | 89.5 | 0.250 | 0.190 | 23 |
| 112 | 7.0 | 89.5 | 0.250 | 0.287 | 14 |
| 113 | 7.0 | 65.0 | 0.250 | 0.438 | 2 |
| 114 | 5.8 | 89.5 | 0.250 | 0.321 | 11 |
| 115 | 12.2 | 89.5 | 0.320 | 0.340 | 22 |
| 116 | 12.1 | 89.5 | 0.250 | 0.243 | 26 |
| 117 | 5.0 | 89.5 | 0.250 | 0.316 | 10 |
| 118 | 8.3 | 89.8 | 0.250 | 0.316 | 16 |
| 119 | 9.0 | 89.5 | 0.250 | 0.226 | 20 |
| 120 | 5.1 | 89.5 | 0.250 | 0.332 | 9 |
| 121 | 5.8 | 89.5 | 0.250 | 0.154 | 15 |
| 122 | 12.8 | 65.0 | 0.250 | 0.185 | 5 |
| 123 | 3.2 | 89.5 | 0.250 | 0.293 | 6 |
| 124 | 4.5 | 89.5 | 0.250 | 0.431 | 7 |
| 126 | 1.0 | 65.0 | 0.250 | 0.193 | 4 |
| 127 | 5.1 | 89.5 | 0.250 | 0.372 | 9 |
| 128 | 7.0 | 89.5 | 0.250 | 0.275 | 14 |
| 129 | 7.7 | 89.5 | 0.250 | 0.284 | 15 |
| 130 | 18.6 | 89.5 | 0.342 | 0.314 | 34 |
| 131 | 16.0 | 89.5 | 0.280 | 0.292 | 31 |
| 132 | 9.6 | 65.0 | 0.286 | 0.279 | 3 |
| 133* | 7.0 | 89.5 | 0.250 | 0.275 | 14 |
| 134* | 1.9 | 89.5 | 0.250 | 0.229 | 4 |
| 135* | 3.2 | 89.5 | 0.250 | 0.258 | 7 |
| 136* | 1.9 | 89.5 | 0.250 | 0.259 | 4 |
| 137* | 14.1 | 89.5 | 0.295 | 0.194 | 33 |
| 138* | 1.9 | 89.5 | 0.250 | 0.229 | 4 |
| 139* | 3.8 | 89.5 | 0.250 | 0.175 | 10 |

* In Section 32 HEC-1 FILE (SEC32B.1)

**TABLE 1a** (cont')
SUB-BASIN RUNOFF SUMMARY
50 YEAR - 2 HOUR STORM

| SUB-BASIN | AREA (ac) | CN | Tc (hr.) | R (hr.) | Qpeak (cfs) |
|---|---|---|---|---|---|
| 140* | 8.3 | 89.5 | 0.275 | 0.411 | 13 |
| 141* | 7.7 | 96.0 | 0.250 | 0.043 | 35 |
| 142 | 8.13 | 88.3 | 0.690 | 2.952 | 11 |
| 143* | 19.8 | 65.0 | 0.750 | 0.516 | 4 |
| 144 | 16.0 | 65.0 | 0.400 | 0.367 | 4 |
| 145* | 8.3 | 89.5 | 0.253 | 0.285 | 17 |
| 147 | 40.8 | 89.5 | 0.456 | 0.364 | 67 |
| 148 | 6.4 | 89.5 | 0.250 | 0.338 | 12 |
| 149 | 16.6 | 68.0 | 0.500 | 0.184 | 8 |
| 150 | 26.2 | 89.5 | 0.357 | 0.350 | 46 |
| 151 | 38.6 | 89.5 | 0.440 | 0.430 | 58 |
| 152 | 3.8 | 89.5 | 0.250 | 0.269 | 8 |
| 153 | 15.4 | 89.5 | 0.253 | 0.232 | 34 |
| 154 | 10.9 | 89.5 | 0.318 | 0.304 | 20 |
| 155 | 2.6 | 92.0 | 0.310 | 1.195 | 2 |
| 156 | 6.4 | 88.0 | 0.690 | 3.383 | 8 |
| 157 | 5.1 | 96.0 | 0.250 | 0.054 | 23 |
| 158 | 8.3 | 65.0 | 0.250 | 0.138 | 4 |
| 159 | 7.7 | 65.0 | 0.283 | 0.194 | 3 |
| 161 | 5.8 | 65.0 | 0.250 | 0.170 | 2 |
| 162 | 6.5 | 65.0 | 0.250 | 0.160 | 3 |
| 163 | 3.8 | 92.0 | 0.400 | 1.235 | 3 |
| 164 | 37.3 | 89.5 | 0.360 | 0.473 | 55 |
| 166 | 6.0 | 65.0 | 0.250 | 0.154 | 2 |
| 167* | 1.3 | 96.0 | 0.250 | 0.120 | 5 |
| 168* | 6.4 | 96.0 | 0.250 | 0.048 | 29 |
| Section 32: | | | | | |
| 102 | 6.7 | 87.0 | 0.250 | 0.258 | 12 |
| 103 | 35.8 | 87.0 | 0.383 | 0.342 | 54 |
| L3 | 32.4 | 76.3 | 0.733 | 0.534 | 17 |
| 104 | 28.1 | 88.0 | 0.333 | 0.354 | 45 |
| 105 | 12.9 | 87.0 | 0.283 | 0.304 | 21 |
| 106 | 32.9 | 87.0 | 0.517 | 0.509 | 38 |
| L2 | 48.8 | 78.3 | 0.550 | 0.237 | 48 |
| 107 | 14.3 | 87.0 | 0.267 | 0.222 | 28 |
| 108 | 10.8 | 87.0 | 0.350 | 0.416 | 15 |
| 116 | 11.7 | 74.0 | 0.400 | 0.256 | 9 |

* In Section 32 HEC-1 FILE (SEC32B.1)

**TABLE 1a** (cont')
SUB-BASIN RUNOFF SUMMARY
50 YEAR - 2 HOUR STORM

| SUB-BASIN | AREA (ac) | CN | Tc (hr.) | R (hr.) | Qpeak (cfs) |
|---|---|---|---|---|---|
| 117 | 41.5 | 87.0 | 0.525 | 0.430 | 53 |
| 110 | 28.7 | 87.0 | 0.292 | 0.211 | 57 |
| L5 | 3.9 | 84.0 | 0.250 | 0.036 | 10 |
| 111 | 31.2 | 87.0 | 0.442 | 0.336 | 47 |
| L6 | 7.6 | 80.5 | 0.250 | 0.025 | 16 |
| 113 | 48.0 | 87.0 | 0.833 | 0.959 | 34 |
| L7 | 9.4 | 81.5 | 0.250 | 0.080 | 19 |
| 109 | 16.9 | 87.0 | 0.333 | 0.304 | 28 |
| L9 | 9.0 | 80.5 | 0.250 | 0.039 | 19 |
| 112 | 12.8 | 87.0 | 0.292 | 0.308 | 21 |
| 114 | 9.7 | 87.0 | 0.250 | 0.314 | 16 |
| L8 | 9.4 | 80.9 | 0.250 | 0.080 | 18 |
| 115 | 25.6 | 87.0 | 0.525 | 0.489 | 30 |
| L10 | 6.0 | 81.3 | 0.250 | 0.120 | 11 |
| 118 | 71.9 | 87.0 | 0.483 | 0.281 | 115 |
| L1 | 19.2 | 76.2 | 0.667 | 0.298 | 14 |
| 198 | 1.3 | 92.0 | 0.115 | 0.389 | 3 |
| 199 | 1.3 | 92.0 | 0.115 | 0.389 | 3 |
| 119 | 7.1 | 87.0 | 0.250 | 0.263 | 13 |
| 200 | 6.4 | 92.0 | 0.245 | 1.070 | 6 |

**TABLE 1B**
CONCENTRATION POINT
RUNOFF SUMMARY

| CONC. POINT | HEC-1 HYDROGRAPH | Qpeak (cfs) |
|---|---|---|
| Section 33 HEC-1 FILE (Sec 33B.0H1) | | |
| 1 | DET 30 | 13 |
| 2 | SUM 163 | 28 |
| 3 | SUM 155 | 35 |
| 4 | SUM 155 | 35 |
| 5 | SUM 142 | 11 |
| 6 | SUM 156 | 48 |
| Section 32 HEC-1 FILE (Sec 32B.0H1) | | |
| 7 | SUM 119 | 49 |
| 8 | SUM 200 | 52 |
| 9 | SUM 198 | 15 |
| 10 | DET L1 | 12 |
| 11 | SEC 32 | 65 |

**TABLE 2**
HUNT HIGHWAY
CHANNEL HEC 2 SUMMARY*

| Section | Station | Related Conc. Point (if applicable) | Qpeak (cfs) | Depth (ft) | Water Surface (ft) |
|---|---|---|---|---|---|
| 1 | 43+00 | - | 65 | 1.80 | 1186.00 |
| 2 | 49+00 | - | 65 | 1.69 | 1186.55 |
| 3 | 55+00 | - | 65 | 1.70 | 1187.16 |
| 4 | 59+40 | 11 | 65 | 1.99 | 1187.69 |
| 5 | 59+70 | - | 52 | 1.90 | 1187.70 |
| 6 | 60+30 | - | 52 | 2.02 | 1188.52 |
| 7 | 60+60 | 8 | 52 | 1.43 | 1188.53 |
| 8 | 62+00 | - | 49 | 1.08 | 1188.68 |
| 9 | 66+00 | 7 | 49 | 1.00 | 1189.80 |
| 10 | 72+00 | - | 48 | 1.11 | 1191.01 |
| 11 | 78+00 | - | 48 | 1.41 | 1191.81 |
| 12 | 84+00 | - | 48 | 1.26 | 1192.56 |
| 13 | 90+00 | - | 48 | 1.30 | 1193.60 |
| 14 | 96+00 | - | 48 | 1.44 | 1195.08 |
| 15 | 102+00 | - | 48 | 1.56 | 1196.16 |
| 16 | 108+00 | - | 48 | 1.72 | 1196.82 |
| 17 | 112+32.48 | - | 48 | 1.73 | 1197.23 |
| 18 | 112+62.48 | - | 35 | 1.54 | 1197.24 |
| 19 | 113+22.48 | - | 35 | 1.76 | 1197.76 |
| 20 | 113+52.48 | 4 | 35 | 1.49 | 1197.79 |
| 21 | 114+00 | - | 35 | 1.18 | 1197.78 |
| 22 | 116+00 | - | 35 | 1.28 | 1198.28 |
| 23 | 118+00 | 3 | 35 | 1.43 | 1198.73 |

* See Appendix B for HEC 2 Computer Run

**TABLE 3**
ALMA SCHOOL ROAD
SWALE HEC 2 SUMMARY

| | | West Side Swale | | | East Side Swale | | |
|---|---|---|---|---|---|---|---|
| Section | Station | Q peak (cfs) | Depth (ft) | Water Surface (ft) | Q peak (cfs) | Depth (ft) | Water Surface (ft) |
| 1.83 | 1 + 83 | 14 | 1.60 | 1197.20 | 5 | 1.42 | 1197.32 |
| 4.00 | 4 + 00 | 14 | 1.40 | 1197.30 | 5 | 1.17 | 1197.38 |
| 6.00 | 6 + 00 | 14 | 1.20 | 1197.38 | 5 | 0.91 | 1197.41 |
| 8.00 | 8 + 00 | 14 | 0.98 | 1197.44 | 5 | 0.64 | 1197.43 |
| 9.18 | 9 + 18 | 14 | 0.83 | 1197.46 | 5 | 0.48 | 1197.44 |

**TABLE 4**
DOBSON SCHOOL ROAD
SWALE HEC 2 SUMMARY

| | | West Side Swale | | | East Side Swale | | |
|---|---|---|---|---|---|---|---|
| Section | Station | Q peak (cfs) | Depth (ft) | Water Surface (ft) | Q peak (cfs) | Depth (ft) | Water Surface (ft) |
| 1.70 | 1 + 70 | 3 | 0.70 | 1187.70 | 13 | 2.06 | 1188.56 |
| 3.20 | 3 + 20 | 3 | 0.70 | 1188.15 | 13 | 1.83 | 1188.59 |
| 5.00 | 5 + 00 | 3 | 0.50 | 1188.50 | 13 | 1.47 | 1188.63 |
| 7.00 | 7 + 00 | 3 | 0.33 | 1189.43 | 13 | 1.22 | 1188.78 |
| 9.00 | 9 + 18 | 3 | -- | | 13 | 1.14 | 1189.10 |
| 11.00 | 11 + 00 | -- | -- | | 13 | 1.16 | 1189.52 |
| 13.00 | 13 + 00 | -- | -- | | 13 | 1.14 | 1189.90 |
| 14.00 | 14 + 00 | -- | -- | | 13 | 1.11 | 1190.07 |

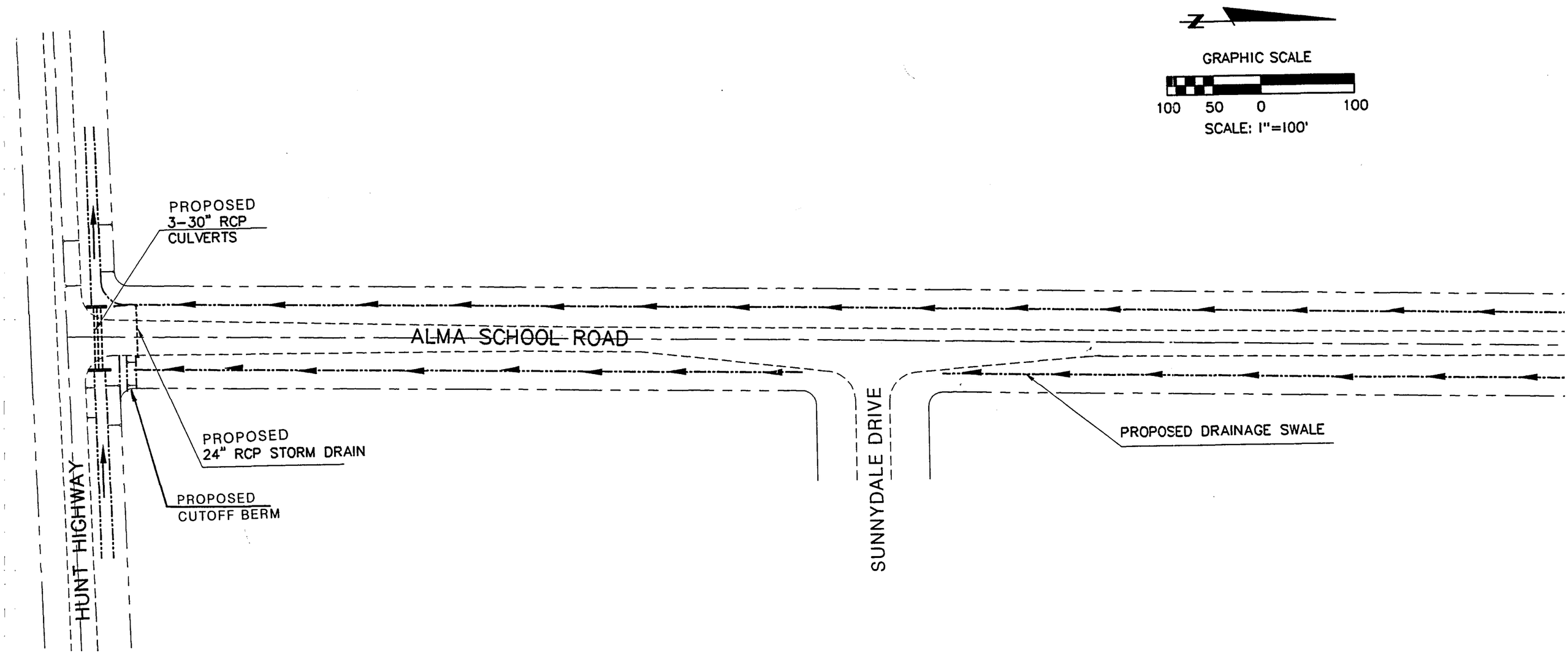

GRAPHIC SCALE
100 50 0 100
SCALE: 1"=100'
PROPOSED
3-30" RCP
CULVERTS
ALMA SCHOOL ROAD
PROPOSED
24" RCP STORM DRAIN
PROPOSED
CUTOFF BERM
HUNT HIGHWAY
SUNNYDALE DRIVE
PROPOSED DRAINAGE SWALE

**FIGURE 4**

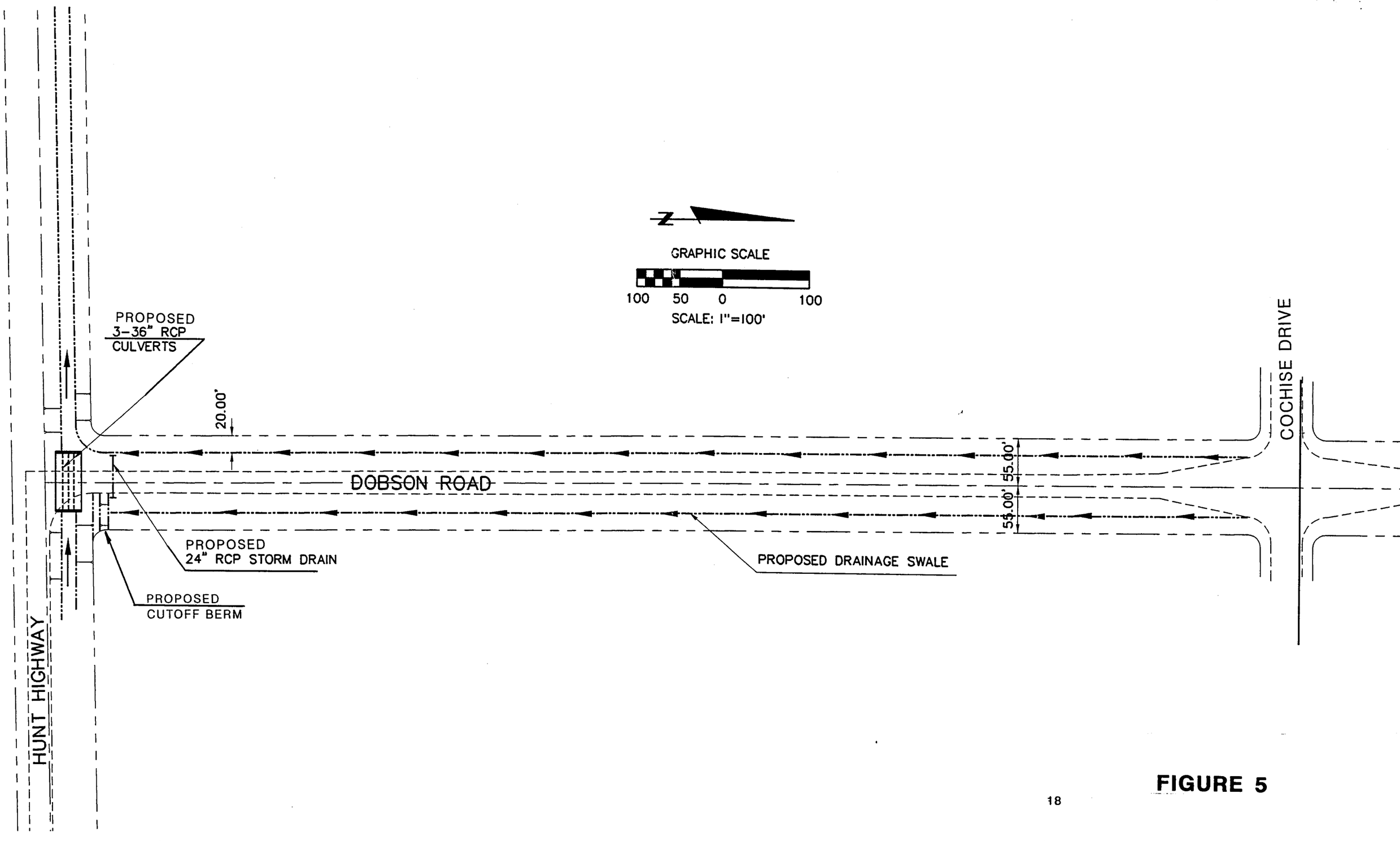

N
GRAPHIC SCALE
100 50 0 100
SCALE: 1"=100'
PROPOSED
3-36" RCP
CULVERTS
20.00'
DOBSON ROAD
55.00'
55.00'
COCHISE DRIVE
PROPOSED
24" RCP STORM DRAIN
PROPOSED DRAINAGE SWALE
PROPOSED
CUTOFF BERM
HUNT HIGHWAY

**FIGURE 5**

# APPENDIX "A"

# HYDROLOGY
# HEC 1 ANALYSIS
# 50 YEAR STORM
# SECTIONS 32 & 33

```
TD SUN LAKES SEC. 33
 D     FILE NAME:  C:\HYDROPRO\DATA\SL\HUNTHWY\SEC33B.1              DATE:  8/2/96
 D
ID     **** This model has been prepared by B&R Engineering, Inc. to represent
ID          the volume of runoff produced on Section 33 as a result of a
 D          50-yr, 2-hr storm, for the purposes of determining the culvert
 D          sizes and capacity under Alma School Road along Hunt Highway and
ID          for determining necessary drainage improvements to prevent
ID          excessive flooding of Alma School at this intersection. This model
TD          uses prepared information taken from TR-20 computer runs, master
 D          drainage reports, calculations and maps. ****
 D
ID          RJH
ID
 D PRECIPITATION
 D     Design depth corresponds to the 50-yr, 2-hr storm using rainfall
ID     distribution provided by the Drainage Design Manual for Maricopa County,
ID     as reported in the Sun Lakes Section 29 and 30 Master Drainage Plan,
TD     April, 1993.
 D
 D     Rainfall depth      (50-yr, 2-hr) = 2.31 inches
ID                         Aerial adjustment factor used is 1.00
ID
 D TIME INCREMENT:   5 minutes
 D
ID SUB-BASIN DELINEATION
ID     Drainage sub-basins are delineated using the 1 inch equals 500' map
TD     labeled as Exhibit A, Drainage Delineation Map.
 D
 D LAND USE
ID
ID RAINFALL LOSSES BY LAND USE ARE ACCORDING TO PAST APPROVED REPORTS
 D
 D RAINFALL LOSSES BY SUB-BASIN ARE BASED ON PAST APPROVED REPORTS
ID
ID TIME OF CONCENTRATION
TD     Times of Concentration were taken from the previously prepared TR-20
 D     input file "SL33HYD2" and from revisions discussed with TH to Section
 D     33 based on current land use and grading scheme of certain areas.
ID
ID TIME AREA RELATION
 D     The time vs. drainage area relations for the Clark Unit Hydrograph
 D     are taken from Table 5.2 (FCDMC) for "Urban Watersheds".
ID
ID OFFSITE FLOWS
TD     No offsite flows impact Section 33.
 D
DIAGRAM
ID
IT     5                    1000
 O     3
KSUB102
BA .0677
IN     5
PB  2.31
PC  .000    .011    .018    .023    .028    .032    .046    .071    .100    .137
PC  .176    .232    .327    .601    .743    .863    .901    .930    .954    .962
PC  .970    .979    .982    .992   1.000
LS          76.0
JC  .467    .293
JA     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUB105
BA 0.015
LS          89.5
JC 0.265   0.413
UA     0       5      16      30      65      77      84      90      94      97
UA   100
KCNL105
RK   100  0.0011   0.018            TRAP      15       3
KKSUM105
HC     2
KSUB103
BA .0113
LS          89.5
UC   .25    .228
```



**SUN LAKES SECT.33 HEC 1 INPUT**

```
U      0       5      16      30      65      77      84      90      94      97
U    100
KKSUM103
HC     2
K  UB107
B   0.02
L              65
UC   0.4   0.148
U      0       5      16      30      65      77      84      90      94      97
U    100
F  UM107
HC     2
KK DET18
I
I
K      1    STOR      -1
SV   0.0    0.85    2.32    4.56    7.13
SE1204.0  1205.0  1206.0  1207.0  1208.0
     0.0     1.0    1.41    1.62     1.8
   PIP18
KM      10" CONC. PIPE - LAKE 18 TO LAKE 19
RK   890  0.0052   0.018            CIRC   0.833
  SUB104
   0.018
LS           89.5
UC  0.25   0.242
U      0       5      16      30      65      77      84      90      94      97
    100
  SUB162
BA  0.01
LS             65
  0.25   0.160
      0       5      16      30      65      77      84      90      94      97
UA   100
KKSUM162
C      3
 C DET19
 )
KM
RS     1    STOR      -1
 V   0.0    0.07    0.38    1.23    2.84    5.35
 E1202.0  1203.0  1204.0  1205.0  1206.0  1207.0
SQ   0.0    3.43    4.16    4.17    4.18    4.19
KK PIP19
M      15" CONC. PIPE - LAKE 19 TO LAKE 20
 K   850   0.008   0.018            CIRC    1.25
 KSUB106
BA 0.024
LS           89.5
C 0.264   0.218
A      0       5      16      30      65      77      84      90      94      97
UA   100
KKSUB110
A 0.008
S            89.5
C  0.25   0.228
UA     0       5      16      30      65      77      84      90      94      97
UA   100
KSUM110
C      3
KKCNL110
RK   700  0.0086   0.035            TRAP      20      20
KKSUB111
BA 0.015
LS           89.5
UC  0.25   0.190
UA     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUM111
HC     2
KKSUB112
BA 0.011
LS           89.5
UC  0.25   0.287
UA     0       5      16      30      65      77      84      90      94      97
UA   100
```

```
  SUM112
      2
KKSUB113
BA 0.011
LS            65
   0.25   0.438
      0       5      16      30      65      77      84      90      94      97
UA   100
KKSUM113
      2
  DET20
KO
KM
RS     1    STOR      -1
   0.0    0.14    0.66    1.78    3.53    5.79    7.11    8.63
1199.0  1200.0  1201.0  1202.0  1203.0  1204.0  1204.5  1205.0
SQ   0.0    4.43    4.66    5.10    5.49    5.92    23.0    72.0
KK PIP20
      15" CONC. PIPE - LAKE 20 TO LAKE 23
   700    0.01   0.018            CIRC    1.25
KKSUB109
BA 0.006
LS           89.5
  0.25   0.287
     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUB108
  0.015
            65
  0.25   0.230
UA     0       5      16      30      65      77      84      90      94      97
UA   100
KSUM108
     2
KK DET21
KO
     1    STOR      -1
SV   0.0    0.17    0.85    2.37    5.29
SE1203.0  1204.0  1205.0  1206.0  1207.0
SQ   0.0    0.85    0.86    0.87    0.88
 PIP21
      8" CONC. PIPE - LAKE 21 TO LAKE 22
RK   480  0.0092   0.018            CIRC   0.667
KKSUB114
  0.009
           89.5
  0.25   0.321
UA     0       5      16      30      65      77      84      90      94      97
UA   100
KSUM114
     2
KKSUB159
BA 0.012
            65
 0.283   0.194
UA     0       5      16      30      65      77      84      90      94      97
UA   100
KSUM159
     2
KSUB115
BA 0.019
LS           89.5
  0.32   0.340
     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUM159
     2
K DET22
O
KM
RS     1    STOR      -1
V   0.0    0.17    0.80    1.97     3.6    5.67    6.93
E1201.0  1202.0  1203.0  1204.0  1205.0  1206.0  1206.5
SQ   0.0    1.43    1.76    2.04    2.28    2.49    2.59
KK PIP22
```

```
TM      10" CONC. PIPE - LAKE 21 TO LAKE 23
 K   540    0.03   0.018            CIRC   0.833
 KSUB158
BA 0.013
LS            65
 C  0.25   0.138
 A     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUB116
TA 0.019
 S          89.5
 C  0.25   0.243
UA     0       5      16      30      65      77      84      90      94      97
UA   100
 KSUM158
 C     4
KK DET23
KO
 M
 S     1    STOR      -1
 V   0.0    1.09    2.54    4.63    7.67    11.8   16.96    23.4
SE1198.0  1199.0  1200.0  1201.0  1202.0  1203.0  1204.0  1205.0
SQ   0.0     2.2     4.3     4.5    6.41     6.5     8.6    10.2
 K PIP23
 M      18" CONC. PIPE - LAKE 23 TO COMBINE WITH PIPE FROM LAKE 24
RK   750   0.007   0.018            CIRC     1.5
KKSUB121
 A 0.009
 S          89.5
 C  0.25   0.154
UA     0       5      16      30      65      77      84      90      94      97
UA   100
 KSTR121
 K  1200  0.0057   0.035            TRAP      20      20
KKSUB122
BA  0.02
 S            65
 C  0.25   0.185
JA     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUM122
 C     2
 KSUB120
BA 0.008
LS          89.5
 C  0.25   0.332
JA     0       5      16      30      65      77      84      90      94      97
JA   100
KKCNL120
RK   350  0.0014   0.035            TRAP      20      20
 KSUM122
 C     2
KKSUB118
BA 0.013
 S          89.8
 C  0.25   0.316
JA     0       5      16      30      65      77      84      90      94      97
UA   100
KKCNL118
RK   250  0.0123   0.035            TRAP      20      20
 KSUB117
BA 0.008
LS          89.5
 C  0.25   0.316
JA     0       5      16      30      65      77      84      90      94      97
JA   100
KKSUM118
C     2
KKSUM122
C     2
KK DET24
KO
KM
RS     1    STOR      -1
SV   0.0   0.132   1.015   1.898   3.275    5.23   7.644
SE1198.0  1199.0  1200.0  1201.0  1202.0  1203.0  1203.5
```

```
 ) 0.0     2.8     4.1     5.0     5.4     6.1    45.0
 ( PIP24
KM      18" CONC. PIPE - LAKE 24 TO COMBINE WITH PIPE FROM LAKE 23
RK   250  0.0071   0.018            CIRC     1.5
KKSUM166
 :     2
 (PIP166
KM      21" CONC. PIPE - LAKES 23, 24 TO LAKE 25
RK   800  0.0070   0.018            CIRC    1.75
 (SUB119
 A 0.014
LS          89.5
UC  0.25   0.226
UA     0       5      16      30      65      77      84      90      94      97
 A   100
 (CNL119
RK   300  0.0019   0.035            TRAP      20      20
KKSUM166
 :     2
 KSUB166
BA 0.009
LS            65
UC  0.25   0.154
 A     0       5      16      30      65      77      84      90      94      97
 A   100
KKSUM166
HC     2
 K DET25
 O
KM
RS     1    STOR      -1
SV   0.0    0.76    1.76    3.11    4.93    7.12    9.98
 E1196.0  1197.0  1198.0  1199.0  1200.0  1201.0  1202.0
 Q   0.0     3.7    6.78    9.58   13.58   16.60   19.17
KKSUB131
BA 0.025
 S          89.5
 C  0.28   0.292
UA     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUM131
 C     2
 KSUB123
BA 0.005
LS          89.5
 C  0.25   0.293
 A     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUB126
A 0.014
S            65
C  0.25   0.193
UA     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUM126
C     2
KKSUB124
BA 0.007
S          89.5
C  0.25   0.431
A     0       5      16      30      65      77      84      90      94      97
UA   100
KKCNL124
K   400  0.0081   0.035            TRAP      20      20
KSUM126
HC     2
KK DET26
KO
KM
RS     1    STOR      -1
SV   0.0    0.06    0.64    1.86    3.67    6.48   10.75
SE1201.5  1202.0  1203.0  1204.0  1205.0  1206.0  1207.0
SQ   0.0     0.5    0.76     0.8     0.9    1.04    1.17
KK PIP26
KM       8" CONC. PIPE - LAKE 26 TO LAKE 27
RK   600  0.0084   0.018            CIRC   0.667
```

```
   SUB128
    0.011
LS           89.5
UC  0.25   0.275
UA     0       5      16      30      65      77      84      90      94      97
     100
   SUB161
BA 0.009
LS            65
    0.25   0.170
       0       5      16      30      65      77      84      90      94      97
UA   100
KKSUB127
BA 0.008
             89.5
    0.25   0.372
UA     0       5      16      30      65      77      84      90      94      97
UA   100
  CNL127
   350  0.0077   0.035            TRAP      20      20
KKSUM161
HC     4
KK DET27
RS     1    STOR      -1
SV   0.0    0.73    1.61    2.75    4.28    6.36    9.14
SE1200.0  1201.0  1202.0  1203.0  1204.0  1205.0  1206.0
Q    0.0    1.35    1.46    1.79    1.96    2.12    2.27
KK CNL27
RK   870  0.0069   0.035            TRAP      20      20
KSUB129
A 0.012
S            89.5
UC  0.25   0.284
UA     0       5      16      30      65      77      84      90      94      97
A   100
CNL129
RK   460  0.0032   0.035            TRAP      20      20
KKSUM129
HC     2
KSUB130
A 0.029
LS           89.5
UC  .342   0.314
A      0       5      16      30      65      77      84      90      94      97
A    100
KKSUM130
HC     2
KSUB132
A 0.015
S             65
UC 0.286   0.279
UA     0       5      16      30      65      77      84      90      94      97
A   100
KSUM132
HC     3
KK DET28
O
M      OUTFLOW PUMPED AT 6000 GPM TO HUNT HIGHWAY
S      1    STOR      -1
SV   0.0    1.18    2.53    4.10    5.96    8.27   11.15
SE1194.0  1195.0  1196.0  1197.0  1198.0  1199.0  1200.0
Q    0.0   13.34   13.35   13.36   13.37   13.38   13.39
KSUB164
BA .0582
LS           89.5
C    .36    .473
A      0       5      16      30      65      77      84      90      94      97
A    100
KK DET30
RS     1    STOR      -1
V    0.0    1.19    3.07    6.89
E1207.0  1208.0  1209.0  1210.0
SQ   0.0    6.78   13.89    18.0
KKSTR103
```

```
  . 2440  0.0011   0.018            TRAP      15       1
  SUB163
 A 0.006
LS            92
C   0.4   1.235
 .    0       5      16      30      65      77      84      90      94      97
 .  100
KKSUM163
HC     3
 STR163
 : 2215  0.0011   0.018            TRAP      15       1
KSUB155
BA 0.004
S            92
 : 0.31   1.195
 .    0       5      16      30      65      77      84      90      94      97
UA   100
KKSUM155
 :    2
 SUB144
BA 0.025
LS            65
C  0.40   0.367
 .    0       5      16      30      65      77      84      90      94      97
 .  100
KK DET14
KO
 1
 3    1    STOR      -1
SV   0.0    0.12    0.68    2.42
SE1199.0  1200.0  1201.0  1202.0
SQ   0.0     1.0    1.45    1.78
 C PIP14
 1      8" CONC. PIPE - LAKE 14 TO LAKE 13
RK   530  0.0144   0.018            CIRC   0.667
KKSUB147
 A  .064
 3          89.5
UC 0.456   0.364
UA    0       5      16      30      65      77      84      90      94      97
A   100
 K SUM14
 C    2
KKSUB148
BA  0.01
 S          89.5
 C  0.25   0.338
UA    0       5      16      30      65      77      84      90      94      97
UA   100
KSUM148
 C    2
 KSUB149
BA 0.026
LS            68
 C   0.5   0.184
 A    0       5      16      30      65      77      84      90      94      97
UA   100
KKSUM149
C    2
 K DET13
 O
KM
RS    1    STOR      -1
 V   0.0    2.03    4.06    5.16    8.47    13.5   19.79
 E1195.0  1195.5  1196.0 1196.25  1197.0  1198.0  1199.0
SQ   0.0     0.5     0.9     1.2     1.8    2.52    3.08
KK PIP13
M      15" CONC. PIPE - LAKE 13 TO LAKE 12
 K  1700  0.0016   0.018            CIRC    1.25
KSUB150
BA 0.041
LS          89.5
C 0.357   0.350
A    0       5      16      30      65      77      84      90      94      97
UA   100
KKSTR151 ROUTE HYDROGRAPH SUB150 THRU 60'R\W IN SUB151
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```
 S      1    FLOW      -1
 C   .025    .015    .025    1950   .0030
 C      0      10      12      30      48      50      60      61
RY   0.83    0.33       0    0.33       0    0.33    0.83    0.88
KKSUB151
 A  .0603
 S           89.5
UC   0.44    .430
UA      0       5      16      30      65      77      84      90      94      97
 A    100
 KSUM151
 C      2
KKSUB152
BA  0.006
 S           89.5
 C   0.25   0.269
UA      0       5      16      30      65      77      84      90      94      97
UA    100
 KSUM152
 C      2
KKSUMP13
HC      2
KKSUB153
 A  0.024
 S           89.5
UC  0.253   0.232
UA      0       5      16      30      65      77      84      90      94      97
 A    100
 KSUM153
 C      2
KKSUB154
BA  0.017
 S           89.5
 C  0.318   0.304
UA      0       5      16      30      65      77      84      90      94      97
UA    100
 KSUM154
 C      2
KKSUB157
BA  0.008
 S             96
 C   0.25   0.054
 A      0       5      16      30      65      77      84      90      94      97
UA    100
KKSUM157
 C      2
 K DET12
KO
KM       OUTFLOW PUMPED AT 2700 GPM TO HUNT HIGHWAY
PS      1    STOR      -1
 V    0.0    1.38    4.35    7.67   11.36   15.44
 E1194.5  1195.0  1196.0  1197.0  1198.0  1199.0
SQ    0.0     6.0    6.01    6.02    6.02    6.02
KKSUM155
 C      2
 KSUB142
KO      1
BA  .0127
 S           88.3
 D   .556
 A      0       5      16      30      65      77      84      90      94      97
UA    100
KKSUB156
 A   0.01
 S           88.0
UD   .556
UA      0       5      16      30      65      77      84      90      94      97
UA    100
 KSUM156
 C      2
KKSUM156
KO      1       2                      21
 C      2
 Z
```

FN:SEC33B.OH1 50 YEAR, 2 HOUR OUTPUT

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
NPUT
LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

 NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  51      SUB102
               .
               .
  62           .      SUB105
               .           V
               .           V
  68           .      CNL105
               .           .
               .           .
  70      SUM105............
               .
               .
  72           .      SUB103
               .           .
               .           .
  78      SUM103............
               .
               .
  80           .      SUB107
               .           .
               .           .
  86      SUM107............
               V
               V
  88       DET18
               V
               V
  95       PIP18
               .
               .
  98           .      SUB104
               .           .
               .           .
 104           .           .      SUB162
               .           .           .
               .           .           .
 110      SUM162........................
               V
               V
 112       DET19
               V
               V
 119       PIP19
               .
               .
 122           .      SUB106
               .           .
               .           .
 128           .           .      SUB110
               .           .           .
               .           .           .
 134      SUM110........................
               V
               V
 136      CNL110
               .
               .
 138           .      SUB111
               .           .
               .           .
 144      SUM111............
               .
               .
 146           .      SUB112
               .           .
               .           .
 152      SUM112............
               .
               .
 154           .      SUB113
               .           .
               .           .
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160     SUM113............
            V
            V
162      DET20
            V
            V
169      PIP20
            .
            .
172         .      SUB109
            .           .
            .           .
178         .           .      SUB108
            .           .           .
            .           .           .
184         .      SUM108............
            .           V
            .           V
186         .       DET21
            .           V
            .           V
193         .       PIP21
            .           .
            .           .
196         .           .      SUB114
            .           .           .
            .           .           .
202         .      SUM114............
            .           .
            .           .
204         .           .      SUB159
            .           .           .
            .           .           .
210         .      SUM159............
            .           .
            .           .
212         .           .      SUB115
            .           .           .
            .           .           .
218         .      SUM159............
            .           V
            .           V
220         .       DET22
            .           V
            .           V
227         .       PIP22
            .           .
            .           .
230         .           .      SUB158
            .           .           .
            .           .           .
236         .           .           .      SUB116
            .           .           .           .
            .           .           .           .
242     SUM158.................................
            V
            V
244      DET23
            V
            V
251      PIP23
            .
            .
254         .      SUB121
            .           V
            .           V
260         .      STR121
            .           .
            .           .
262         .           .      SUB122
            .           .           .
            .           .           .
268         .      SUM122............
            .           .
            .           .
270         .           .      SUB120
            .           .           V
            .           .           V
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276                 .           .       CNL120
                    .           .           .
                    .           .           .
278                 .       SUM122............
                    .           .
                    .           .
280                 .           .       SUB118
                    .           .           V
                    .           .           V
286                 .           .       CNL118
                    .           .           .
                    .           .           .
288                 .           .           .       SUB117
                    .           .           .           .
                    .           .           .           .
294                 .           .       SUM118............
                    .           .           .
                    .           .           .
296                 .       SUM122............
                    .           V
                    .           V
298                 .        DET24
                    .           V
                    .           V
305                 .        PIP24
                    .           .
                    .           .
308            SUM166............
                    V
                    V
310            PIP166
                    .
                    .
313                 .       SUB119
                    .           V
                    .           V
319                 .       CNL119
                    .           .
                    .           .
321            SUM166............
                    .
                    .
323                 .       SUB166
                    .           .
                    .           .
329            SUM166............
                    V
                    V
331             DET25
                    .
                    .
338                 .       SUB131
                    .           .
                    .           .
344            SUM131............
                    .
                    .
346                 .       SUB123
                    .           .
                    .           .
352                 .           .       SUB126
                    .           .           .
                    .           .           .
358                 .       SUM126............
                    .           .
                    .           .
360                 .           .       SUB124
                    .           .           V
                    .           .           V
366                 .           .       CNL124
                    .           .           .
                    .           .           .
368                 .       SUM126............
                    .           V
                    .           V
370                 .        DET26
                    .           V
                    .           V
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377          .       PIP26
             .           .
             .           .
380          .           .      SUB128
             .           .           .
             .           .           .
386          .           .           .      SUB161
             .           .           .           .
             .           .           .           .
392          .           .           .           .      SUB127
             .           .           .           .           V
             .           .           .           .           V
398          .           .           .           .      CNL127
             .           .           .           .           .
             .           .           .           .           .
400          .      SUM161.................................
             .           V
             .           V
402          .       DET27
             .           V
             .           V
409          .       CNL27
             .           .
             .           .
411          .           .      SUB129
             .           .           V
             .           .           V
417          .           .      CNL129
             .           .           .
             .           .           .
419          .      SUM129............
             .           .
             .           .
421          .           .      SUB130
             .           .           .
             .           .           .
427          .      SUM130............
             .           .
             .           .
429          .           .      SUB132
             .           .           .
             .           .           .
435     SUM132........................
             V
             V
437      DET28
             .
             .
444          .      SUB164
             .           V
             .           V
450          .       DET30
             .           V
             .           V
455          .      STR103
             .           .
             .           .
457          .           .      SUB163
             .           .           .
             .           .           .
463     SUM163........................
             V
             V
465     STR163
             .
             .
467          .      SUB155
             .           .
             .           .
473     SUM155............
             .
             .
475          .      SUB144
             .           V
             .           V
481          .       DET14
             .           V
             .           V
```

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488          PIP14
                 .
                 .
491                  SUB147
                         .
                         .
497          SUM14............
                 .
                 .
499                  SUB148
                         .
                         .
505         SUM148............
                 .
                 .
507                  SUB149
                         .
                         .
513         SUM149............
                 V
                 V
515          DET13
                 V
                 V
522          PIP13
                 .
                 .
525                  SUB150
                         V
                         V
531                  STR151
                         .
                         .
536                          SUB151
                                 .
                                 .
542                  SUM151............
                         .
                         .
544                          SUB152
                                 .
                                 .
550                  SUM152............
                         .
                         .
552         SUMP13............
                 .
                 .
554                  SUB153
                         .
                         .
560         SUM153............
                 .
                 .
562                  SUB154
                         .
                         .
568         SUM154............
                 .
                 .
570                  SUB157
                         .
                         .
576         SUM157............
                 V
                 V
578          DET12
                 .
                 .
585     SUM155............
                 .
                 .
587          SUB142
                 .
                 .
594                  SUB156
                         .
                         .
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600          .      SUM156............
             .           .
             .           .
602      SUM156............
```

***) RUNOFF ALSO COMPUTED AT THIS LOCATION

FN:SEC33B.OH1 50 YEAR, 2 HOUR OUTPUT

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 | SUB102 | 34. | 1.50 | 4. | 1. | 0. | 0.07 | | |
| HYDROGRAPH AT | SUB105 | 15. | 1.42 | 2. | 1. | 0. | 0.01 | | |
| ROUTED TO | CNL105 | 15. | 1.42 | 2. | 1. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM105 | 48. | 1.50 | 6. | 2. | 1. | 0.08 | | |
| HYDROGRAPH AT | SUB103 | 16. | 1.33 | 2. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM103 | 63. | 1.42 | 8. | 2. | 1. | 0.09 | | |
| HYDROGRAPH AT | SUB107 | 5. | 1.42 | 0. | 0. | 0. | 0.02 | | |
| 2 COMBINED AT | SUM107 | 68. | 1.42 | 8. | 2. | 1. | 0.11 | | |
| ROUTED TO | DET18 | 2. | 2.83 | 2. | 1. | 1. | 0.11 | 1206.73 | 2.92 |
| ROUTED TO | PIP18 | 2. | 2.92 | 2. | 1. | 1. | 0.11 | | |
| HYDROGRAPH AT | SUB104 | 25. | 1.33 | 3. | 1. | 0. | 0.02 | | |
| HYDROGRAPH AT | SUB162 | 3. | 1.42 | 0. | 0. | 0. | 0.01 | | |
| 3 COMBINED AT | SUM162 | 28. | 1.33 | 4. | 2. | 1. | 0.14 | | |
| ROUTED TO | DET19 | 4. | 1.83 | 4. | 2. | 1. | 0.14 | 1204.80 | 2.25 |
| ROUTED TO | PIP19 | 4. | 2.25 | 4. | 2. | 1. | 0.14 | | |
| HYDROGRAPH AT | SUB106 | 35. | 1.33 | 3. | 1. | 0. | 0.02 | | |
| HYDROGRAPH AT | SUB110 | 11. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| 3 COMBINED AT | SUM110 | 50. | 1.33 | 8. | 3. | 1. | 0.17 | | |
| ROUTED TO | CNL110 | 48. | 1.33 | 8. | 3. | 1. | 0.17 | | |
| HYDROGRAPH AT | SUB111 | 23. | 1.33 | 2. | 1. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM111 | 72. | 1.33 | 11. | 4. | 1. | 0.19 | | |
| HYDROGRAPH AT | SUB112 | 14. | 1.33 | 2. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM112 | 86. | 1.33 | 12. | 4. | 2. | 0.20 | | |
| HYDROGRAPH AT | SUB113 | 2. | 1.50 | 0. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM113 | 87. | 1.33 | 12. | 4. | 2. | 0.21 | | |
| ROUTED TO | DET20 | 6. | 2.58 | 6. | 4. | 2. | 0.21 | 1203.20 | 2.67 |
| ROUTED TO | PIP20 | 6. | 2.58 | 6. | 4. | 2. | 0.21 | | |
| HYDROGRAPH AT | SUB109 | 8. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | SUB108 | 3. | 1.42 | 0. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM108 | 11. | 1.33 | 1. | 0. | 0. | 0.02 | | |
| ROUTED TO | DET21 | 1. | 2.08 | 1. | 0. | 0. | 0.02 | 1204.50 | 2.42 |
| ROUTED TO | PIP21 | 1. | 1.92 | 1. | 0. | 0. | 0.02 | | |
| HYDROGRAPH AT | SUB114 | 11. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM114 | 12. | 1.33 | 2. | 1. | 0. | 0.03 | | |
| HYDROGRAPH AT | SUB159 | 3. | 1.42 | 0. | 0. | 0. | 0.01 | | |

**SUN LAKES SECT.33 HEC 1 SUMMARY OUTPUT**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 COMBINED AT | SUM159 | 14. | 1.42 | 2. | 1. | 0. | 0.04 | | |
| HYDROGRAPH AT | SUB115 | 22. | 1.42 | 3. | 1. | 0. | 0.02 | | |
| 2 COMBINED AT | SUM159 | 36. | 1.42 | 5. | 1. | 0. | 0.06 | | |
| ROUTED TO | DET22 | 2. | 2.67 | 2. | 1. | 0. | 0.06 | 1203.98 | 2.75 |
| ROUTED TO | PIP22 | 2. | 2.67 | 2. | 1. | 0. | 0.06 | | |
| HYDROGRAPH AT | SUB158 | 4. | 1.42 | 0. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | SUB116 | 26. | 1.33 | 3. | 1. | 0. | 0.02 | | |
| 4 COMBINED AT | SUM158 | 36. | 1.33 | 10. | 6. | 2. | 0.30 | | |
| ROUTED TO | DET23 | 5. | 18.67 | 5. | 5. | 2. | 0.30 | 1201.24 | 18.75 |
| ROUTED TO | PIP23 | 5. | 18.67 | 5. | 5. | 2. | 0.30 | | |
| HYDROGRAPH AT | SUB121 | 15. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| ROUTED TO | STR121 | 15. | 1.42 | 1. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | SUB122 | 5. | 1.42 | 0. | 0. | 0. | 0.02 | | |
| 2 COMBINED AT | SUM122 | 20. | 1.42 | 2. | 0. | 0. | 0.03 | | |
| HYDROGRAPH AT | SUB120 | 9. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| ROUTED TO | CNL120 | 9. | 1.42 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM122 | 29. | 1.42 | 3. | 1. | 0. | 0.04 | | |
| HYDROGRAPH AT | SUB118 | 16. | 1.33 | 2. | 0. | 0. | 0.01 | | |
| ROUTED TO | CNL118 | 16. | 1.33 | 2. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | SUB117 | 10. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM118 | 25. | 1.33 | 3. | 1. | 0. | 0.02 | | |
| 2 COMBINED AT | SUM122 | 54. | 1.42 | 6. | 1. | 0. | 0.06 | | |
| ROUTED TO | DET24 | 5. | 2.33 | 5. | 1. | 0. | 0.06 | 1201.32 | 2.42 |
| ROUTED TO | PIP24 | 5. | 2.33 | 5. | 1. | 0. | 0.06 | | |
| 2 COMBINED AT | SUM166 | 9. | 3.83 | 9. | 6. | 3. | 0.36 | | |
| ROUTED TO | PIP166 | 9. | 3.83 | 9. | 6. | 3. | 0.36 | | |
| HYDROGRAPH AT | SUB119 | 20. | 1.33 | 2. | 0. | 0. | 0.01 | | |
| ROUTED TO | CNL119 | 19. | 1.33 | 2. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM166 | 24. | 1.42 | 10. | 6. | 3. | 0.38 | | |
| HYDROGRAPH AT | SUB166 | 2. | 1.42 | 0. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM166 | 27. | 1.42 | 10. | 6. | 3. | 0.38 | | |
| ROUTED TO | DET25 | 8. | 8.25 | 7. | 6. | 3. | 0.38 | 1198.28 | 8.25 |
| HYDROGRAPH AT | SUB131 | 31. | 1.33 | 4. | 1. | 0. | 0.03 | | |
| 2 COMBINED AT | SUM131 | 33. | 1.33 | 10. | 7. | 3. | 0.41 | | |
| HYDROGRAPH AT | SUB123 | 6. | 1.33 | 1. | 0. | 0. | 0.00 | | |
| HYDROGRAPH AT | SUB126 | 4. | 1.42 | 0. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM126 | 10. | 1.33 | 1. | 0. | 0. | 0.02 | | |
| HYDROGRAPH AT | SUB124 | 7. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| ROUTED TO | CNL124 | 7. | 1.42 | 1. | 0. | 0. | 0.01 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 COMBINED AT | SUM126 | 17. | 1.42 | 2. | 1. | 0. | 0.03 | | |
| ROUTED TO | DET26 | 1. | 2.33 | 1. | 1. | 0. | 0.03 | 1203.21 | 2.75 |
| ROUTED TO | PIP26 | 1. | 2.50 | 1. | 1. | 0. | 0.03 | | |
| HYDROGRAPH AT | SUB128 | 14. | 1.33 | 2. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | SUB161 | 2. | 1.42 | 0. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | SUB127 | 9. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| ROUTED TO | CNL127 | 9. | 1.42 | 1. | 0. | 0. | 0.01 | | |
| 4 COMBINED AT | SUM161 | 26. | 1.33 | 4. | 1. | 0. | 0.05 | | |
| ROUTED TO | DET27 | 1. | 2.67 | 1. | 1. | 0. | 0.05 | 1201.71 | 2.75 |
| ROUTED TO | CNL27 | 1. | 2.75 | 1. | 1. | 0. | 0.05 | | |
| HYDROGRAPH AT | SUB129 | 15. | 1.33 | 2. | 0. | 0. | 0.01 | | |
| ROUTED TO | CNL129 | 15. | 1.42 | 2. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM129 | 15. | 1.42 | 3. | 2. | 1. | 0.07 | | |
| HYDROGRAPH AT | SUB130 | 34. | 1.42 | 4. | 1. | 0. | 0.03 | | |
| 2 COMBINED AT | SUM130 | 50. | 1.42 | 7. | 3. | 1. | 0.09 | | |
| HYDROGRAPH AT | SUB132 | 3. | 1.42 | 0. | 0. | 0. | 0.01 | | |
| 3 COMBINED AT | SUM132 | 86. | 1.42 | 17. | 9. | 4. | 0.52 | | |
| ROUTED TO | DET28 | 13. | 2.33 | 13. | 9. | 4. | 0.52 | 1196.85 | 2.50 |
| HYDROGRAPH AT | SUB164 | 55. | 1.42 | 8. | 2. | 1. | 0.06 | | |
| ROUTED TO | DET30 | 13. | 2.42 | 7. | 2. | 1. | 0.06 | 1208.81 | 2.42 |
| ROUTED TO | STR103 | 13. | 2.58 | 7. | 2. | 1. | 0.06 | | |
| HYDROGRAPH AT | SUB163 | 3. | 1.58 | 1. | 0. | 0. | 0.01 | | |
| 3 COMBINED AT | SUM163 | 28. | 2.42 | 22. | 12. | 5. | 0.58 | | |
| ROUTED TO | STR163 | 28. | 2.50 | 22. | 12. | 5. | 0.58 | | |
| HYDROGRAPH AT | SUB155 | 2. | 1.50 | 1. | 0. | 0. | 0.00 | | |
| 2 COMBINED AT | SUM155 | 29. | 2.42 | 22. | 12. | 5. | 0.59 | | |
| HYDROGRAPH AT | SUB144 | 4. | 1.58 | 1. | 0. | 0. | 0.03 | | |
| ROUTED TO | DET14 | 1. | 2.33 | 1. | 0. | 0. | 0.03 | 1200.13 | 2.42 |
| ROUTED TO | PIP14 | 1. | 2.33 | 1. | 0. | 0. | 0.03 | | |
| HYDROGRAPH AT | SUB147 | 67. | 1.42 | 9. | 2. | 1. | 0.06 | | |
| 2 COMBINED AT | SUM14 | 67. | 1.42 | 10. | 2. | 1. | 0.09 | | |
| HYDROGRAPH AT | SUB148 | 12. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM148 | 78. | 1.42 | 11. | 3. | 1. | 0.10 | | |
| HYDROGRAPH AT | SUB149 | 8. | 1.50 | 1. | 0. | 0. | 0.03 | | |
| 2 COMBINED AT | SUM149 | 86. | 1.42 | 12. | 3. | 1. | 0.13 | | |
| ROUTED TO | DET13 | 1. | 3.25 | 1. | 1. | 1. | 0.13 | 1196.35 | 3.42 |
| ROUTED TO | PIP13 | 1. | 3.50 | 1. | 1. | 1. | 0.13 | | |
| HYDROGRAPH AT | SUB150 | 46. | 1.42 | 6. | 1. | 0. | 0.04 | | |
| ROUTED TO | STR151 | 38. | 1.58 | 6. | 1. | 0. | 0.04 | 0.52 | 1.58 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| HYDROGRAPH AT | SUB151 | 58. | 1.42 | 9. | 2. | 1. | 0.06 | | |
| 2 COMBINED AT | SUM151 | 94. | 1.50 | 14. | 4. | 1. | 0.10 | | |
| HYDROGRAPH AT | SUB152 | 8. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM152 | 101. | 1.50 | 15. | 4. | 1. | 0.11 | | |
| 2 COMBINED AT | SUMP13 | 101. | 1.50 | 16. | 5. | 2. | 0.23 | | |
| HYDROGRAPH AT | SUB153 | 34. | 1.33 | 3. | 1. | 0. | 0.02 | | |
| 2 COMBINED AT | SUM153 | 127. | 1.42 | 20. | 6. | 2. | 0.26 | | |
| HYDROGRAPH AT | SUB154 | 20. | 1.42 | 2. | 1. | 0. | 0.02 | | |
| 2 COMBINED AT | SUM154 | 147. | 1.42 | 22. | 6. | 2. | 0.27 | | |
| HYDROGRAPH AT | SUB157 | 23. | 1.25 | 2. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM157 | 158. | 1.42 | 24. | 7. | 3. | 0.28 | | |
| ROUTED TO | DET12 | 6. | 1.83 | 6. | 6. | 3. | 0.28 | 1197.69 | 3.17 |
| 2 COMBINED AT | SUM155 | 35. | 2.42 | 28. | 18. | 8. | 0.87 | | |
| HYDROGRAPH AT | SUB142 | 11. | 1.67 | 2. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | SUB156 | 8. | 1.67 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM156 | 19. | 1.67 | 3. | 1. | 0. | 0.02 | | |
| 2 COMBINED AT | SUM156 | 48. | 1.92 | 31. | 18. | 8. | 0.89 | | |

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

```
 D  SUN LAKES SEC. 32
 D      FILE NAME:  C:\HYDROPRO\DATA\SL\HUNTHWY\SEC32B.1                DATE: 8-2-96
 D
ID      **** This model has been prepared by B&R Engineering, Inc. to represent
ID           the volume of runoff produced on Section 32 as a result of a
 D           50-yr, 2-hr storm, for the purposes of determining the culvert
 D           sizes and capacity under Dobson Road along Hunt Highway and for
ID           determining necessary drainage improvements to prevent excessive
ID           flooding of Dobson Road at this intersection. This model uses
 D           prepared information taken from TR-20 computer runs, master
 D           drainage reports, calculations and maps. ****
 D
ID           RJH
ID
 DIAGRAM
 D
IT     5                    1000
IO     3
 KSUB134
 A 0.003
 N     5
PB  2.31
PC  .000    .011    .018    .023    .028    .032    .046    .071    .100    .137
 C  .176    .232    .327    .601    .743    .863    .901    .930    .954    .962
 C  .970    .979    .982    .992   1.000
LS          89.5
UC  0.25   0.229
 A     0       5      16      30      65      77      84      90      94      97
 A   100
 KSUB167
BA 0.002
LS            96
 C  0.25   0.120
 A     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUM167
 C     2
 K DET16
 O
KM
RS     1    STOR      -1
 V   0.0     0.4     0.8     1.3
 E1203.0  1203.5  1204.0  1204.5
SQ   0.0    10.6    30.0    55.1
KKSUB133
 A 0.011
 S          89.5
 C  0.25   0.275
UA     0       5      16      30      65      77      84      90      94      97
UA   100
 KSUB135
 A 0.005
LS          89.5
UC  0.25   0.258
 A     0       5      16      30      65      77      84      90      94      97
 A   100
 KSUM141
HC     2
KKSUB136
 A 0.003
 S          89.5
UC  0.25   0.259
UA     0       5      16      30      65      77      84      90      94      97
 A   100
 KSUM141
 C     2
KKSUB141
BA 0.012
 S            96
 C  0.25   0.043
UA     0       5      16      30      65      77      84      90      94      97
UA   100
 KSUM141
 C     3
 K DET17
KO
```



**SUN LAKES SECT.32 HEC 1 INPUT**

```
 M
 S     1    STOR      -1
 V   0.0    2.56    5.45
SE1202.5  1203.0  1203.5
SQ   0.0    10.6    30.0
 KSUB137
 A 0.022
LS          89.5
UC 0.295   0.194
 A     0       5      16      30      65      77      84      90      94      97
 A   100
 KSUB138
BA 0.003
LS          89.5
 C  0.25   0.229
 A     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUM168
 C     2
 KSUB139
_A 0.006
LS          89.5
UC  0.25   0.175
 A     0       5      16      30      65      77      84      90      94      97
 A   100
KKSUM168
HC     2
 KSUB140
 A 0.013
_S          89.5
UC 0.275   0.411
UA     0       5      16      30      65      77      84      90      94      97
 A   100
 KSUM168
HC     2
KKSUB168
 A  0.01
 S            96
JC  0.25   0.048
UA     0       5      16      30      65      77      84      90      94      97
UA   100
 KSUM168
 C     3
KK DET15
KO
 M
 S     1    STOR      -1
 V   0.0    1.87    3.83    6.08     8.7   11.73   15.14
SE1200.0  1200.5  1201.0  1201.5  1202.0  1202.5  1203.0
SQ   0.0    0.01    0.02     1.2     1.7    2.05    2.37
 K PIP15
 M      10" CONC. PIPE - LAKE 15 TO LAKE 11
RK   480  0.0042   0.018            CIRC   0.833
KKSUB145
 A 0.013
 S          89.5
JC 0.253   0.285
UA     0       5      16      30      65      77      84      90      94      97
UA   100
 KSUB143
 O
BA 0.031
LS            65
JC  0.75   0.516
JA     0       5      16      30      65      77      84      90      94      97
JA   100
KKSUM143
KO
HC     3
 K DET11
KO
KM
RS     1    STOR      -1
SV   0.0    0.98     2.3     4.3    6.96   10.29
SE1198.0  1199.0  1199.5  1200.0  1200.5  1201.0
SQ   0.0    1.07     1.2    1.31    1.42    1.52
```

```
 (SUB102
 A0.0105
LS            87
UC 0.250   0.258
"A     0       5      16      30      65      77      84      90      94      97
 A   100
 (SUB103
BA0.0559
LS            87
 C 0.383   0.342
 A     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUM103
"C     2
 K    L3
 A0.0505
LS          76.3
UC 0.733   0.534
 A     0       5      16      30      65      77      84      90      94      97
 A   100
KK SUML3
HC     3
"K DETL3
 O
 M
RS     1    STOR      -1
SV   0.0   10.51
 E1190.0 1192.36
 Q   0.0    6.25
KKSUB104
BA0.0439
"S            88
 C 0.333   0.354
 A     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUB105
 A0.0202
 S            87
UC 0.283   0.304
UA     0       5      16      30      65      77      84      90      94      97
"A   100
 KSUM104
 C     2
KKSUB106
BA0.0515
 S            87
 C 0.517   0.509
UA     0       5      16      30      65      77      84      90      94      97
UA   100
 KSUM106
 C     2
 K    L2
BA0.0763
LS          78.3
 C 0.550   0.237
 A     0       5      16      30      65      77      84      90      94      97
UA   100
KK SUML2
 C     3
 K DETL2
 O
KM
RS     1    STOR      -1
 V   0.0   25.55
 E1187.5  1190.7
SQ   0.0    5.35
KKSUB107
BA0.0224
 S            87
 C 0.267   0.222
UA     0       5      16      30      65      77      84      90      94      97
UA   100
(KSUB108
BA0.0168
LS            87
UC 0.350   0.416
```

```
'JA      0        5       16       30       65       77       84       90       94       97
 JA    100
 (KSUB116
 BA0.0183
 LS             74
 JC 0.400    0.256
 JA      0        5       16       30       65       77       84       90       94       97
 JA    100
 KKSUM116
 'IC      3
 (KSUB117
 3A0.0649
 LS             87
 UC 0.525    0.430
 JA      0        5       16       30       65       77       84       90       94       97
 JA    100
 KKSUM117
 HC      2
 'KK SUML1
 IC      2
 (KSUB110
 BA0.0449
 LS             87
 JC 0.292    0.211
 JA      0        5       16       30       65       77       84       90       94       97
 UA    100
 KK     L5
 3A0.0061
 .S             84
 JC 0.250    0.036
 UA      0        5       16       30       65       77       84       90       94       77
 UA    100
 (K SUML5
 IC      2
 KK DETL5
 KO
 'M
 (S      1     STOR       -1
 ;V    0.0     4.05
 SE1193.0  1194.36
 SQ    0.0     1.95
 (KSUB111
 3A0.0488
 LS             87
 UC 0.442    0.336
 JA      0        5       16       30       65       77       84       90       94       97
 JA    100
 (KSUM111
 HC      2
 KK     L6
 3A0.0119
 .S           80.5
 UC 0.250    0.025
 UA      0        5       16       30       65       77       84       90       94       97
 JA    100
 (K SUML6
 .IC      2
 KK DETL6
 KO
 (M
 (S      1     STOR       -1
 SV    0.0     6.92
 SE1192.0  1194.2
 (Q    0.0     2.52
 (KSUB113
 3A0.0751
 LS             87
 UC 0.833    0.959
 JA      0        5       16       30       65       77       84       90       94       97
 JA    100
 KK     L7
 BA0.0147
 .S           81.5
 JC 0.250    0.080
 JA      0        5       16       30       65       77       84       90       94       97
 UA    100
```

```
 ( SUML7
 :     2
KK DETL7
KO
'M
 3     1    STOR      -1
 /   0.0    7.84
SE1190.5 1192.89
SQ   0.0    2.60
 (SUB109
 \0.0264
LS            87
UC 0.333   0.304
''A     0       5      16      30      65      77      84      90      94      97
 A   100
 K    L9
BA0.0141
LS          80.5
 C 0.250   0.039
 A     0       5      16      30      65      77      84      90      94      97
UA   100
KK SUML9
''C     2
 K DETL9
 O
KM
RS     1    STOR      -1
 V   0.0    2.71
 E1190.0 1191.04
SQ   0.0    1.71
KKSUB112
'A0.0200
 S            87
 C 0.292   0.308
UA     0       5      16      30      65      77      84      90      94      97
UA   100
 KSUB114
 A0.0150
LS            87
UC 0.250   0.314
''A     0       5      16      30      65      77      84      90      94      97
'A   100
'K    L8
BA0.0147
LS          80.9
'C 0.250   0.080
'A     0       5      16      30      65      77      84      90      94      97
UA   100
KK SUML8
'C     3
'K SUML8
'C     4
KK DETL8
KO
'M
'S     1    STOR      -1
SV   0.0    7.79
SE1189.4 1191.82
'Q   0.0    5.88
'KSUB115
'A0.0400
LS            87
UC 0.525   0.489
'A     0       5      16      30      65      77      84      90      94      97
'A   100
KK   L10
BA0.0093
'S          81.3
'C 0.250   0.120
'A     0       5      16      30      65      77      84      90      94      97
UA   100
KKSUML10
'C     2
'KSUML10
HC     2
KKDETL10
```

```
 O
 M
..S     1    STOR      -1
SV   0.0    4.50
SE1187.5  1189.3
 Q   0.0    6.64
 K SUML1
HC     2
KKSUB118
 A0.1123
 S            87
.C 0.483   0.281
UA     0       5      16      30      65      77      84      90      94      97
UA   100
 K SUML1
 C     2
KK    L1
BA0.0300
 .S          76.2
 C 0.667   0.298
JA     0       5      16      30      65      77      84      90      94      97
UA   100
KK SUML1
 C     2
 K DETL1
KM
RS     1    STOR      -1
 V   0.0    1.49    4.85    8.96   13.77   19.36   25.40
 E1181.5  1182.0  1183.0  1184.0  1185.0  1186.0  1187.0
JQ   0.0   12.48   12.48   12.48   12.48   12.48   12.48
KKRSEC32
KO     1       2
 K  1400  0.0747   0.035            TRAP       2      66
KSUB198
BA  .002
LS           92
 C  .115    .389
 A     0       5      16      30      65      77      84      90      94      97
JA   100
KKSUM198
KO     1
 C     2
KSUB199
BA  .002
LS           92
 C  .115    .389
 A     0       5      16      30      65      77      84      90      94      97
JA   100
KKSUM199
HC     2
KSUM156
 I           21
KKREA156
RK  4300  0.0011   0.035            TRAP      15       1
KSUB119
BA0.0110
LS           87
UC 0.250   0.263
JA     0       5      16      30      65      77      84      90      94      97
JA   100
KSUM119
HC     2
KKCNL119
RK  1000  0.0011   0.035            TRAP      15       1
KSUB200
BA   .01
LS           92
UC  .245    1.07
JA     0       5      16      30      65      77      84      90      94      97
JA   100
KKSUM200
HC     2
KK SEC32
KO     1       2                       22
HC     2
ZZ
```

FN:SEC32B.OH1 50 YEAR, 2 HOUR OUTPUT

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
NPUT
LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

 NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  18      SUB134
               .
               .
  29           .      SUB167
               .           .
               .           .
  35      SUM167............
               V
               V
  37       DET16
               .
               .
  44           .      SUB133
               .           .
               .           .
  50           .           .      SUB135
               .           .           .
               .           .           .
  56           .      SUM141............
               .           .
               .           .
  58           .           .      SUB136
               .           .           .
               .           .           .
  64           .      SUM141............
               .           .
               .           .
  66           .           .      SUB141
               .           .           .
               .           .           .
  72      SUM141........................
               V
               V
  74       DET17
               .
               .
  81           .      SUB137
               .           .
               .           .
  87           .           .      SUB138
               .           .           .
               .           .           .
  93           .      SUM168............
               .           .
               .           .
  95           .           .      SUB139
               .           .           .
               .           .           .
 101           .      SUM168............
               .           .
               .           .
 103           .           .      SUB140
               .           .           .
               .           .           .
 109           .      SUM168............
               .           .
               .           .
 111           .           .      SUB168
               .           .           .
               .           .           .
 117      SUM168........................
               V
               V
 119       DET15
               V
               V
 126       PIP15
               .
               .
 129           .      SUB145
               .           .
               .           .
```

FN:SEC32B.OH1 50 YEAR, 2 HOUR OUTPUT

```
135                 .                 .        SUB143
                    .                 .            .
                    .                 .            .
142           SUM143.......................
                   V
                   V
145            DET11
                    .
                    .
152                 .        SUB102
                    .                 .
                    .                 .
158                 .                 .        SUB103
                    .                 .            .
                    .                 .            .
164                 .        SUM103............
                    .                 .
                    .                 .
166                 .                 .            L3
                    .                 .            .
                    .                 .            .
172            SUML3.......................
                   V
                   V
174            DETL3
                    .
                    .
181                 .        SUB104
                    .                 .
                    .                 .
187                 .                 .        SUB105
                    .                 .            .
                    .                 .            .
193                 .        SUM104............
                    .                 .
                    .                 .
195                 .                 .        SUB106
                    .                 .            .
                    .                 .            .
201                 .        SUM106............
                    .                 .
                    .                 .
203                 .                 .            L2
                    .                 .            .
                    .                 .            .
209            SUML2.......................
                   V
                   V
211            DETL2
                    .
                    .
218                 .        SUB107
                    .                 .
                    .                 .
224                 .                 .        SUB108
                    .                 .            .
                    .                 .            .
230                 .                 .            .        SUB116
                    .                 .            .            .
                    .                 .            .            .
236                 .        SUM116.......................
                    .                 .
                    .                 .
238                 .                 .        SUB117
                    .                 .            .
                    .                 .            .
244                 .        SUM117............
                    .                 .
                    .                 .
246            SUML1............
                    .
                    .
248                 .        SUB110
                    .                 .
                    .                 .
254                 .                 .            L5
                    .                 .            .
                    .                 .            .
```

```
260   .   SUML5............
      .       V
      .       V
262   .   DETL5
      .       .
      .       .
269   .       .     SUB111
      .       .         .
      .       .         .
275   .  SUM111............
      .       .
      .       .
277   .       .        L6
      .       .         .
      .       .         .
283   .   SUML6............
      .       V
      .       V
285   .   DETL6
      .       .
      .       .
292   .       .     SUB113
      .       .         .
      .       .         .
298   .       .         .        L7
      .       .         .         .
      .       .         .         .
304   .       .      SUML7............
      .       .          V
      .       .          V
306   .       .      DETL7
      .       .         .
      .       .         .
313   .       .         .     SUB109
      .       .         .         .
      .       .         .         .
319   .       .         .         .        L9
      .       .         .         .         .
      .       .         .         .         .
325   .       .         .     SUML9............
      .       .         .         V
      .       .         .         V
327   .       .         .     DETL9
      .       .         .         .
      .       .         .         .
334   .       .         .         .    SUB112
      .       .         .         .         .
      .       .         .         .         .
340   .       .         .         .         .    SUB114
      .       .         .         .         .         .
      .       .         .         .         .         .
346   .       .         .         .         .         .        L8
      .       .         .         .         .         .         .
      .       .         .         .         .         .         .
352   .       .         .         .    SUML8........................
      .       .         .         .         .
      .       .         .         .         .
354   .   SUML8.................................
      .       V
      .       V
356   .   DETL8
      .       .
      .       .
363   .       .     SUB115
      .       .         .
      .       .         .
369   .       .         .        L10
      .       .         .         .
      .       .         .         .
375   .       .     SUML10............
      .       .         .
      .       .         .
377   .  SUML10............
      .       V
      .       V
379   .  DETL10
      .       .
      .       .
```

```
386       SUML1............
              .
              .
388           .       SUB118
              .            .
              .            .
394       SUML1............
              .
              .
396           .           L1
              .            .
              .            .
402       SUML1............
              V
              V
404       DETL1
              V
              V
410      RSEC32
              .
              .
413           .       SUB198
              .            .
              .            .
419      SUM198............
              .
              .
422           .       SUB199
              .            .
              .            .
428      SUM199............
              .
              .
430           .       SUM156
              .            V
              .            V
432           .       REA156
              .            .
              .            .
434           .            .       SUB119
              .            .            .
              .            .            .
440           .       SUM119............
              .            V
              .            V
442           .       CNL119
              .            .
              .            .
444           .            .       SUB200
              .            .            .
              .            .            .
450           .       SUM200............
              .            .
              .            .
452       SEC32............
```

***) RUNOFF ALSO COMPUTED AT THIS LOCATION

FN:SEC32B.OH1 50 YEAR, 2 HOUR OUTPUT

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 | SUB134 | 4. | 1.33 | 0. | 0. | 0. | 0.00 | | |
| HYDROGRAPH AT | SUB167 | 5. | 1.25 | 0. | 0. | 0. | 0.00 | | |
| 2 COMBINED AT | SUM167 | 9. | 1.25 | 1. | 0. | 0. | 0.00 | | |
| ROUTED TO | DET16 | 5. | 1.58 | 1. | 0. | 0. | 0.00 | 1203.22 | 1.58 |
| HYDROGRAPH AT | SUB133 | 14. | 1.33 | 2. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | SUB135 | 7. | 1.33 | 1. | 0. | 0. | 0.00 | | |
| 2 COMBINED AT | SUM141 | 21. | 1.33 | 2. | 1. | 0. | 0.02 | | |
| HYDROGRAPH AT | SUB136 | 4. | 1.33 | 0. | 0. | 0. | 0.00 | | |
| 2 COMBINED AT | SUM141 | 25. | 1.33 | 3. | 1. | 0. | 0.02 | | |
| HYDROGRAPH AT | SUB141 | 35. | 1.17 | 2. | 1. | 0. | 0.01 | | |
| 3 COMBINED AT | SUM141 | 60. | 1.25 | 6. | 1. | 0. | 0.04 | | |
| ROUTED TO | DET17 | 9. | 2.08 | 5. | 1. | 0. | 0.04 | 1202.92 | 2.08 |
| HYDROGRAPH AT | SUB137 | 33. | 1.33 | 3. | 1. | 0. | 0.02 | | |
| HYDROGRAPH AT | SUB138 | 4. | 1.33 | 0. | 0. | 0. | 0.00 | | |
| 2 COMBINED AT | SUM168 | 38. | 1.33 | 4. | 1. | 0. | 0.03 | | |
| HYDROGRAPH AT | SUB139 | 10. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM168 | 47. | 1.33 | 4. | 1. | 0. | 0.03 | | |
| HYDROGRAPH AT | SUB140 | 13. | 1.42 | 2. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM168 | 60. | 1.33 | 6. | 2. | 1. | 0.04 | | |
| HYDROGRAPH AT | SUB168 | 29. | 1.25 | 2. | 1. | 0. | 0.01 | | |
| 3 COMBINED AT | SUM168 | 87. | 1.25 | 13. | 4. | 1. | 0.09 | | |
| ROUTED TO | DET15 | 1. | 7.75 | 1. | 1. | 1. | 0.09 | 1201.53 | 8.08 |
| ROUTED TO | PIP15 | 1. | 7.75 | 1. | 1. | 1. | 0.09 | | |
| HYDROGRAPH AT | SUB145 | 17. | 1.33 | 2. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | SUB143 | 4. | 1.75 | 1. | 0. | 0. | 0.03 | | |
| 3 COMBINED AT | SUM143 | 18. | 1.33 | 3. | 2. | 1. | 0.13 | | |
| ROUTED TO | DET11 | 1. | 12.75 | 1. | 1. | 1. | 0.13 | 1199.11 | 14.25 |
| HYDROGRAPH AT | SUB102 | 12. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | SUB103 | 54. | 1.42 | 7. | 2. | 1. | 0.06 | | |
| 2 COMBINED AT | SUM103 | 66. | 1.42 | 8. | 2. | 1. | 0.07 | | |
| HYDROGRAPH AT | L3 | 17. | 1.67 | 3. | 1. | 0. | 0.05 | | |
| 3 COMBINED AT | SUML3 | 78. | 1.42 | 12. | 4. | 2. | 0.25 | | |
| ROUTED TO | DETL3 | 3. | 3.17 | 3. | 2. | 2. | 0.25 | 1191.20 | 3.25 |
| HYDROGRAPH AT | SUB104 | 45. | 1.42 | 6. | 1. | 0. | 0.04 | | |
| HYDROGRAPH AT | SUB105 | 21. | 1.33 | 2. | 1. | 0. | 0.02 | | |

**SUN LAKES SECT.32 HEC 1 SUMMARY OUTPUT**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 COMBINED AT | SUM104 | 66. | 1.42 | 8. | 2. | 1. | 0.06 | | |
| HYDROGRAPH AT | SUB106 | 38. | 1.50 | 6. | 2. | 1. | 0.05 | | |
| 2 COMBINED AT | SUM106 | 102. | 1.42 | 15. | 4. | 1. | 0.12 | | |
| HYDROGRAPH AT | L2 | 48. | 1.50 | 6. | 1. | 0. | 0.08 | | |
| 3 COMBINED AT | SUML2 | 149. | 1.42 | 23. | 7. | 3. | 0.44 | | |
| ROUTED TO | DETL2 | 2. | 15.00 | 2. | 2. | 2. | 0.44 | 1188.83 | 15.83 |
| HYDROGRAPH AT | SUB107 | 28. | 1.33 | 3. | 1. | 0. | 0.02 | | |
| HYDROGRAPH AT | SUB108 | 15. | 1.42 | 2. | 1. | 0. | 0.02 | | |
| HYDROGRAPH AT | SUB116 | 9. | 1.42 | 1. | 0. | 0. | 0.02 | | |
| 3 COMBINED AT | SUM116 | 50. | 1.42 | 6. | 1. | 0. | 0.06 | | |
| HYDROGRAPH AT | SUB117 | 53. | 1.50 | 8. | 2. | 1. | 0.06 | | |
| 2 COMBINED AT | SUM117 | 100. | 1.42 | 14. | 3. | 1. | 0.12 | | |
| 2 COMBINED AT | SUML1 | 100. | 1.42 | 16. | 6. | 3. | 0.57 | | |
| HYDROGRAPH AT | SUB110 | 57. | 1.33 | 6. | 1. | 0. | 0.04 | | |
| HYDROGRAPH AT | L5 | 10. | 1.25 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUML5 | 65. | 1.33 | 6. | 2. | 1. | 0.05 | | |
| ROUTED TO | DETL5 | 1. | 2.42 | 1. | 1. | 0. | 0.05 | 1193.98 | 2.42 |
| HYDROGRAPH AT | SUB111 | 47. | 1.42 | 6. | 2. | 1. | 0.05 | | |
| 2 COMBINED AT | SUM111 | 47. | 1.42 | 7. | 2. | 1. | 0.10 | | |
| HYDROGRAPH AT | L6 | 16. | 1.25 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUML6 | 56. | 1.33 | 8. | 3. | 1. | 0.11 | | |
| ROUTED TO | DETL6 | 1. | 4.17 | 1. | 1. | 1. | 0.11 | 1193.12 | 4.58 |
| HYDROGRAPH AT | SUB113 | 34. | 1.75 | 9. | 2. | 1. | 0.08 | | |
| HYDROGRAPH AT | L7 | 19. | 1.25 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUML7 | 37. | 1.58 | 11. | 3. | 1. | 0.09 | | |
| ROUTED TO | DETL7 | 2. | 4.92 | 2. | 1. | 1. | 0.09 | 1191.96 | 5.00 |
| HYDROGRAPH AT | SUB109 | 28. | 1.42 | 3. | 1. | 0. | 0.03 | | |
| HYDROGRAPH AT | L9 | 19. | 1.25 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUML9 | 43. | 1.33 | 4. | 1. | 0. | 0.04 | | |
| ROUTED TO | DETL9 | 1. | 2.58 | 1. | 1. | 0. | 0.04 | 1190.79 | 2.58 |
| HYDROGRAPH AT | SUB112 | 21. | 1.42 | 2. | 1. | 0. | 0.02 | | |
| HYDROGRAPH AT | SUB114 | 16. | 1.33 | 2. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | L8 | 18. | 1.25 | 1. | 0. | 0. | 0.01 | | |
| 3 COMBINED AT | SUML8 | 54. | 1.33 | 6. | 1. | 0. | 0.05 | | |
| 4 COMBINED AT | SUML8 | 55. | 1.33 | 9. | 5. | 2. | 0.29 | | |
| ROUTED TO | DETL8 | 3. | 17.00 | 3. | 3. | 2. | 0.29 | 1190.62 | 17.17 |
| HYDROGRAPH AT | SUB115 | 30. | 1.50 | 5. | 1. | 0. | 0.04 | | |
| HYDROGRAPH AT | L10 | 11. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUML10 | 37. | 1.42 | 6. | 1. | 0. | 0.05 | | |

FN:SEC32B.OH1 50 YEAR, 2 HOUR OUTPUT

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 COMBINED AT | SUML10 | 38. | 1.42 | 8. | 4. | 3. | 0.34 | | |
| ROUTED TO | DETL10 | 4. | 3.17 | 4. | 3. | 3. | 0.34 | 1188.55 | 3.25 |
| 2 COMBINED AT | SUML1 | 101. | 1.42 | 19. | 9. | 6. | 0.91 | | |
| HYDROGRAPH AT | SUB118 | 115. | 1.42 | 14. | 3. | 1. | 0.11 | | |
| 2 COMBINED AT | SUML1 | 216. | 1.42 | 33. | 12. | 7. | 1.02 | | |
| HYDROGRAPH AT | L1 | 14. | 1.58 | 2. | 0. | 0. | 0.03 | | |
| 2 COMBINED AT | SUML1 | 228. | 1.42 | 35. | 13. | 7. | 1.05 | | |
| ROUTED TO | DETL1 | 12. | 1.33 | 12. | 12. | 7. | 1.05 | 1184.91 | 2.92 |
| ROUTED TO | RSEC32 | 12. | 1.50 | 12. | 12. | 7. | 1.05 | | |
| HYDROGRAPH AT | SUB198 | 3. | 1.33 | 0. | 0. | 0. | 0.00 | | |
| 2 COMBINED AT | SUM198 | 15. | 1.42 | 13. | 12. | 7. | 1.05 | | |
| HYDROGRAPH AT | SUB199 | 3. | 1.33 | 0. | 0. | 0. | 0.00 | | |
| 2 COMBINED AT | SUM199 | 17. | 1.42 | 13. | 12. | 7. | 1.05 | | |
| HYDROGRAPH AT | SUM156 | 48. | 1.92 | 31. | 18. | 8. | 0.89 | | |
| ROUTED TO | REA156 | 48. | 2.33 | 30. | 18. | 8. | 0.89 | | |
| HYDROGRAPH AT | SUB119 | 13. | 1.33 | 1. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM119 | 49. | 2.25 | 30. | 18. | 8. | 0.90 | | |
| ROUTED TO | CNL119 | 49. | 2.33 | 30. | 18. | 8. | 0.90 | | |
| HYDROGRAPH AT | SUB200 | 6. | 1.42 | 2. | 0. | 0. | 0.01 | | |
| 2 COMBINED AT | SUM200 | 52. | 2.33 | 31. | 19. | 8. | 0.91 | | |
| 2 COMBINED AT | SEC32 | 65. | 2.33 | 44. | 31. | 15. | 1.97 | | |

** NORMAL END OF HEC-1 ***

# APPENDIX "B"

## HEC 2 WATER SURFACE PROFILES

A. HUNT HIGHWAY CHANNEL
B. ALMA SCHOOL ROAD SWALES
C. DOBSON ROAD SWALES

# A. HEC 2 - HUNT HIGHWAY CHANNEL

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************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.0;  February 1991
************************************


T1     HUNT HIGHWAY DRAINAGE
T2     HEC2 RUN - STA 43+00 TO STA 118+00
T3     50 YR - 2 HR STORM

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

                                                                          65.    1186.00

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     -1                  -1                                     -1.00       0


NC    0.030     0.030     0.030     0.10      0.30

  STA 43+00
X1        1         4     10.00     55.00
GR   1187.8     10.00   1184.20     22.00   1184.20     32.00   1186.70     55.00

  STA 49+00

X1        2         4     10.00     55.00    600.00    600.00    600.00
GR   1186.7     10.00   1184.86     22.00   1184.86     32.00   1186.70     55.00

  STA 55+00

X1        3         4     10.00     55.00    600.00    600.00    600.00
GR   1188.5     10.00   1185.46     22.00   1185.46     32.00   1189.00     55.00

  STA 59+40

X1        4         4     10.00     55.00    440.00    440.00    440.00
GR   1190.0     10.00   1185.70     22.00   1185.70     32.00   1191.70     55.00

  STA 59+70

NC    0.030     0.030     0.018      0.30      0.50
X2    52.00
X1        5         4     18.00     37.00     30.00     30.00     30.00
GR   1190.0     18.00   1185.80     22.00   1185.80     33.00   1190.00     37.00

SC    3.012      0.50      3.00     10.00      3.00                60.00       1.1   1186.50   1185.80

  STA 60+30

X1        6         4     18.00     37.00     60.00     60.00     60.00
X2     52.0                    2    1189.5   1191.50
GR   1191.0     18.00   1186.50     22.00   1186.50     33.00   1191.00     37.00

  STA 60+60

X1        7         4     10.00     55.00     30.00     30.00     30.00
GR   1189.6     10.00   1187.10     22.00   1187.10     32.00   1191.00     55.00

  STA 62+00

NC    0.030     0.030     0.030
X2    49.00
X1        8         4     10.00     55.00    140.00    140.00    140.00
GR   1192.7     10.00   1187.60     24.00   1187.60     39.00   1192.70     55.00

  STA 66+00

NC    0.030     0.030     0.030      0.10      0.30
X1        9         4     10.00     55.00    400.00    400.00    400.00
GR   1192.4     10.00   1188.80     22.00   1188.80     40.00   1192.40     55.00
```

**HUNT HIGHWAY HEC 2 ANALYSIS**

```
  STA 72+00

X1        10          4       10.00       55.00      600.00      600.00      600.00
X2     48.00
GR    1192.7      10.00     1189.90       19.00     1189.90       38.00     1193.38       55.00

  STA 78+00

X1        11          4       10.00       55.00      600.00      600.00      600.00
GR    1193.6      10.00     1190.70       21.00     1190.40       38.00     1194.50       55.00

  STA 84+00

X1        12          4       10.00       55.00      600.00      600.00      600.00
GR    1194.6      10.00     1191.30       25.00     1191.34       41.00     1194.70       55.00

  STA 90+00

X1        13          4       18.00       55.00      600.00      600.00      600.00
GR    1195.9      18.00     1192.30       34.00     1192.30       44.00     1195.20       55.00

  STA 96+00

X1        14          4       18.00       55.00      600.00      600.00      600.00
GR    1197.3      18.00     1193.76       35.00     1193.59       43.00     1196.30       55.00

  STA 102+00

X1        15          4       18.00       55.00      600.00      600.00      600.00
GR    1198.6      18.00     1194.60       30.00     1194.60       40.00     1197.80       55.00

  STA 108+00

X1        16          4       17.00       55.00      600.00      600.00      600.00
GR    1199.4      17.00     1195.10       30.00     1195.10       40.00     1198.40       55.00

  STA 112+32.48

X1        17          4       18.00       55.00      432.48      432.48      432.48
GR    1201.2      18.00     1195.50       33.00     1195.50       43.00     1199.30       55.00

  STA 112+62.48

NC     0.030       0.030       0.016        0.30        0.50
X2     35.00
X1        18          4       31.00       49.00       30.00       30.00       30.00
GR    1199.7      31.00     1195.70       35.00     1195.70       45.00     1199.70       49.00

SC     3.018        0.50        3.00       10.00        2.50                  60.00         1.1     1196.00     1195.70

  STA 113+22.48
X1        19          4       31.00       49.00       60.00       60.00       60.00
X2                              2        1198.5     1201.00
GR    1200.0      31.00     1196.00       35.00     1196.00       45.00     1200.00       49.00

  STA 113+52.48

NC     0.030       0.030       0.030        0.10        0.30
X1        20          4        5.00       55.00       30.00       30.00       30.00
GR    1201.9       5.00     1196.30       25.00     1196.30       42.00     1201.50       55.00

  STA 114+00

NC     0.030       0.030       0.030        0.10        0.30
X1        21          4       22.00       50.00       47.52       47.52       47.52
GR    1201.9      22.00     1196.60       32.00     1196.60       42.00     1201.50       50.00

  STA 116+00

NC     0.030       0.030       0.030        0.10        0.30
X1        22          4       18.00       55.00      200.00      200.00      200.00
GR    1202.0      18.00     1197.00       32.00     1197.00       40.00     1200.96       55.00

  STA 118+00

X1        23          4       18.00       55.00      200.00      200.00      200.00
GR    1202.1      18.00     1197.49       33.00     1197.30       40.00     1201.07       55.00
```

112
108

S = 232.48

1195.5
1195.1

S = 0.09 %

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SECNO | DEPTH | CWSEL | CRIWS | WSELK | EG | HV | HL | OLOSS | L-BANK ELEV |
| Q | QLOB | QCH | QROB | ALOB | ACH | AROB | VOL | TWA | R-BANK ELEV |
| TIME | VLOB | VCH | VROB | XNL | XNCH | XNR | WTN | ELMIN | SSTA |
| SLOPE | XLOBL | XLCH | XLOBR | ITRIAL | IDC | ICONT | CORAR | TOPWID | ENDST |

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .100 CEHV= .300
*SECNO 1.000

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 1.80 | 1186.00 | 1185.10 | 1186.00 | 1186.04 | .04 | .00 | .00 | 1187.80 |
| 65.0 | .0 | 65.0 | .0 | .0 | 38.3 | .0 | .0 | .0 | 1186.70 |
| .00 | .00 | 1.70 | .00 | .000 | .030 | .000 | .000 | 1184.20 | 16.00 |
| .000959 | 0. | 0. | 0. | 0 | 7 | 0 | .00 | 32.56 | 48.56 |

*SECNO 2.000

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2.000 | 1.69 | 1186.55 | 1185.69 | .00 | 1186.58 | .03 | .53 | .00 | 1186.70 |
| 65.0 | .0 | 65.0 | .0 | .0 | 44.3 | .0 | .6 | .5 | 1186.70 |
| .11 | .00 | 1.47 | .00 | .000 | .030 | .000 | .000 | 1184.86 | 10.95 |
| .000831 | 600. | 600. | 600. | 1 | 14 | 0 | .00 | 42.24 | 53.18 |

*SECNO 3.000

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3.000 | 1.70 | 1187.16 | 1186.38 | .00 | 1187.23 | .06 | .64 | .01 | 1188.50 |
| 65.0 | .0 | 65.0 | .0 | .0 | 32.1 | .0 | 1.1 | 1.0 | 1189.00 |
| .20 | .00 | 2.02 | .00 | .000 | .030 | .000 | .000 | 1185.46 | 15.28 |
| .001396 | 600. | 600. | 600. | 2 | 11 | 0 | .00 | 27.77 | 43.05 |

*SECNO 4.000

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4.000 | 1.99 | 1187.69 | 1186.68 | .00 | 1187.75 | .06 | .52 | .00 | 1190.00 |
| 65.0 | .0 | 65.0 | .0 | .0 | 33.0 | .0 | 1.4 | 1.3 | 1191.70 |
| .26 | .00 | 1.97 | .00 | .000 | .030 | .000 | .000 | 1185.70 | 16.45 |
| .001024 | 440. | 440. | 440. | 2 | 11 | 0 | .00 | 23.17 | 39.62 |

CCHV= .300 CEHV= .500
*SECNO 5.000

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5.000 | 1.90 | 1187.70 | 1186.66 | .00 | 1187.77 | .07 | .02 | .01 | 1190.00 |
| 52.0 | .0 | 52.0 | .0 | .0 | 24.4 | .0 | 1.4 | 1.3 | 1190.00 |
| .26 | .00 | 2.13 | .00 | .000 | .018 | .000 | .000 | 1185.80 | 20.19 |
| .000390 | 30. | 30. | 30. | 2 | 14 | 0 | .00 | 14.62 | 34.81 |

SPECIAL CULVERT

| SC | CUNO | CUNV | ENTLC | COFQ | RDLEN | RISE | SPAN | CULVLN | CHRT | SCL | ELCHU | ELCHD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 | .012 | .50 | 3.00 | 10.00 | 3.00 | .00 | 60.00 | 1 | 1 | 1186.50 | 1185.80 |

CHART 1 - CONCRETE PIPE CULVERT; NO BEVELED RING ENTRANCE
SCALE 1 - SQUARE EDGE ENTRANCE WITH HEADWALL

*SECNO 6.000

SPECIAL CULVERT OUTLET CONTROL
EGIC = 1188.381 EGOC = 1188.581 PCWSE= 1187.702 ELTRD= 1191.500

SPECIAL CULVERT

| EGIC | EGOC | H4 | QWEIR | QCULV | VCH | ACULV | ELTRD | WEIRLN |
|---|---|---|---|---|---|---|---|---|
| 1188.38 | 1188.58 | .81 | 0. | 52. | 2.014 | 21.2 | 1191.50 | 0. |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6.000 | 2.02 | 1188.52 | .00 | .00 | 1188.58 | .06 | .81 | .00 | 1191.00 |
| 52.0 | .0 | 52.0 | .0 | .0 | 25.8 | .0 | 1.5 | 1.3 | 1191.00 |
| .27 | .00 | 2.01 | .00 | .000 | .018 | .000 | .000 | 1186.50 | 20.21 |
| .000325 | 60. | 60. | 60. | 2 | 0 | 0 | .00 | 14.59 | 34.79 |

```
   SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
   Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
   TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
   SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

*SECNO 7.000
    7.000      1.43    1188.53    1187.91       .00    1188.60        .07        .01        .00    1189.60
     52.0        .0       52.0        .0        .0       25.2        .0        1.5        1.3    1191.00
      .27       .00       2.06       .00      .000       .018      .000       .000    1187.10      15.14
  .000637       30.        30.        30.         0         18         0        .00      25.28      40.42


*SECNO 8.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .44

    8.000      1.08    1188.68    1188.26       .00    1188.77        .10        .16        .02    1192.70
     49.0        .0       49.0        .0        .0       19.6        .0        1.6        1.4    1192.70
      .29       .00       2.51       .00      .000       .030      .000       .000    1187.60      21.04
  .002937      140.       140.       140.         2         14         0        .00      21.33      42.38


CCHV=     .100 CEHV=     .300
*SECNO 9.000
    9.000      1.00    1189.80    1189.39       .00    1189.88        .08       1.11        .00    1192.40
     49.0        .0       49.0        .0        .0       21.7        .0        1.8        1.6    1192.40
      .34       .00       2.26       .00      .000       .030      .000       .000    1188.80      18.67
  .002611      400.       400.       400.         3         11         0        .00      25.49      44.16


*SECNO 10.000
   10.000      1.11    1191.01    1190.46       .00    1191.06        .05       1.18        .00    1192.70
     48.0        .0       48.0        .0        .0       26.2        .0        2.1        2.0    1193.38
      .43       .00       1.83       .00      .000       .030      .000       .000    1189.90      15.42
  .001522      600.       600.       600.         3         11         0        .00      28.02      43.44


*SECNO 11.000
   11.000      1.41    1191.81    1191.14       .00    1191.86        .05        .80        .00    1193.60
     48.0        .0       48.0        .0        .0       28.0        .0        2.5        2.3    1194.50
      .53       .00       1.72       .00      .000       .030      .000       .000    1190.40      16.78
  .001167      600.       600.       600.         3         14         0        .00      27.09      43.86


*SECNO 12.000
   12.000      1.26    1192.56    1191.93       .00    1192.61        .05        .75        .00    1194.60
     48.0        .0       48.0        .0        .0       26.7        .0        2.8        2.7    1194.70
      .62       .00       1.80       .00      .000       .030      .000       .000    1191.30      19.25
  .001349      600.       600.       600.         1         14         0        .00      26.85      46.10


*SECNO 13.000
   13.000      1.30    1193.60    1193.09       .00    1193.69        .09       1.07        .01    1195.90
     48.0        .0       48.0        .0        .0       20.2        .0        3.2        3.0    1195.20
      .69       .00       2.38       .00      .000       .030      .000       .000    1192.30      28.18
  .002455      600.       600.       600.         2         14         0        .00      20.79      48.97


*SECNO 14.000
   14.000      1.49    1195.08    1194.54       .00    1195.17        .09       1.48        .00    1197.30
     48.0        .0       48.0        .0        .0       20.2        .0        3.4        3.3    1196.30
      .76       .00       2.38       .00      .000       .030      .000       .000    1193.59      28.70
  .002466      600.       600.       600.         3         19         0        .00      20.86      49.56


*SECNO 15.000
   15.000      1.56    1196.16    1195.40       .00    1196.22        .06       1.05        .00    1198.60
     48.0        .0       48.0        .0        .0       25.0        .0        3.7        3.6    1197.80
      .85       .00       1.92       .00      .000       .030      .000       .000    1194.60      25.31
  .001295      600.       600.       600.         2         11         0        .00      22.02      47.33


*SECNO 16.000
   16.000      1.72    1196.82    1195.90       .00    1196.86        .04        .65        .00    1199.40
     48.0        .0       48.0        .0        .0       28.4        .0        4.1        3.9    1198.40
      .94       .00       1.69       .00      .000       .030      .000       .000    1195.10      24.80
  .000907      600.       600.       600.         3         11         0        .00      23.01      47.81
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    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

*SECNO 17.000
    17.000      1.73    1197.23    1196.32       .00    1197.28       .05       .42       .00    1201.20
      48.0        .0       48.0        .0        .0       25.9        .0       4.4       4.1    1199.30
      1.01       .00       1.85       .00      .000      .030      .000      .000   1195.50      28.45
   .001026      432.       432.      432.         2        11         0       .00     20.01      48.46


CCHV=     .300 CEHV=     .500
*SECNO 18.000
    18.000      1.54    1197.24    1196.40       .00    1197.30       .06       .02       .00    1199.70
      35.0        .0       35.0        .0        .0       17.9        .0       4.4       4.2    1199.70
      1.01       .00       1.95       .00      .000      .016      .000      .000   1195.70      33.45
   .000330       30.        30.       30.         1        18         0       .00     13.10      46.55


SPECIAL CULVERT

SC  CUNO      CUNV      ENTLC     COFQ      RDLEN     RISE      SPAN      CULVLN    CHRT      SCL       ELCHU     ELCHD
     3         .018      .50      3.00      10.00     2.50      .00       60.00     1         1       1196.00   1195.70

CHART  1 - CONCRETE PIPE CULVERT; NO BEVELED RING ENTRANCE
SCALE  1 - SQUARE EDGE ENTRANCE WITH HEADWALL

*SECNO 19.000

SPECIAL CULVERT OUTLET CONTROL
EGIC =   1197.634  EGOC =   1197.801  PCWSE=   1197.243  ELTRD=   1201.000

SPECIAL CULVERT

     EGIC      EGOC       H4      QWEIR     QCULV      VCH      ACULV     ELTRD     WEIRLN
   1197.63   1197.80      .50       0.       35.     1.696      14.7   1201.00       0.


    19.000      1.76    1197.76       .00       .00    1197.80       .04       .50       .00    1200.00
      35.0        .0       35.0        .0        .0       20.6        .0       4.4       4.2    1200.00
      1.02       .00       1.70       .00      .000      .016      .000      .000   1196.00      33.24
   .000217       60.        60.       60.         2         0         0       .00     13.51      46.76


CCHV=     .100 CEHV=     .300
*SECNO 20.000
    20.000      1.49    1197.79    1196.79       .00    1197.81       .02       .01       .00    1201.90
      35.0        .0       35.0        .0        .0       32.2        .0       4.4       4.2    1201.50
      1.03       .00       1.09       .00      .000      .030      .000      .000   1196.30      19.67
   .000374       30.        30.       30.         2        14         0       .00     26.07      45.73


CCHV=     .100 CEHV=     .300
*SECNO 21.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .38

    21.000      1.18    1197.78    1197.29       .00    1197.87       .09       .04       .02    1201.90
      35.0        .0       35.0        .0        .0       14.2        .0       4.5       4.2    1201.50
      1.04       .00       2.46       .00      .000      .030      .000      .000   1196.60      29.78
   .002600       48.        48.       48.         2        14         0       .00     14.14      43.92


CCHV=     .100 CEHV=     .300
*SECNO 22.000
    22.000      1.28    1198.28    1197.75       .00    1198.36       .08       .49       .00    1202.00
      35.0        .0       35.0        .0        .0       15.6        .0       4.5       4.3    1200.96
      1.06       .00       2.25       .00      .000      .030      .000      .000   1197.00      28.43
   .002272      200.       200.      200.         2        14         0       .00     16.41      44.84


*SECNO 23.000
    23.000      1.43    1198.73    1198.18       .00    1198.80       .08       .44       .00    1202.10
      35.0        .0       35.0        .0        .0       15.9        .0       4.6       4.4    1201.07
      1.09       .00       2.20       .00      .000      .030      .000      .000   1197.30      28.97
   .002177      200.       200.      200.         2        19         0       .00     16.71      45.68
```

YR - 2 HR STORM

SUMMARY PRINTOUT TABLE 150

| | SECNO | Q | CWSEL | DIFWSP | DIFWSX | DIFKWS | TOPWID | XLCH |
|---|---|---|---|---|---|---|---|---|
| | 1.000 | 65.00 | 1186.00 | .00 | .00 | .00 | 32.56 | .00 |
| | 2.000 | 65.00 | 1186.55 | .00 | .55 | .00 | 42.24 | 600.00 |
| | 3.000 | 65.00 | 1187.16 | .00 | .61 | .00 | 27.77 | 600.00 |
| | 4.000 | 65.00 | 1187.69 | .00 | .53 | .00 | 23.17 | 440.00 |
| | 5.000 | 52.00 | 1187.70 | .00 | .01 | .00 | 14.62 | 30.00 |
| | 6.000 | 52.00 | 1188.52 | .00 | .82 | .00 | 14.59 | 60.00 |
| | 7.000 | 52.00 | 1188.53 | .00 | .01 | .00 | 25.28 | 30.00 |
| * | 8.000 | 49.00 | 1188.68 | .00 | .15 | .00 | 21.33 | 140.00 |
| | 9.000 | 49.00 | 1189.80 | .00 | 1.13 | .00 | 25.49 | 400.00 |
| | 10.000 | 48.00 | 1191.01 | .00 | 1.21 | .00 | 28.02 | 600.00 |
| | 11.000 | 48.00 | 1191.81 | .00 | .80 | .00 | 27.09 | 600.00 |
| | 12.000 | 48.00 | 1192.56 | .00 | .75 | .00 | 26.85 | 600.00 |
| | 13.000 | 48.00 | 1193.60 | .00 | 1.04 | .00 | 20.79 | 600.00 |
| | 14.000 | 48.00 | 1195.08 | .00 | 1.48 | .00 | 20.86 | 600.00 |
| | 15.000 | 48.00 | 1196.16 | .00 | 1.08 | .00 | 22.02 | 600.00 |
| | 16.000 | 48.00 | 1196.82 | .00 | .66 | .00 | 23.01 | 600.00 |
| | 17.000 | 48.00 | 1197.23 | .00 | .41 | .00 | 20.01 | 432.48 |
| | 18.000 | 35.00 | 1197.24 | .00 | .01 | .00 | 13.10 | 30.00 |
| | 19.000 | 35.00 | 1197.76 | .00 | .51 | .00 | 13.51 | 60.00 |
| | 20.000 | 35.00 | 1197.79 | .00 | .04 | .00 | 26.07 | 30.00 |
| * | 21.000 | 35.00 | 1197.78 | .00 | -.02 | .00 | 14.14 | 47.52 |
| | 22.000 | 35.00 | 1198.28 | .00 | .50 | .00 | 16.41 | 200.00 |
| | 23.000 | 35.00 | 1198.73 | .00 | .45 | .00 | 16.71 | 200.00 |

**********
HEC-2 WATER SURFACE PROFILES

Version 4.6.0; February 1991
**********

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

YR - 2 HR STORM

SUMMARY PRINTOUT TABLE 150

| | SECNO | XLCH | ELTRD | ELLC | ELMIN | Q | CWSEL | CRIWS | EG | 10*KS | VCH | AREA | .01K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.000 | .00 | .00 | .00 | 1184.20 | 65.00 | 1186.00 | 1185.10 | 1186.04 | 9.59 | 1.70 | 38.31 | 20.99 |
| | 2.000 | 600.00 | .00 | .00 | 1184.86 | 65.00 | 1186.55 | 1185.69 | 1186.58 | 8.31 | 1.47 | 44.26 | 22.55 |
| | 3.000 | 600.00 | .00 | .00 | 1185.46 | 65.00 | 1187.16 | 1186.38 | 1187.23 | 13.96 | 2.02 | 32.13 | 17.40 |
| | 4.000 | 440.00 | .00 | .00 | 1185.70 | 65.00 | 1187.69 | 1186.68 | 1187.75 | 10.24 | 1.97 | 32.97 | 20.32 |
| | 5.000 | 30.00 | .00 | .00 | 1185.80 | 52.00 | 1187.70 | 1186.66 | 1187.77 | 3.90 | 2.13 | 24.36 | 26.35 |
| | 6.000 | 60.00 | 1191.50 | 1189.50 | 1186.50 | 52.00 | 1188.52 | .00 | 1188.58 | 3.25 | 2.01 | 25.81 | 28.84 |
| | 7.000 | 30.00 | .00 | .00 | 1187.10 | 52.00 | 1188.53 | 1187.91 | 1188.60 | 6.37 | 2.06 | 25.20 | 20.61 |
| * | 8.000 | 140.00 | .00 | .00 | 1187.60 | 49.00 | 1188.68 | 1188.26 | 1188.77 | 29.37 | 2.51 | 19.56 | 9.04 |
| | 9.000 | 400.00 | .00 | .00 | 1188.80 | 49.00 | 1189.80 | 1189.39 | 1189.88 | 26.11 | 2.26 | 21.70 | 9.59 |
| | 10.000 | 600.00 | .00 | .00 | 1189.90 | 48.00 | 1191.01 | 1190.46 | 1191.06 | 15.22 | 1.83 | 26.17 | 12.30 |
| | 11.000 | 600.00 | .00 | .00 | 1190.40 | 48.00 | 1191.81 | 1191.14 | 1191.86 | 11.67 | 1.72 | 27.98 | 14.05 |
| | 12.000 | 600.00 | .00 | .00 | 1191.30 | 48.00 | 1192.56 | 1191.93 | 1192.61 | 13.49 | 1.80 | 26.68 | 13.07 |
| | 13.000 | 600.00 | .00 | .00 | 1192.30 | 48.00 | 1193.60 | 1193.09 | 1193.69 | 24.55 | 2.38 | 20.16 | 9.69 |
| | 14.000 | 600.00 | .00 | .00 | 1193.59 | 48.00 | 1195.08 | 1194.54 | 1195.17 | 24.66 | 2.38 | 20.15 | 9.67 |
| | 15.000 | 600.00 | .00 | .00 | 1194.60 | 48.00 | 1196.16 | 1195.40 | 1196.22 | 12.95 | 1.92 | 25.03 | 13.34 |
| | 16.000 | 600.00 | .00 | .00 | 1195.10 | 48.00 | 1196.82 | 1195.90 | 1196.86 | 9.07 | 1.69 | 28.36 | 15.94 |
| | 17.000 | 432.48 | .00 | .00 | 1195.50 | 48.00 | 1197.23 | 1196.32 | 1197.28 | 10.26 | 1.85 | 25.94 | 14.98 |
| | 18.000 | 30.00 | .00 | .00 | 1195.70 | 35.00 | 1197.24 | 1196.40 | 1197.30 | 3.30 | 1.95 | 17.91 | 19.25 |
| | 19.000 | 60.00 | 1201.00 | 1198.50 | 1196.00 | 35.00 | 1197.76 | .00 | 1197.80 | 2.17 | 1.70 | 20.64 | 23.75 |
| | 20.000 | 30.00 | .00 | .00 | 1196.30 | 35.00 | 1197.79 | 1196.79 | 1197.81 | 3.74 | 1.09 | 32.15 | 18.09 |
| * | 21.000 | 47.52 | .00 | .00 | 1196.60 | 35.00 | 1197.78 | 1197.29 | 1197.87 | 26.00 | 2.46 | 14.21 | 6.86 |
| | 22.000 | 200.00 | .00 | .00 | 1197.00 | 35.00 | 1198.28 | 1197.75 | 1198.36 | 22.72 | 2.25 | 15.58 | 7.34 |
| | 23.000 | 200.00 | .00 | .00 | 1197.30 | 35.00 | 1198.73 | 1198.18 | 1198.80 | 21.77 | 2.20 | 15.89 | 7.50 |

# B. HEC 2 - ALMA SCHOOL ROAD SWALES

SEC33B.OH1 50 YEAR, 2 HOUR OUTPUT

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

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            **************
            *            *
587 KK      *   SUB142   *
            *            *
            **************

588 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

              SUBBASIN RUNOFF DATA

589 BA          SUBBASIN CHARACTERISTICS
                      TAREA        0.01  SUBBASIN AREA

                PRECIPITATION DATA

 54 PB                STORM        2.31  BASIN TOTAL PRECIPITATION

 55 PI            INCREMENTAL PRECIPITATION PATTERN
                     0.01      0.01      0.01      0.01      0.00      0.01      0.03      0.03      0.04      0.04
                     0.06      0.09      0.27      0.14      0.12      0.04      0.03      0.02      0.01      0.01
                     0.01      0.00      0.01      0.01

590 LS          SCS LOSS RATE
                      STRTL        0.27  INITIAL ABSTRACTION
                     CRVNBR       88.30  CURVE NUMBER
                      RTIMP        0.00  PERCENT IMPERVIOUS AREA

591 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG        0.56  LAG
```

***

UNIT HYDROGRAPH
35 END-OF-PERIOD ORDINATES

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 2. | 3. | 6. | 8. | 10. | 10. | 10. | 9. | 8. |
| 7. | 5. | 4. | 3. | 3. | 2. | 2. | 1. | 1. | 1. |
| 1. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | | | | | |

**********

HYDROGRAPH AT STATION SUB142

**********

| DA | MON | HRMN | ORD | RAIN | LOSS | EXCESS | COMP Q | * | DA | MON | HRMN | ORD | RAIN | LOSS | EXCESS | COMP Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 0000 | 1 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | | 1740 | 501 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0005 | 2 | 0.03 | 0.03 | 0.00 | 0. | * | 2 | | 1745 | 502 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0010 | 3 | 0.02 | 0.02 | 0.00 | 0. | * | 2 | | 1750 | 503 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0015 | 4 | 0.01 | 0.01 | 0.00 | 0. | * | 2 | | 1755 | 504 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0020 | 5 | 0.01 | 0.01 | 0.00 | 0. | * | 2 | | 1800 | 505 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0025 | 6 | 0.01 | 0.01 | 0.00 | 0. | * | 2 | | 1805 | 506 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0030 | 7 | 0.03 | 0.03 | 0.00 | 0. | * | 2 | | 1810 | 507 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0035 | 8 | 0.06 | 0.06 | 0.00 | 0. | * | 2 | | 1815 | 508 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0040 | 9 | 0.07 | 0.07 | 0.00 | 0. | * | 2 | | 1820 | 509 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0045 | 10 | 0.09 | 0.08 | 0.00 | 0. | * | 2 | | 1825 | 510 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0050 | 11 | 0.09 | 0.08 | 0.01 | 0. | * | 2 | | 1830 | 511 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0055 | 12 | 0.13 | 0.10 | 0.03 | 0. | * | 2 | | 1835 | 512 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0100 | 13 | 0.22 | 0.13 | 0.09 | 0. | * | 2 | | 1840 | 513 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0105 | 14 | 0.63 | 0.25 | 0.38 | 1. | * | 2 | | 1845 | 514 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0110 | 15 | 0.33 | 0.08 | 0.24 | 1. | * | 2 | | 1850 | 515 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0115 | 16 | 0.28 | 0.06 | 0.22 | 3. | * | 2 | | 1855 | 516 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0120 | 17 | 0.09 | 0.02 | 0.07 | 5. | * | 2 | | 1900 | 517 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0125 | 18 | 0.07 | 0.01 | 0.06 | 7. | * | 2 | | 1905 | 518 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0130 | 19 | 0.06 | 0.01 | 0.05 | 9. | * | 2 | | 1910 | 519 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0135 | 20 | 0.02 | 0.00 | 0.02 | 10. | * | 2 | | 1915 | 520 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0140 | 21 | 0.02 | 0.00 | 0.02 | 11. | * | 2 | | 1920 | 521 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0145 | 22 | 0.02 | 0.00 | 0.02 | 11. | * | 2 | | 1925 | 522 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0150 | 23 | 0.01 | 0.00 | 0.01 | 10. | * | 2 | | 1930 | 523 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0155 | 24 | 0.02 | 0.00 | 0.02 | 9. | * | 2 | | 1935 | 524 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | | 0200 | 25 | 0.02 | 0.00 | 0.02 | 8. | * | 2 | | 1940 | 525 | 0.00 | 0.00 | 0.00 | 0. |

**"SUB 142" HYDROGRAPH**

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0205 | 26 | 0.00 | 0.00 | 0.00 | 7. | * | 2 | 1945 | 526 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0210 | 27 | 0.00 | 0.00 | 0.00 | 6. | * | 2 | 1950 | 527 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0215 | 28 | 0.00 | 0.00 | 0.00 | 5. | * | 2 | 1955 | 528 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0220 | 29 | 0.00 | 0.00 | 0.00 | 4. | * | 2 | 2000 | 529 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0225 | 30 | 0.00 | 0.00 | 0.00 | 3. | * | 2 | 2005 | 530 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0230 | 31 | 0.00 | 0.00 | 0.00 | 3. | * | 2 | 2010 | 531 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0235 | 32 | 0.00 | 0.00 | 0.00 | 2. | * | 2 | 2015 | 532 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0240 | 33 | 0.00 | 0.00 | 0.00 | 2. | * | 2 | 2020 | 533 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0245 | 34 | 0.00 | 0.00 | 0.00 | 1. | * | 2 | 2025 | 534 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0250 | 35 | 0.00 | 0.00 | 0.00 | 1. | * | 2 | 2030 | 535 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0255 | 36 | 0.00 | 0.00 | 0.00 | 1. | * | 2 | 2035 | 536 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0300 | 37 | 0.00 | 0.00 | 0.00 | 1. | * | 2 | 2040 | 537 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0305 | 38 | 0.00 | 0.00 | 0.00 | 1. | * | 2 | 2045 | 538 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0310 | 39 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2050 | 539 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0315 | 40 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2055 | 540 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0320 | 41 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2100 | 541 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0325 | 42 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2105 | 542 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0330 | 43 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2110 | 543 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0335 | 44 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2115 | 544 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0340 | 45 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2120 | 545 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0345 | 46 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2125 | 546 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0350 | 47 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2130 | 547 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0355 | 48 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2135 | 548 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0400 | 49 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2140 | 549 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0405 | 50 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2145 | 550 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0410 | 51 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2150 | 551 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0415 | 52 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2155 | 552 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0420 | 53 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2200 | 553 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0425 | 54 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2205 | 554 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0430 | 55 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2210 | 555 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0435 | 56 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2215 | 556 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0440 | 57 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2220 | 557 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0445 | 58 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2225 | 558 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0450 | 59 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2230 | 559 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0455 | 60 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2235 | 560 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0500 | 61 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2240 | 561 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0505 | 62 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2245 | 562 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0510 | 63 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2250 | 563 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0515 | 64 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2255 | 564 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0520 | 65 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2300 | 565 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0525 | 66 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2305 | 566 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0530 | 67 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2310 | 567 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0535 | 68 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2315 | 568 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0540 | 69 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2320 | 569 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0545 | 70 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2325 | 570 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0550 | 71 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2330 | 571 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0555 | 72 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2335 | 572 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0600 | 73 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2340 | 573 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0605 | 74 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2345 | 574 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0610 | 75 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2350 | 575 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0615 | 76 | 0.00 | 0.00 | 0.00 | 0. | * | 2 | 2355 | 576 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0620 | 77 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0000 | 577 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0625 | 78 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0005 | 578 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0630 | 79 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0010 | 579 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0635 | 80 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0015 | 580 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0640 | 81 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0020 | 581 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0645 | 82 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0025 | 582 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0650 | 83 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0030 | 583 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0655 | 84 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0035 | 584 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0700 | 85 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0040 | 585 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0705 | 86 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0045 | 586 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0710 | 87 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0050 | 587 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0715 | 88 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0055 | 588 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0720 | 89 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0100 | 589 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0725 | 90 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0105 | 590 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0730 | 91 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0110 | 591 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0735 | 92 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0115 | 592 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0740 | 93 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0120 | 593 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0745 | 94 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0125 | 594 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0750 | 95 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0130 | 595 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0755 | 96 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0135 | 596 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0800 | 97 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0140 | 597 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0805 | 98 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0145 | 598 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0810 | 99 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0150 | 599 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0815 | 100 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0155 | 600 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0820 | 101 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0200 | 601 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0825 | 102 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0205 | 602 | 0.00 | 0.00 | 0.00 | 0. |
| 1 | 0830 | 103 | 0.00 | 0.00 | 0.00 | 0. | * | 3 | 0210 | 603 | 0.00 | 0.00 | 0.00 | 0. |

SEC33B.OH1 50 YEAR, 2 HOUR OUTPUT

```
* *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
02 KK     *   SUM156   *
          *            *
          **************

03 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          1  PRINT CONTROL
                     IPLOT          2  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                      IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2       1000  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT      0.083  TIME INTERVAL IN HOURS


604 HC         HYDROGRAPH COMBINATION
                     ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                    ***
```

HYDROGRAPH AT STATION SUM156
SUM OF 2 HYDROGRAPHS

| DA | MON | HRMN | ORD | FLOW | DA | MON | HRMN | ORD | FLOW | DA | MON | HRMN | ORD | FLOW | DA | MON | HRMN | ORD | FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 0000 | 1 | 0. | 1 | | 2050 | 251 | 12. | 2 | | 1740 | 501 | 3. | 3 | | 1430 | 751 | 1. |
| 1 | | 0005 | 2 | 0. | 1 | | 2055 | 252 | 12. | 2 | | 1745 | 502 | 3. | 3 | | 1435 | 752 | 1. |
| 1 | | 0010 | 3 | 0. | 1 | | 2100 | 253 | 12. | 2 | | 1750 | 503 | 3. | 3 | | 1440 | 753 | 1. |
| 1 | | 0015 | 4 | 0. | 1 | | 2105 | 254 | 12. | 2 | | 1755 | 504 | 3. | 3 | | 1445 | 754 | 1. |
| 1 | | 0020 | 5 | 0. | 1 | | 2110 | 255 | 12. | 2 | | 1800 | 505 | 3. | 3 | | 1450 | 755 | 1. |
| 1 | | 0025 | 6 | 0. | 1 | | 2115 | 256 | 12. | 2 | | 1805 | 506 | 3. | 3 | | 1455 | 756 | 1. |
| 1 | | 0030 | 7 | 0. | 1 | | 2120 | 257 | 12. | 2 | | 1810 | 507 | 3. | 3 | | 1500 | 757 | 1. |
| 1 | | 0035 | 8 | 0. | 1 | | 2125 | 258 | 12. | 2 | | 1815 | 508 | 3. | 3 | | 1505 | 758 | 1. |
| 1 | | 0040 | 9 | 0. | 1 | | 2130 | 259 | 12. | 2 | | 1820 | 509 | 3. | 3 | | 1510 | 759 | 1. |
| 1 | | 0045 | 10 | 0. | 1 | | 2135 | 260 | 12. | 2 | | 1825 | 510 | 3. | 3 | | 1515 | 760 | 1. |
| 1 | | 0050 | 11 | 0. | 1 | | 2140 | 261 | 12. | 2 | | 1830 | 511 | 3. | 3 | | 1520 | 761 | 1. |
| 1 | | 0055 | 12 | 0. | 1 | | 2145 | 262 | 12. | 2 | | 1835 | 512 | 3. | 3 | | 1525 | 762 | 1. |
| 1 | | 0100 | 13 | 1. | 1 | | 2150 | 263 | 12. | 2 | | 1840 | 513 | 3. | 3 | | 1530 | 763 | 1. |
| 1 | | 0105 | 14 | 3. | 1 | | 2155 | 264 | 12. | 2 | | 1845 | 514 | 3. | 3 | | 1535 | 764 | 1. |
| 1 | | 0110 | 15 | 7. | 1 | | 2200 | 265 | 12. | 2 | | 1850 | 515 | 3. | 3 | | 1540 | 765 | 1. |
| 1 | | 0115 | 16 | 13. | 1 | | 2205 | 266 | 12. | 2 | | 1855 | 516 | 3. | 3 | | 1545 | 766 | 1. |
| 1 | | 0120 | 17 | 17. | 1 | | 2210 | 267 | 12. | 2 | | 1900 | 517 | 3. | 3 | | 1550 | 767 | 1. |
| 1 | | 0125 | 18 | 25. | 1 | | 2215 | 268 | 12. | 2 | | 1905 | 518 | 3. | 3 | | 1555 | 768 | 1. |
| 1 | | 0130 | 19 | 37. | 1 | | 2220 | 269 | 12. | 2 | | 1910 | 519 | 3. | 3 | | 1600 | 769 | 1. |
| 1 | | 0135 | 20 | 43. | 1 | | 2225 | 270 | 12. | 2 | | 1915 | 520 | 3. | 3 | | 1605 | 770 | 1. |
| 1 | | 0140 | 21 | 45. | 1 | | 2230 | 271 | 12. | 2 | | 1920 | 521 | 3. | 3 | | 1610 | 771 | 1. |
| 1 | | 0145 | 22 | 46. | 1 | | 2235 | 272 | 12. | 2 | | 1925 | 522 | 3. | 3 | | 1615 | 772 | 1. |
| 1 | | 0150 | 23 | 48. | 1 | | 2240 | 273 | 12. | 2 | | 1930 | 523 | 2. | 3 | | 1620 | 773 | 1. |
| 1 | | 0155 | 24 | 48. | 1 | | 2245 | 274 | 12. | 2 | | 1935 | 524 | 2. | 3 | | 1625 | 774 | 1. |
| 1 | | 0200 | 25 | 47. | 1 | | 2250 | 275 | 12. | 2 | | 1940 | 525 | 2. | 3 | | 1630 | 775 | 1. |
| 1 | | 0205 | 26 | 46. | 1 | | 2255 | 276 | 12. | 2 | | 1945 | 526 | 2. | 3 | | 1635 | 776 | 1. |
| 1 | | 0210 | 27 | 44. | 1 | | 2300 | 277 | 12. | 2 | | 1950 | 527 | 2. | 3 | | 1640 | 777 | 1. |
| 1 | | 0215 | 28 | 43. | 1 | | 2305 | 278 | 12. | 2 | | 1955 | 528 | 2. | 3 | | 1645 | 778 | 1. |
| 1 | | 0220 | 29 | 42. | 1 | | 2310 | 279 | 12. | 2 | | 2000 | 529 | 2. | 3 | | 1650 | 779 | 1. |
| 1 | | 0225 | 30 | 41. | 1 | | 2315 | 280 | 12. | 2 | | 2005 | 530 | 2. | 3 | | 1655 | 780 | 1. |
| 1 | | 0230 | 31 | 40. | 1 | | 2320 | 281 | 12. | 2 | | 2010 | 531 | 2. | 3 | | 1700 | 781 | 1. |
| 1 | | 0235 | 32 | 39. | 1 | | 2325 | 282 | 12. | 2 | | 2015 | 532 | 2. | 3 | | 1705 | 782 | 1. |
| 1 | | 0240 | 33 | 38. | 1 | | 2330 | 283 | 11. | 2 | | 2020 | 533 | 2. | 3 | | 1710 | 783 | 1. |
| 1 | | 0245 | 34 | 37. | 1 | | 2335 | 284 | 11. | 2 | | 2025 | 534 | 2. | 3 | | 1715 | 784 | 1. |
| 1 | | 0250 | 35 | 36. | 1 | | 2340 | 285 | 11. | 2 | | 2030 | 535 | 2. | 3 | | 1720 | 785 | 1. |
| 1 | | 0255 | 36 | 36. | 1 | | 2345 | 286 | 11. | 2 | | 2035 | 536 | 2. | 3 | | 1725 | 786 | 1. |
| 1 | | 0300 | 37 | 35. | 1 | | 2350 | 287 | 11. | 2 | | 2040 | 537 | 2. | 3 | | 1730 | 787 | 1. |
| 1 | | 0305 | 38 | 34. | 1 | | 2355 | 288 | 11. | 2 | | 2045 | 538 | 2. | 3 | | 1735 | 788 | 1. |
| 1 | | 0310 | 39 | 34. | 2 | | 0000 | 289 | 11. | 2 | | 2050 | 539 | 2. | 3 | | 1740 | 789 | 1. |
| 1 | | 0315 | 40 | 33. | 2 | | 0005 | 290 | 11. | 2 | | 2055 | 540 | 2. | 3 | | 1745 | 790 | 1. |
| 1 | | 0320 | 41 | 33. | 2 | | 0010 | 291 | 11. | 2 | | 2100 | 541 | 2. | 3 | | 1750 | 791 | 1. |
| 1 | | 0325 | 42 | 33. | 2 | | 0015 | 292 | 11. | 2 | | 2105 | 542 | 2. | 3 | | 1755 | 792 | 1. |
| 1 | | 0330 | 43 | 32. | 2 | | 0020 | 293 | 11. | 2 | | 2110 | 543 | 2. | 3 | | 1800 | 793 | 1. |

**"SUM 156" HYDROGRAPH**

HEC-5 ANALYSIS

PROJECT: HUNT HIGHWAY @ ALMA SCHOOL ROAD

DESIGNER: TH

DATE: 8/5/96

## HYDROLOGIC AND CHANNEL INFORMATION

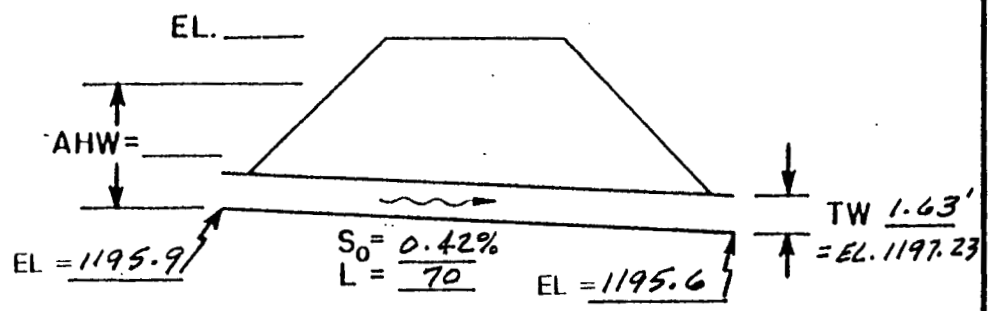
$Q_1$ = _____ $TW_1$ = _____

$Q_2$ = _____ $TW_2$ = _____

( $Q_1$ = DESIGN DISCHARGE, SAY $Q_{25}$
$Q_2$ = CHECK DISCHARGE, SAY $Q_{50}$ OR $Q_{100}$ )

## SKETCH

STATION: _____




MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

| CULVERT DESCRIPTION (ENTRANCE TYPE) | Q | SIZE | HEADWATER COMPUTATION | | | | | | | | | | CONTROLLING HW | OUTLET VELOCITY | COST | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | INLET CONT. | | OUTLET CONTROL $HW = H + h_o - LS_o$ | | | | | | | | | | | |
| | | | $\frac{HW}{D}$ | HW | $K_e$ | H | $d_c$ | $\frac{d_c+D}{2}$ | TW | $h_o$ | $LS_o$ | HW | | | | |
| | 5cfs | 24" | 0.55 | 1.1 | 0.5 | 0.09 | — | — | 1.63 | 1.63 | 0.3 | 1.42 | 1.42 | | | w.s. = 1197.32 |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

SUMMARY & RECOMMENDATIONS:

ALMA SCHOOL 24" HEC 5 ANALYSIS

```
T1       WATER PROFILE  ALMA SCH RD E.SIDE CHANNEL FN "ALMSCHRD.E" TH 8/05/96
T2       5 SECTIONS - NUMBER  1.83  to 9.18 - 50 YEAR FLOW. OUTPUT FN "ALMSCH.E"
T3       HUNT HWY DRG. PROJ. - ALMA SCH RD. (EAST SIDE CHANNEL)

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      0         2         0         0         0         0         0        5.      97.32

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     -1         0        -1         0         0         0         0         0         0         0


NC     .016      .030      .030       0.1       0.3
X1    1.83         4       19.       55.
GR   100.2       0.0      100.       19.      95.9       40.    101.86       55.

X1    4.00         4       16.       55.      217.      217.      217.
GR   98.66        0.     98.53       16.     96.21       40.    101.35       55.

X1    6.00         4       14.       55.      200.      200.      200.
GR   97.91        0.     97.26       14.     96.50       40.    100.35       55.

X1    8.00         4       21.       55.      200.      200.      200.
GR   97.25        0.     97.08       21.     96.79       40.    100.88       55.

NH       2      .016       35.      .030       55.
X1    9.18         3        0.       55.      118.      118.      118.
GR   97.25       0.0     96.96       35.     100.0       55.

   Run Date:  11AUG96    Run Time: 15:23:10    HMVersion: 6.20    Data File:   ALMSCHRD.E                          Page    2

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*PROF 1

CCHV=     .100 CEHV=     .300
*SECNO 1.830
     1.830      1.42     97.32       .00     97.32     97.33       .01       .00       .00    100.00
       5.0        .0       5.0        .0        .0       7.7        .0       .0        .0    101.86
       .00       .00       .65       .00      .000      .030      .000      .000     95.90     32.73
   .000285        0.        0.        0.         0         0         0       .00     10.85     43.57

*SECNO 4.000
     4.000      1.17     97.38       .00       .00     97.39       .00       .06       .00     98.53
       5.0        .0       5.0        .0        .0       9.1        .0       .0        .1    101.35
       .11       .00       .55       .00      .000      .030      .000      .000     96.21     27.88
   .000256      217.      217.      217.         0         0         0       .00     15.54     43.42

*SECNO 6.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.61

     6.000       .91     97.41       .00       .00     97.42       .00       .03       .00     97.26
       5.0        .0       5.0        .0        .3      15.5        .0       .1        .2    100.35
       .28       .17       .32       .00      .016      .030      .000      .000     96.50     10.68
   .000099      200.      200.      200.         2         0         0       .00     32.88     43.56

*SECNO 8.000
3280 CROSS SECTION      8.00 EXTENDED       .19 FEET

     8.000       .64     97.43       .00       .00     97.43       .00       .02       .00     97.08
       5.0       2.1       2.9        .0       5.8      10.4        .0       .2        .3    100.88
       .46       .36       .28       .00      .016      .030      .000      .000     96.79       .00
   .000085      200.      200.      200.         1         0         0       .00     42.39     42.39

1490 NH CARD USED
*SECNO 9.180
3280 CROSS SECTION      9.18 EXTENDED       .24 FEET

     9.180       .48     97.44       .00       .00     97.44       .00       .01       .00     97.20
       5.0        .0       5.0        .0        .0      13.5        .0       .2        .5    100.00
       .55       .00       .37       .00      .000      .016      .000      .000     96.96       .00
   .000067      118.      118.      118.         0         0         0       .00     38.18     38.18
```

# ALMA SCHOOL ROAD-EAST SIDE SWALE HEC 2 ANALYSIS

THIS RUN EXECUTED 11AUG96 15:23:11

**********
HEC-2 WATER SURFACE PROFILES

Version 4.6.0; February 1991
**********

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

HUNT HWY DRG. PROJ. - A

SUMMARY PRINTOUT TABLE 150

| | SECNO | XLCH | ELTRD | ELLC | ELMIN | Q | CWSEL | CRIWS | EG | 10*KS | VCH | AREA | .01K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.830 | .00 | .00 | .00 | 95.90 | 5.00 | 97.32 | .00 | 97.33 | 2.85 | .65 | 7.70 | 2.96 |
| | 4.000 | 217.00 | .00 | .00 | 96.21 | 5.00 | 97.38 | .00 | 97.39 | 2.56 | .55 | 9.11 | 3.12 |
| * | 6.000 | 200.00 | .00 | .00 | 96.50 | 5.00 | 97.41 | .00 | 97.42 | .99 | .32 | 15.77 | 5.03 |
| | 8.000 | 200.00 | .00 | .00 | 96.79 | 5.00 | 97.43 | .00 | 97.43 | .85 | .28 | 16.18 | 5.43 |
| | 9.180 | 118.00 | .00 | .00 | 96.96 | 5.00 | 97.44 | .00 | 97.44 | .67 | .37 | 13.48 | 6.13 |

HUNT HWY DRG. PROJ. - A

SUMMARY PRINTOUT TABLE 150

| | SECNO | Q | CWSEL | DIFWSP | DIFWSX | DIFKWS | TOPWID | XLCH |
|---|---|---|---|---|---|---|---|---|
| | 1.830 | 5.00 | 97.32 | .00 | .00 | .00 | 10.85 | .00 |
| | 4.000 | 5.00 | 97.38 | .00 | .06 | .00 | 15.54 | 217.00 |
| * | 6.000 | 5.00 | 97.41 | .00 | .03 | .00 | 32.88 | 200.00 |
| | 8.000 | 5.00 | 97.43 | .00 | .02 | .00 | 42.39 | 200.00 |
| | 9.180 | 5.00 | 97.44 | .00 | .01 | .00 | 38.18 | 118.00 |

```
T1        WATER PROFILE  ALMA SCH RD W.SIDE CHANNEL FN "ALMSCHRD.W" TH 8/05/96
T2        5 SECTIONS - NUMBER  1.83  thru 9.18  - 50 YEAR FLOW
T3        HUNT HWY DRG. PROJ. - ALMA SCH RD. (WEST SIDE CHANNEL)

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
      0         2         0         0         0         0         0       14.     97.20

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
     -1         0        -1         0         0         0         0         0         0         0

NC     .030      .030      .016      0.1       0.3
X1    1.83         5        8.      37.
GR   100.6       0.0      100.       8.      95.6        20.    100.00       37.     100.2      55.

X1    4.00         5        9.      40.      217.      217.      217.
GR   100.4        0.     99.34       9.     95.90       25.     98.55       40.     98.66      55.

X1    6.00         5        9.      42.      200.      200.      200.
GR   100.4        0.     99.23       9.     96.18       25.     97.78       42.     97.91      55.

X1    8.00         5        8.      42.      200.      200.      200.
GR   100.6        0.     100.0       8.     96.46       25.     97.04       42.     97.25      55.

X1    9.18         5        8.      42.      118.      118.      118.
GR   100.6       0.0     100.0       8.     96.63       25.     97.10       42.     97.25      55.
   Run Date:   5AUG96    Run Time: 18:09:26    HMVersion: 6.20    Data File:   ALMSCHRD.W                    Page    2

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*PROF 1

CCHV=     .100 CEHV=     .300
*SECNO 1.830
     1.830      1.60     97.20       .00     97.20     97.24       .04       .00       .00    100.00
      14.0        .0      14.0        .0        .0       8.4        .0        .0        .0    100.00
       .00       .00      1.66       .00      .000      .016      .000      .000     95.60     15.64
   .000457        0.        0.        0.         0         0         0       .00     10.55     26.18


*SECNO 4.000
     4.000      1.40     97.30       .00       .00     97.33       .03       .09       .00     99.34
      14.0        .0      14.0        .0        .0      10.1        .0        .0        .1     98.55
       .04       .00      1.39       .00      .000      .016      .000      .000     95.90     18.49
   .000368      217.      217.      217.         0         0         0       .00     14.43     32.92


*SECNO 6.000
     6.000      1.20     97.38       .00       .00     97.40       .02       .07       .00     99.23
      14.0        .0      14.0        .0        .0      11.5        .0        .1        .1     97.78
       .09       .00      1.21       .00      .000      .016      .000      .000     96.18     18.68
   .000340      200.      200.      200.         0         0         0       .00     19.13     37.81


*SECNO 8.000
3280 CROSS SECTION      8.00 EXTENDED       .20 FEET


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.41

     8.000       .98     97.44       .00       .00     97.45       .01       .05       .00    100.00
      14.0        .0      12.9       1.1        .0      14.2       3.9        .2        .3     97.04
       .15       .00       .91       .29      .000      .016      .030      .000     96.46     20.27
   .000171      200.      200.      200.         1         0         0       .00     34.73     55.00


*SECNO 9.180
3280 CROSS SECTION      9.18 EXTENDED       .27 FEET

     9.180       .83     97.46       .00       .00     97.48       .01       .02       .00    100.00
      14.0        .0      12.5       1.5        .0      12.1       4.2        .2        .4     97.10
       .19       .00      1.03       .37      .000      .016      .030      .000     96.63     20.76
   .000264      118.      118.      118.         0         0         0       .00     34.24     55.00
```

# ALMA SCHOOL ROAD-WEST SIDE SWALE HEC 2 ANALYSIS

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

HUNT HWY DRG. PROJ. - A

SUMMARY PRINTOUT TABLE 150

| | SECNO | XLCH | ELTRD | ELLC | ELMIN | Q | CWSEL | CRIWS | EG | 10*KS | VCH | AREA | .01K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.830 | .00 | .00 | .00 | 95.60 | 14.00 | 97.20 | .00 | 97.24 | 4.57 | 1.66 | 8.44 | 6.55 |
| | 4.000 | 217.00 | .00 | .00 | 95.90 | 14.00 | 97.30 | .00 | 97.33 | 3.68 | 1.39 | 10.09 | 7.30 |
| | 6.000 | 200.00 | .00 | .00 | 96.18 | 14.00 | 97.38 | .00 | 97.40 | 3.40 | 1.21 | 11.53 | 7.60 |
| * | 8.000 | 200.00 | .00 | .00 | 96.46 | 14.00 | 97.44 | .00 | 97.45 | 1.71 | .91 | 18.07 | 10.71 |
| | 9.180 | 118.00 | .00 | .00 | 96.63 | 14.00 | 97.46 | .00 | 97.48 | 2.64 | 1.03 | 16.24 | 8.62 |



HUNT HWY DRG. PROJ. - A

SUMMARY PRINTOUT TABLE 150

| | SECNO | Q | CWSEL | DIFWSP | DIFWSX | DIFKWS | TOPWID | XLCH |
|---|---|---|---|---|---|---|---|---|
| | 1.830 | 14.00 | 97.20 | .00 | .00 | .00 | 10.55 | .00 |
| | 4.000 | 14.00 | 97.30 | .00 | .10 | .00 | 14.43 | 217.00 |
| | 6.000 | 14.00 | 97.38 | .00 | .08 | .00 | 19.13 | 200.00 |
| * | 8.000 | 14.00 | 97.44 | .00 | .06 | .00 | 34.73 | 200.00 |
| | 9.180 | 14.00 | 97.46 | .00 | .02 | .00 | 34.24 | 118.00 |

# C. HEC 2 - DOBSON ROAD SWALES

SEC32B.OH1 50 YEAR, 2 HOUR OUTPUT

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

```
          **************
          *            *
19 KK     *    SUM198  *
          *            *
          **************

20 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          1  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

21 HC          HYDROGRAPH COMBINATION
                     ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE
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HYDROGRAPH AT STATION SUM198
SUM OF 2 HYDROGRAPHS

**********

| DA | MON | HRMN | ORD | FLOW | DA | MON | HRMN | ORD | FLOW | DA | MON | HRMN | ORD | FLOW | DA | MON | HRMN | ORD | FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 0000 | 1 | 0. | 1 | | 2050 | 251 | 12. | 2 | | 1740 | 501 | 5. | 3 | | 1430 | 751 | 4. |
| 1 | | 0005 | 2 | 0. | 1 | | 2055 | 252 | 12. | 2 | | 1745 | 502 | 5. | 3 | | 1435 | 752 | 4. |
| 1 | | 0010 | 3 | 0. | 1 | | 2100 | 253 | 12. | 2 | | 1750 | 503 | 5. | 3 | | 1440 | 753 | 4. |
| 1 | | 0015 | 4 | 0. | 1 | | 2105 | 254 | 12. | 2 | | 1755 | 504 | 5. | 3 | | 1445 | 754 | 4. |
| 1 | | 0020 | 5 | 0. | 1 | | 2110 | 255 | 12. | 2 | | 1800 | 505 | 5. | 3 | | 1450 | 755 | 4. |
| 1 | | 0025 | 6 | 0. | 1 | | 2115 | 256 | 12. | 2 | | 1805 | 506 | 5. | 3 | | 1455 | 756 | 4. |
| 1 | | 0030 | 7 | 0. | 1 | | 2120 | 257 | 12. | 2 | | 1810 | 507 | 5. | 3 | | 1500 | 757 | 4. |
| 1 | | 0035 | 8 | 0. | 1 | | 2125 | 258 | 12. | 2 | | 1815 | 508 | 5. | 3 | | 1505 | 758 | 4. |
| 1 | | 0040 | 9 | 0. | 1 | | 2130 | 259 | 12. | 2 | | 1820 | 509 | 5. | 3 | | 1510 | 759 | 3. |
| 1 | | 0045 | 10 | 0. | 1 | | 2135 | 260 | 12. | 2 | | 1825 | 510 | 5. | 3 | | 1515 | 760 | 3. |
| 1 | | 0050 | 11 | 0. | 1 | | 2140 | 261 | 12. | 2 | | 1830 | 511 | 5. | 3 | | 1520 | 761 | 3. |
| 1 | | 0055 | 12 | 0. | 1 | | 2145 | 262 | 12. | 2 | | 1835 | 512 | 5. | 3 | | 1525 | 762 | 3. |
| 1 | | 0100 | 13 | 0. | 1 | | 2150 | 263 | 12. | 2 | | 1840 | 513 | 5. | 3 | | 1530 | 763 | 3. |
| 1 | | 0105 | 14 | 1. | 1 | | 2155 | 264 | 12. | 2 | | 1845 | 514 | 5. | 3 | | 1535 | 764 | 3. |
| 1 | | 0110 | 15 | 3. | 1 | | 2200 | 265 | 12. | 2 | | 1850 | 515 | 5. | 3 | | 1540 | 765 | 3. |
| 1 | | 0115 | 16 | 6. | 1 | | 2205 | 266 | 12. | 2 | | 1855 | 516 | 5. | 3 | | 1545 | 766 | 3. |
| 1 | | 0120 | 17 | 13. | 1 | | 2210 | 267 | 12. | 2 | | 1900 | 517 | 5. | 3 | | 1550 | 767 | 3. |
| 1 | | 0125 | 18 | 15. | 1 | | 2215 | 268 | 12. | 2 | | 1905 | 518 | 5. | 3 | | 1555 | 768 | 3. |
| 1 | | 0130 | 19 | 14. | 1 | | 2220 | 269 | 12. | 2 | | 1910 | 519 | 5. | 3 | | 1600 | 769 | 3. |
| 1 | | 0135 | 20 | 14. | 1 | | 2225 | 270 | 12. | 2 | | 1915 | 520 | 5. | 3 | | 1605 | 770 | 3. |
| 1 | | 0140 | 21 | 14. | 1 | | 2230 | 271 | 12. | 2 | | 1920 | 521 | 5. | 3 | | 1610 | 771 | 3. |
| 1 | | 0145 | 22 | 14. | 1 | | 2235 | 272 | 12. | 2 | | 1925 | 522 | 5. | 3 | | 1615 | 772 | 3. |
| 1 | | 0150 | 23 | 13. | 1 | | 2240 | 273 | 12. | 2 | | 1930 | 523 | 5. | 3 | | 1620 | 773 | 3. |
| 1 | | 0155 | 24 | 13. | 1 | | 2245 | 274 | 12. | 2 | | 1935 | 524 | 5. | 3 | | 1625 | 774 | 3. |
| 1 | | 0200 | 25 | 13. | 1 | | 2250 | 275 | 12. | 2 | | 1940 | 525 | 5. | 3 | | 1630 | 775 | 3. |
| 1 | | 0205 | 26 | 13. | 1 | | 2255 | 276 | 12. | 2 | | 1945 | 526 | 5. | 3 | | 1635 | 776 | 3. |
| 1 | | 0210 | 27 | 13. | 1 | | 2300 | 277 | 12. | 2 | | 1950 | 527 | 5. | 3 | | 1640 | 777 | 3. |
| 1 | | 0215 | 28 | 13. | 1 | | 2305 | 278 | 12. | 2 | | 1955 | 528 | 5. | 3 | | 1645 | 778 | 3. |
| 1 | | 0220 | 29 | 13. | 1 | | 2310 | 279 | 12. | 2 | | 2000 | 529 | 5. | 3 | | 1650 | 779 | 3. |
| 1 | | 0225 | 30 | 13. | 1 | | 2315 | 280 | 12. | 2 | | 2005 | 530 | 5. | 3 | | 1655 | 780 | 3. |
| 1 | | 0230 | 31 | 13. | 1 | | 2320 | 281 | 12. | 2 | | 2010 | 531 | 5. | 3 | | 1700 | 781 | 3. |
| 1 | | 0235 | 32 | 13. | 1 | | 2325 | 282 | 12. | 2 | | 2015 | 532 | 5. | 3 | | 1705 | 782 | 3. |
| 1 | | 0240 | 33 | 13. | 1 | | 2330 | 283 | 12. | 2 | | 2020 | 533 | 5. | 3 | | 1710 | 783 | 3. |
| 1 | | 0245 | 34 | 13. | 1 | | 2335 | 284 | 12. | 2 | | 2025 | 534 | 4. | 3 | | 1715 | 784 | 3. |
| 1 | | 0250 | 35 | 13. | 1 | | 2340 | 285 | 12. | 2 | | 2030 | 535 | 4. | 3 | | 1720 | 785 | 3. |
| 1 | | 0255 | 36 | 13. | 1 | | 2345 | 286 | 11. | 2 | | 2035 | 536 | 4. | 3 | | 1725 | 786 | 3. |
| 1 | | 0300 | 37 | 13. | 1 | | 2350 | 287 | 11. | 2 | | 2040 | 537 | 4. | 3 | | 1730 | 787 | 3. |
| 1 | | 0305 | 38 | 13. | 1 | | 2355 | 288 | 11. | 2 | | 2045 | 538 | 4. | 3 | | 1735 | 788 | 3. |
| 1 | | 0310 | 39 | 13. | 2 | | 0000 | 289 | 10. | 2 | | 2050 | 539 | 4. | 3 | | 1740 | 789 | 3. |
| 1 | | 0315 | 40 | 13. | 2 | | 0005 | 290 | 10. | 2 | | 2055 | 540 | 4. | 3 | | 1745 | 790 | 3. |
| 1 | | 0320 | 41 | 12. | 2 | | 0010 | 291 | 10. | 2 | | 2100 | 541 | 4. | 3 | | 1750 | 791 | 3. |
| 1 | | 0325 | 42 | 12. | 2 | | 0015 | 292 | 10. | 2 | | 2105 | 542 | 4. | 3 | | 1755 | 792 | 3. |
| 1 | | 0330 | 43 | 12. | 2 | | 0020 | 293 | 9. | 2 | | 2110 | 543 | 4. | 3 | | 1800 | 793 | 3. |
| 1 | | 0335 | 44 | 12. | 2 | | 0025 | 294 | 9. | 2 | | 2115 | 544 | 4. | 3 | | 1805 | 794 | 3. |
| 1 | | 0340 | 45 | 12. | 2 | | 0030 | 295 | 9. | 2 | | 2120 | 545 | 4. | 3 | | 1810 | 795 | 3. |
| 1 | | 0345 | 46 | 12. | 2 | | 0035 | 296 | 9. | 2 | | 2125 | 546 | 4. | 3 | | 1815 | 796 | 3. |
| 1 | | 0350 | 47 | 12. | 2 | | 0040 | 297 | 8. | 2 | | 2130 | 547 | 4. | 3 | | 1820 | 797 | 3. |
| 1 | | 0355 | 48 | 12. | 2 | | 0045 | 298 | 8. | 2 | | 2135 | 548 | 4. | 3 | | 1825 | 798 | 3. |
| 1 | | 0400 | 49 | 12. | 2 | | 0050 | 299 | 8. | 2 | | 2140 | 549 | 4. | 3 | | 1830 | 799 | 3. |
| 1 | | 0405 | 50 | 12. | 2 | | 0055 | 300 | 8. | 2 | | 2145 | 550 | 4. | 3 | | 1835 | 800 | 3. |

**"SUM 198" HYDROGRAPH**

SEC32B.OH1 50 YEAR, 2 HOUR OUTPUT

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

            **************
            *            *
152 KK      *     SEC32  *
            *            *
            **************

153 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          2  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2       1000  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT      0.083  TIME INTERVAL IN HOURS

454 HC          HYDROGRAPH COMBINATION
                      ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                    ***

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HYDROGRAPH AT STATION SEC32
SUM OF 2 HYDROGRAPHS

| DA | MON | HRMN | ORD | FLOW | DA | MON | HRMN | ORD | FLOW | DA | MON | HRMN | ORD | FLOW | DA | MON | HRMN | ORD | FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 0000 | 1 | 0. | 1 | | 2050 | 251 | 25. | 2 | | 1740 | 501 | 8. | 3 | | 1430 | 751 | 4. |
| 1 | | 0005 | 2 | 0. | 1 | | 2055 | 252 | 25. | 2 | | 1745 | 502 | 8. | 3 | | 1435 | 752 | 4. |
| 1 | | 0010 | 3 | 0. | 1 | | 2100 | 253 | 25. | 2 | | 1750 | 503 | 8. | 3 | | 1440 | 753 | 4. |
| 1 | | 0015 | 4 | 0. | 1 | | 2105 | 254 | 25. | 2 | | 1755 | 504 | 8. | 3 | | 1445 | 754 | 4. |
| 1 | | 0020 | 5 | 0. | 1 | | 2110 | 255 | 24. | 2 | | 1800 | 505 | 8. | 3 | | 1450 | 755 | 4. |
| 1 | | 0025 | 6 | 0. | 1 | | 2115 | 256 | 24. | 2 | | 1805 | 506 | 8. | 3 | | 1455 | 756 | 4. |
| 1 | | 0030 | 7 | 0. | 1 | | 2120 | 257 | 24. | 2 | | 1810 | 507 | 8. | 3 | | 1500 | 757 | 4. |
| 1 | | 0035 | 8 | 0. | 1 | | 2125 | 258 | 24. | 2 | | 1815 | 508 | 8. | 3 | | 1505 | 758 | 4. |
| 1 | | 0040 | 9 | 0. | 1 | | 2130 | 259 | 24. | 2 | | 1820 | 509 | 8. | 3 | | 1510 | 759 | 4. |
| 1 | | 0045 | 10 | 0. | 1 | | 2135 | 260 | 24. | 2 | | 1825 | 510 | 8. | 3 | | 1515 | 760 | 4. |
| 1 | | 0050 | 11 | 0. | 1 | | 2140 | 261 | 24. | 2 | | 1830 | 511 | 8. | 3 | | 1520 | 761 | 4. |
| 1 | | 0055 | 12 | 1. | 1 | | 2145 | 262 | 24. | 2 | | 1835 | 512 | 8. | 3 | | 1525 | 762 | 4. |
| 1 | | 0100 | 13 | 1. | 1 | | 2150 | 263 | 24. | 2 | | 1840 | 513 | 8. | 3 | | 1530 | 763 | 4. |
| 1 | | 0105 | 14 | 4. | 1 | | 2155 | 264 | 24. | 2 | | 1845 | 514 | 8. | 3 | | 1535 | 764 | 4. |
| 1 | | 0110 | 15 | 8. | 1 | | 2200 | 265 | 24. | 2 | | 1850 | 515 | 7. | 3 | | 1540 | 765 | 4. |
| 1 | | 0115 | 16 | 16. | 1 | | 2205 | 266 | 24. | 2 | | 1855 | 516 | 7. | 3 | | 1545 | 766 | 4. |
| 1 | | 0120 | 17 | 29. | 1 | | 2210 | 267 | 24. | 2 | | 1900 | 517 | 7. | 3 | | 1550 | 767 | 4. |
| 1 | | 0125 | 18 | 35. | 1 | | 2215 | 268 | 24. | 2 | | 1905 | 518 | 7. | 3 | | 1555 | 768 | 4. |
| 1 | | 0130 | 19 | 35. | 1 | | 2220 | 269 | 24. | 2 | | 1910 | 519 | 7. | 3 | | 1600 | 769 | 4. |
| 1 | | 0135 | 20 | 33. | 1 | | 2225 | 270 | 24. | 2 | | 1915 | 520 | 7. | 3 | | 1605 | 770 | 4. |
| 1 | | 0140 | 21 | 30. | 1 | | 2230 | 271 | 24. | 2 | | 1920 | 521 | 7. | 3 | | 1610 | 771 | 4. |
| 1 | | 0145 | 22 | 28. | 1 | | 2235 | 272 | 24. | 2 | | 1925 | 522 | 7. | 3 | | 1615 | 772 | 4. |
| 1 | | 0150 | 23 | 26. | 1 | | 2240 | 273 | 24. | 2 | | 1930 | 523 | 7. | 3 | | 1620 | 773 | 4. |
| 1 | | 0155 | 24 | 25. | 1 | | 2245 | 274 | 24. | 2 | | 1935 | 524 | 7. | 3 | | 1625 | 774 | 4. |
| 1 | | 0200 | 25 | 27. | 1 | | 2250 | 275 | 24. | 2 | | 1940 | 525 | 7. | 3 | | 1630 | 775 | 4. |
| 1 | | 0205 | 26 | 46. | 1 | | 2255 | 276 | 24. | 2 | | 1945 | 526 | 7. | 3 | | 1635 | 776 | 4. |
| 1 | | 0210 | 27 | 63. | 1 | | 2300 | 277 | 24. | 2 | | 1950 | 527 | 7. | 3 | | 1640 | 777 | 4. |
| 1 | | 0215 | 28 | 65. | 1 | | 2305 | 278 | 24. | 2 | | 1955 | 528 | 7. | 3 | | 1645 | 778 | 4. |
| 1 | | 0220 | 29 | 65. | 1 | | 2310 | 279 | 24. | 2 | | 2000 | 529 | 7. | 3 | | 1650 | 779 | 4. |
| 1 | | 0225 | 30 | 65. | 1 | | 2315 | 280 | 24. | 2 | | 2005 | 530 | 7. | 3 | | 1655 | 780 | 4. |
| 1 | | 0230 | 31 | 63. | 1 | | 2320 | 281 | 24. | 2 | | 2010 | 531 | 7. | 3 | | 1700 | 781 | 4. |
| 1 | | 0235 | 32 | 61. | 1 | | 2325 | 282 | 24. | 2 | | 2015 | 532 | 7. | 3 | | 1705 | 782 | 4. |
| 1 | | 0240 | 33 | 60. | 1 | | 2330 | 283 | 24. | 2 | | 2020 | 533 | 7. | 3 | | 1710 | 783 | 4. |
| 1 | | 0245 | 34 | 58. | 1 | | 2335 | 284 | 24. | 2 | | 2025 | 534 | 7. | 3 | | 1715 | 784 | 4. |
| 1 | | 0250 | 35 | 57. | 1 | | 2340 | 285 | 23. | 2 | | 2030 | 535 | 7. | 3 | | 1720 | 785 | 4. |
| 1 | | 0255 | 36 | 55. | 1 | | 2345 | 286 | 23. | 2 | | 2035 | 536 | 7. | 3 | | 1725 | 786 | 4. |
| 1 | | 0300 | 37 | 54. | 1 | | 2350 | 287 | 23. | 2 | | 2040 | 537 | 7. | 3 | | 1730 | 787 | 4. |
| 1 | | 0305 | 38 | 53. | 1 | | 2355 | 288 | 22. | 2 | | 2045 | 538 | 7. | 3 | | 1735 | 788 | 4. |
| 1 | | 0310 | 39 | 52. | 2 | | 0000 | 289 | 22. | 2 | | 2050 | 539 | 7. | 3 | | 1740 | 789 | 4. |
| 1 | | 0315 | 40 | 51. | 2 | | 0005 | 290 | 22. | 2 | | 2055 | 540 | 7. | 3 | | 1745 | 790 | 4. |
| 1 | | 0320 | 41 | 50. | 2 | | 0010 | 291 | 21. | 2 | | 2100 | 541 | 7. | 3 | | 1750 | 791 | 4. |
| 1 | | 0325 | 42 | 50. | 2 | | 0015 | 292 | 21. | 2 | | 2105 | 542 | 7. | 3 | | 1755 | 792 | 4. |
| 1 | | 0330 | 43 | 49. | 2 | | 0020 | 293 | 21. | 2 | | 2110 | 543 | 7. | 3 | | 1800 | 793 | 4. |

**"SEC 32" HYDROGRAPH**

HEC-5 ANALYSIS

PROJECT: HUNT HIGHWAY @ DOBSON ROAD

DESIGNER: TH

DATE: 8/5/96

## HYDROLOGIC AND CHANNEL INFORMATION

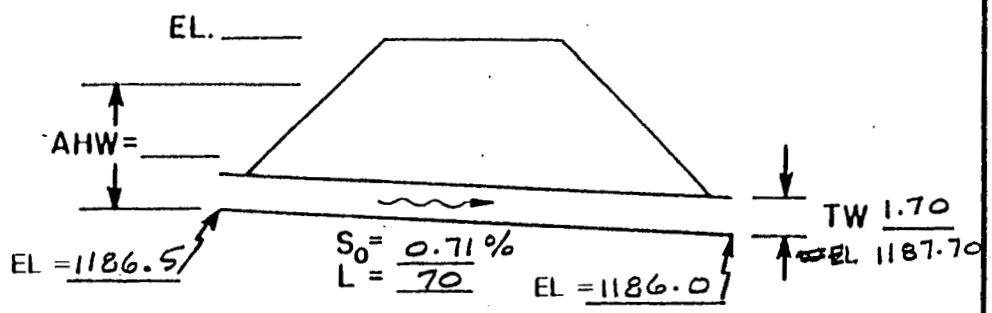
$Q_1$ = _____ $TW_1$ = _____

$Q_2$ = _____ $TW_2$ = _____

( $Q_1$ = DESIGN DISCHARGE, SAY $Q_{25}$
$Q_2$ = CHECK DISCHARGE, SAY $Q_{50}$ OR $Q_{100}$ )

## SKETCH

STATION : _____




MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

| CULVERT DESCRIPTION (ENTRANCE TYPE) | Q | SIZE | HEADWATER COMPUTATION | | | | | | | | | | CONTROLLING HW | OUTLET VELOCITY | COST | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | INLET CONT. | | OUTLET CONTROL $HW=H+h_o-LS_o$ | | | | | | | | | | | |
| | | | $\frac{HW}{D}$ | HW | $K_e$ | H | $d_c$ | $\frac{d_c+D}{2}$ | TW | $h_o$ | $LS_o$ | HW | | | | |
| | 13 | 24" | 1.03 | 2.06 | 0.5 | 0.6 | – | – | 1.7 | 1.7 | 0.5 | 1.8 | 2.06 | | | W.S. = 1188.56 |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

SUMMARY & RECOMMENDATIONS:

DOBSON 24" HEC 5 ANALYSIS

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************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.0;  February 1991
************************************


T1        WATER PROFILE  DOBSON RD E.SIDE CHANNEL FN "DOBSON.E" TH 8/05/96
T2        8 SECTIONS - NUMBER  1.70  thru 14.0  - 50 YEAR FLOW
T3        HUNT HWY DRG. PROJ. - DOBSON RD. (EAST SIDE CHANNEL)

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

       0         2         0         0         0         0         0       13.     88.56

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     -1         0        -1         0         0         0         0         0         0         0


NC     .016      .030      .030       0.1       0.3
X1     1.70         4       12.       55.
GR     91.6       0.0      91.5       12.      86.5       32.     92.95       55.

X1     3.20         4       12.       55.      150.      150.      150.
GR    88.78       0.0     88.79       12.     86.76       32.      92.6       55.

X1     5.00         4       13.       55.      180.      180.      180.
GR    89.28       0.0     89.27       13.     87.16       32.      92.6       55.

X1     7.00         4       13.       55.      200.      200.      200.
GR    89.81       0.0     89.81       13.     87.56       32.      92.4       55.

X1     9.00         4       13.       55.      200.      200.      200.
GR    90.34       0.0     90.34       13.     87.96       32.      92.3       55.

X1    11.00         4       13.       55.      200.      200.      200.
GR     91.0       0.0     90.97       13.     88.36       32.      92.9       55.

X1    13.00         4       13.       55.      200.      200.      200.
GR     91.5       0.0     91.42       13.     88.76       32.      91.8       55.

X1    14.00         4       13.       55.      100.      100.      100.
GR     91.6       0.0     91.58       13.     88.96       32.      92.0       55.

   Run Date:  12AUG96    Run Time:  9:10:25    HMVersion: 6.20    Data File:   DOBSON.E                                Page    2

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*PROF 1

CCHV=     .100 CEHV=     .300
*SECNO 1.700
     1.700      2.06     88.56       .00     88.56     88.57       .01       .00       .00     91.50
      13.0        .0      13.0        .0        .0      16.1        .0        .0        .0     92.95
       .00       .00       .81       .00      .000      .030      .000      .000     86.50     23.76
   .000269        0.        0.        0.         0         0         0       .00     15.59     39.35


*SECNO 3.200
     3.200      1.83     88.59       .00       .00     88.60       .00       .03       .00     88.79
      13.0        .0      13.0        .0        .0      23.4        .0        .1        .1     92.60
       .07       .00       .56       .00      .000      .030      .000      .000     86.76     13.87
   .000144      150.      150.      150.         0         0         0       .00     25.38     39.25
```

# DOBSON ROAD-EAST SIDE SWALE HEC 2 ANALYSIS

*SECNO 5.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .53

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5.000 | 1.47 | 88.63 | .00 | .00 | 88.65 | .01 | .04 | .00 | 89.27 |
| 13.0 | .0 | 13.0 | .0 | .0 | 14.3 | .0 | .1 | .2 | 92.60 |
| .13 | .00 | .91 | .00 | .000 | .030 | .000 | .000 | 87.16 | 18.75 |
| .000514 | 180. | 180. | 180. | 0 | 0 | 0 | .00 | 19.48 | 38.22 |

*SECNO 7.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .61

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 7.000 | 1.22 | 88.78 | .00 | .00 | 88.81 | .03 | .16 | .00 | 89.81 |
| 13.0 | .0 | 13.0 | .0 | .0 | 9.9 | .0 | .2 | .2 | 92.40 |
| .17 | .00 | 1.32 | .00 | .000 | .030 | .000 | .000 | 87.56 | 21.68 |
| .001389 | 200. | 200. | 200. | 2 | 0 | 0 | .00 | 16.13 | 37.81 |

*SECNO 9.000

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 9.000 | 1.14 | 89.10 | .00 | .00 | 89.14 | .03 | .33 | .00 | 90.34 |
| 13.0 | .0 | 13.0 | .0 | .0 | 8.7 | .0 | .2 | .3 | 92.30 |
| .21 | .00 | 1.50 | .00 | .000 | .030 | .000 | .000 | 87.96 | 22.87 |
| .001958 | 200. | 200. | 200. | 2 | 0 | 0 | .00 | 15.18 | 38.06 |

*SECNO 11.000

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 11.000 | 1.16 | 89.52 | .00 | .00 | 89.56 | .04 | .42 | .00 | 90.97 |
| 13.0 | .0 | 13.0 | .0 | .0 | 8.1 | .0 | .3 | .4 | 92.90 |
| .24 | .00 | 1.60 | .00 | .000 | .030 | .000 | .000 | 88.36 | 23.64 |
| .002212 | 200. | 200. | 200. | 1 | 0 | 0 | .00 | 14.18 | 37.82 |

*SECNO 13.000

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 13.000 | 1.14 | 89.90 | .00 | .00 | 89.93 | .03 | .37 | .00 | 91.42 |
| 13.0 | .0 | 13.0 | .0 | .0 | 9.6 | .0 | .3 | .5 | 91.80 |
| .29 | .00 | 1.35 | .00 | .000 | .030 | .000 | .000 | 88.76 | 23.82 |
| .001575 | 200. | 200. | 200. | 1 | 0 | 0 | .00 | 16.85 | 40.67 |

*SECNO 14.000

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 14.000 | 1.11 | 90.07 | .00 | .00 | 90.10 | .03 | .17 | .00 | 91.58 |
| 13.0 | .0 | 13.0 | .0 | .0 | 9.2 | .0 | .3 | .5 | 92.00 |
| .30 | .00 | 1.41 | .00 | .000 | .030 | .000 | .000 | 88.96 | 23.91 |
| .001789 | 100. | 100. | 100. | 1 | 0 | 0 | .00 | 16.53 | 40.44 |

**********
HEC-2 WATER SURFACE PROFILES

Version 4.6.0; February 1991
**********

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

HUNT HWY DRG. PROJ. - D

SUMMARY PRINTOUT TABLE 150

| | SECNO | XLCH | ELTRD | ELLC | ELMIN | Q | CWSEL | CRIWS | EG | 10*KS | VCH | AREA | .01K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.700 | .00 | .00 | .00 | 86.50 | 13.00 | 88.56 | .00 | 88.57 | 2.69 | .81 | 16.05 | 7.93 |
| | 3.200 | 150.00 | .00 | .00 | 86.76 | 13.00 | 88.59 | .00 | 88.60 | 1.44 | .56 | 23.35 | 10.85 |
| * | 5.000 | 180.00 | .00 | .00 | 87.16 | 13.00 | 88.63 | .00 | 88.65 | 5.14 | .91 | 14.33 | 5.74 |
| * | 7.000 | 200.00 | .00 | .00 | 87.56 | 13.00 | 88.78 | .00 | 88.81 | 13.89 | 1.32 | 9.86 | 3.49 |
| | 9.000 | 200.00 | .00 | .00 | 87.96 | 13.00 | 89.10 | .00 | 89.14 | 19.58 | 1.50 | 8.68 | 2.94 |
| | 11.000 | 200.00 | .00 | .00 | 88.36 | 13.00 | 89.52 | .00 | 89.56 | 22.12 | 1.60 | 8.15 | 2.76 |
| | 13.000 | 200.00 | .00 | .00 | 88.76 | 13.00 | 89.90 | .00 | 89.93 | 15.75 | 1.35 | 9.65 | 3.28 |
| | 14.000 | 100.00 | .00 | .00 | 88.96 | 13.00 | 90.07 | .00 | 90.10 | 17.89 | 1.41 | 9.22 | 3.07 |

HUNT HWY DRG. PROJ. - D

SUMMARY PRINTOUT TABLE 150

| | SECNO | Q | CWSEL | DIFWSP | DIFWSX | DIFKWS | TOPWID | XLCH |
|---|---|---|---|---|---|---|---|---|
| | 1.700 | 13.00 | 88.56 | .00 | .00 | .00 | 15.59 | .00 |
| | 3.200 | 13.00 | 88.59 | .00 | .03 | .00 | 25.38 | 150.00 |
| * | 5.000 | 13.00 | 88.63 | .00 | .04 | .00 | 19.48 | 180.00 |
| * | 7.000 | 13.00 | 88.78 | .00 | .15 | .00 | 16.13 | 200.00 |
| | 9.000 | 13.00 | 89.10 | .00 | .32 | .00 | 15.18 | 200.00 |
| | 11.000 | 13.00 | 89.52 | .00 | .41 | .00 | 14.18 | 200.00 |
| | 13.000 | 13.00 | 89.90 | .00 | .38 | .00 | 16.85 | 200.00 |
| | 14.000 | 13.00 | 90.07 | .00 | .17 | .00 | 16.53 | 100.00 |

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************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.0;  February 1991
************************************


T1       WATER PROFILE  DOBSON RD W.SIDE CHANNEL FN "DOBSON.W" TH 8/05/96
T2       4 SECTIONS - NUMBER  1.70  thru 7.0  - 50 YEAR FLOW
T3       HUNT HWY DRG. PROJ. - DOBSON RD. (WEST SIDE CHANNEL)

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      0         2         0         0         0         0         0         3.      87.70

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     -1         0        -1         0         0         0         0         0         0         0


NC     .030      .016      .030      0.1       0.3
X1     1.70         5       16.      42.
GR     92.2       0.0      91.4      16.      87.0       22.      91.47      42.      91.6      55.

X1     3.20         5       15.      42.      150.      150.      150.
GR     91.5       0.0      91.2      15.     87.45       27.      88.77      42.     88.78      55.

X1     5.00         5       17.      42.      180.      180.      180.
GR     90.0       0.0     89.14      17.     88.00       22.      89.29      42.     89.28      55.

X1     7.00         4       18.      42.      200.      200.      200.
GR     90.5       0.0     89.10      18.     89.81       42.      89.81      55.
```



```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


*PROF 1

CCHV=     .100 CEHV=     .300
*SECNO 1.700
    1.700      .70     87.70       .00     87.70     87.77       .07       .00       .00     91.40
      3.0       .0       3.0       .0        .0       1.4       .0        .0        .0      91.47
      .00      .00      2.10       .00      .000      .030      .000      .000     87.00     21.05
  .008007       0.        0.        0.         0         0         0       .00      4.09     25.13


*SECNO 3.200

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.52

    3.200      .70     88.15       .00       .00     88.16       .01       .39       .01     91.20
      3.0       .0       3.0       .0        .0       3.5       .0        .0        .0      88.77
      .05      .00       .86       .00      .000      .030      .000      .000     87.45     24.78
  .001256     150.      150.      150.         5         0         0       .00     10.09     34.87


*SECNO 5.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .59

    5.000      .50     88.50       .00       .00     88.52       .02       .36       .00     89.14
      3.0       .0       3.0       .0        .0       2.5       .0        .0        .1      89.29
      .09      .00      1.18       .00      .000      .030      .000      .000     88.00     19.79
  .003611     180.      180.      180.         3         0         0       .00     10.04     29.83


*SECNO 7.000
    7.000      .33     89.43       .00       .00     89.45       .02       .93       .00     89.10
      3.0       .8       2.2       .0        .7       1.8       .0        .0        .1      89.81
      .14     1.18      1.18       .00      .030      .030      .000      .000     89.10     13.75
  .006258     200.      200.      200.         5         0         0       .00     15.41     29.17
```

THIS RUN EXECUTED 12AUG96 9:17:11

**********
HEC-2 WATER SURFACE PROFILES

Version 4.6.0; February 1991
**********

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

HUNT HWY DRG. PROJ. - D

SUMMARY PRINTOUT TABLE 150

| | SECNO | XLCH | ELTRD | ELLC | ELMIN | Q | CWSEL | CRIWS | EG | 10*KS | VCH | AREA | .01K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.700 | .00 | .00 | .00 | 87.00 | 3.00 | 87.70 | .00 | 87.77 | 80.07 | 2.10 | 1.43 | .34 |
| * | 3.200 | 150.00 | .00 | .00 | 87.45 | 3.00 | 88.15 | .00 | 88.16 | 12.56 | .86 | 3.50 | .85 |
| * | 5.000 | 180.00 | .00 | .00 | 88.00 | 3.00 | 88.50 | .00 | 88.52 | 36.11 | 1.18 | 2.54 | .50 |
| | 7.000 | 200.00 | .00 | .00 | 89.10 | 3.00 | 89.43 | .00 | 89.45 | 62.58 | 1.18 | 2.55 | .38 |

HUNT HWY DRG. PROJ. - D

SUMMARY PRINTOUT TABLE 150

| | SECNO | Q | CWSEL | DIFWSP | DIFWSX | DIFKWS | TOPWID | XLCH |
|---|---|---|---|---|---|---|---|---|
| | 1.700 | 3.00 | 87.70 | .00 | .00 | .00 | 4.09 | .00 |
| * | 3.200 | 3.00 | 88.15 | .00 | .45 | .00 | 10.09 | 150.00 |
| * | 5.000 | 3.00 | 88.50 | .00 | .35 | .00 | 10.04 | 180.00 |
| | 7.000 | 3.00 | 89.43 | .00 | .93 | .00 | 15.41 | 200.00 |