

**STATE ROAD 45 (U.S. 41) / STATE ROAD 700 (U.S. 98)
PROJECT DEVELOPMENT
AND
ENVIRONMENTAL STUDIES**

PASCO AND HERNANDO COUNTIES, FLORIDA

**State Project Nos. 14010-1514, 08010-1519
& 08010-1509**

**W.P. Nos. 7115924, 7112085 & 7112086
Federal Aid No. F-8888(27)**

LOCATION HYDRAULICS REPORT

**S.R. 52 in Pasco County
to C.R. 485B in Hernando County**

**Submitted To:
THE FLORIDA DEPARTMENT OF TRANSPORTATION**

**Submitted By:
GREINER, INC.
Tampa, Florida**

SEPTEMBER 1989

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EXECUTIVE SUMMARY

An evaluation of existing drainage patterns and cross-drain structures was conducted in order to determine the effect of improving S.R. 45 (U.S. 41) from S.R. 52 in Pasco County to S.R. 700 (U.S. 98) in Hernando County, and S.R. 700 (U.S. 98) from S.R. 45 (U.S. 41) to C.R. 485B in Hernando County. The methodology used was established in Executive Order 11988 "Floodplain Management" and Federal-Aid Highway Program Manual (FHPM) 6-7-3(2), Paragraph 7.

Within the project limits, the existing roadway traverses the Federal Emergency Management Agency (FEMA) flood zones A, B, and C. All encroachments to the 100-year floodplains (Zone A) will be mitigated for according to local and regional regulations.

Forty-one existing cross drains were evaluated within the 19.3-mile section of S.R. 45/S.R. 700. With the roadway improvements, 38 of the structures will be lengthened with no significant increase in headloss through the structure. These structures are considered Category 3 structures in accordance with the requirements set forth in FHPM 5-7-3(2), Paragraph 7. Two existing structures are considered Category 4 structures and will require upgrading to minimize flooding impacts upstream and to the proposed roadway. One existing structure is considered Category 5 and will require upgrading due to present flooding conditions.

With the roadway improvements proposed for S.R. 45/S.R. 700, modifications and replacement of existing structures will take place. The proposed roadway project should not significantly contribute to an increase in the flood elevations, and conveyance will be provided as exists with the existing structures.

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| 1 | Location Map | Page 1 |
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INTRODUCTION

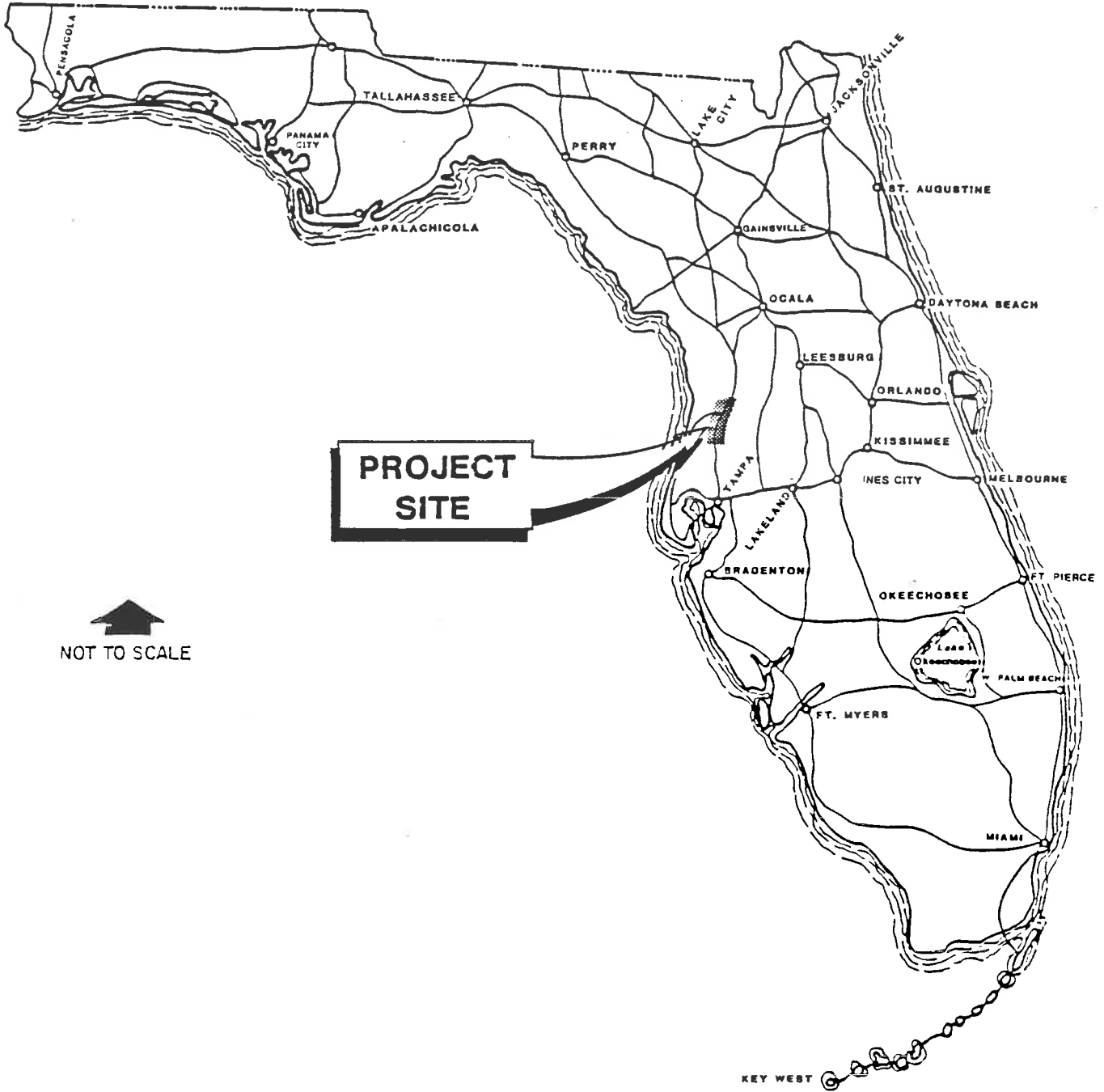
The Florida Department of Transportation (FDOT) is investigating the feasibility of improving S.R. 45 (U.S. 41) from S.R. 52 in Pasco County to S.R. 700 (U.S. 98) in Hernando County, and S.R. 700 (U.S. 98) from S.R. 45 (U.S. 41) to C.R. 485B in Hernando County. The total project length is 19.3 miles (17.4 miles on S.R. 45 and 1.9 miles on S.R. 700). Location and vicinity maps of the project area are presented on Exhibits 1 and 2, respectively. The objective of this report is to provide preliminary information on existing cross-drain structures and potential floodplain impacts associated with the proposed improvements. This report is prepared using methodology established in Executive Order 11988 "Floodplain Management" and Federal-Aid Highway Program Manual (FHPM) 6-7-3(2), Paragraph 7.

Existing Facility

In its present configuration, S.R. 45 and S.R. 700 are two-lane roadways. S.R. 45 has 28 feet of pavement with 6-foot grassed shoulders. The rural right-of-way varies throughout the project from 100 to 250 feet, while existing urban right-of-way is approximately 128 feet. S.R. 700 has 24 feet of pavement with 8-foot grassed shoulders and right-of-way widths of 50 to 190 feet. The existing typical section is shown on Exhibit 3. There are two bridge structures within the project limits.

Proposed Improvements

This project involves upgrading the existing S.R. 45 and S.R. 700 facility to a multi-lane divided facility. The improvements on S.R. 45 from S.R. 52 to Moreland Road

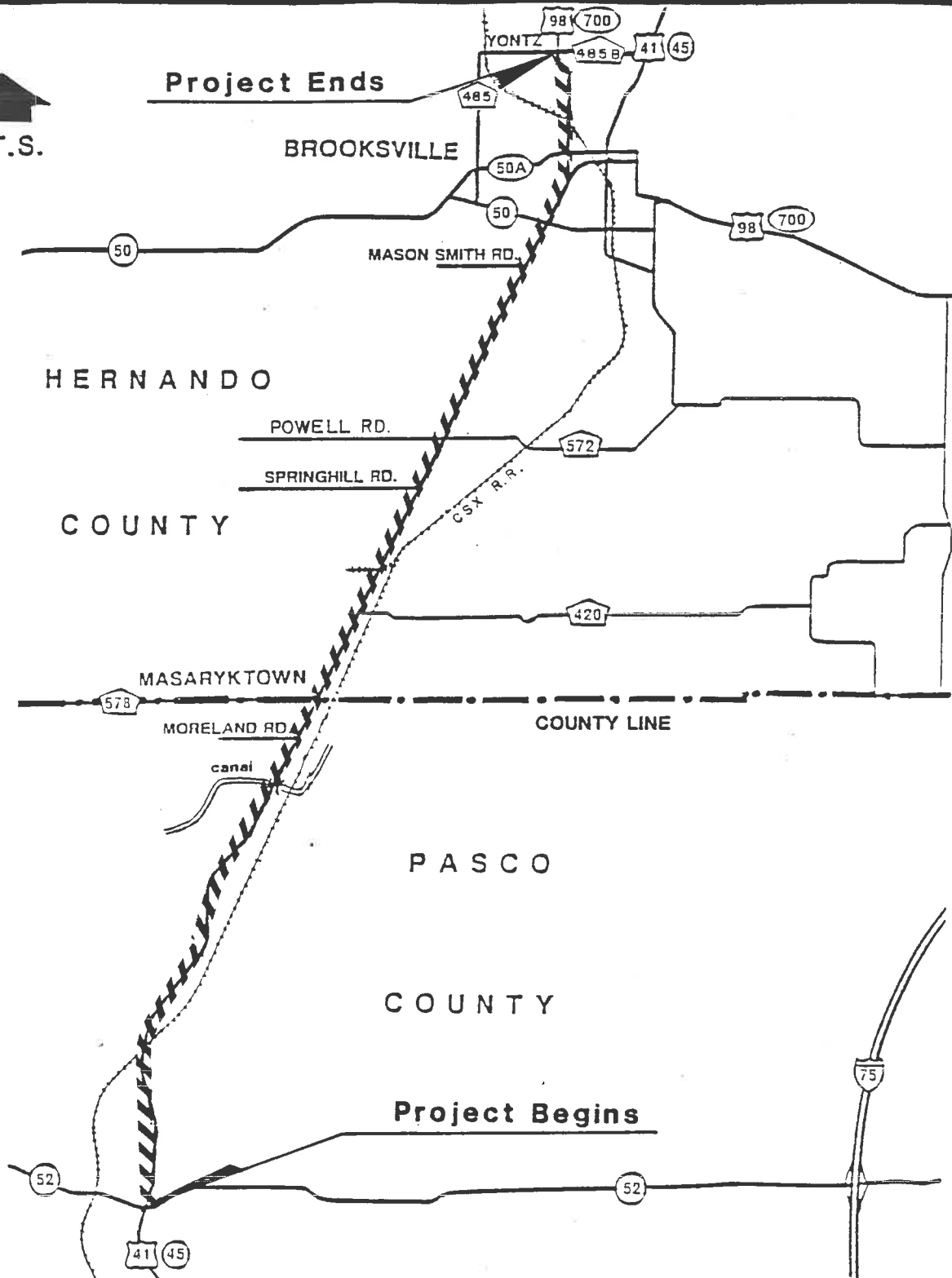


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LOCATION HYDRAULICS REPORT
S.R. 45 (U.S. 41) / S.R. 700 (U.S. 98)
 From S.R. 52 to C.R. 485B
 Pasco and Hernando Counties, Florida

LOCATION MAP



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LEGEND

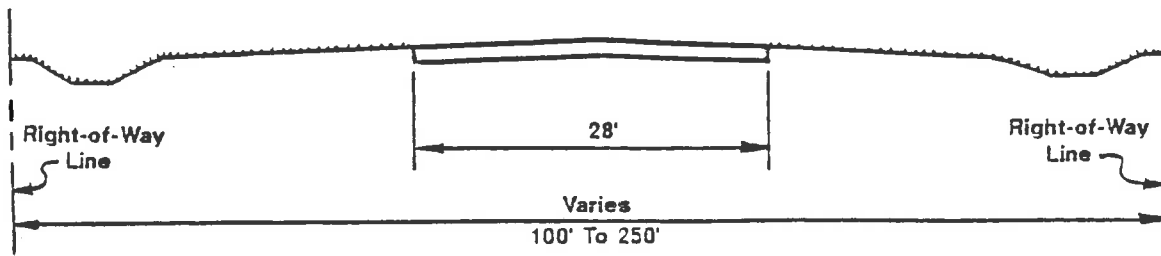
//// Project Area

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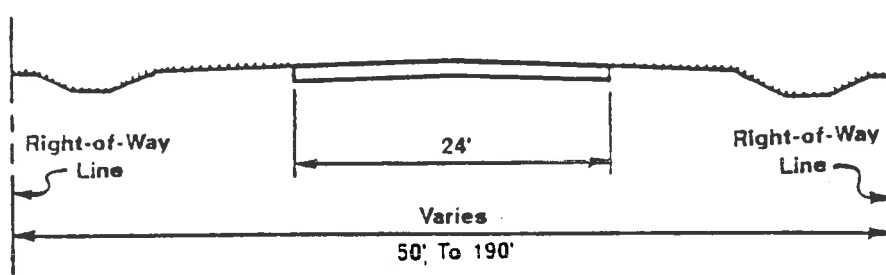
LOCATION HYDRAULICS REPORT
S.R. 45 (U.S. 41) / S.R. 700 (U.S. 98)

From S.R. 52 to C.R. 485B
Pasco and Hernando Counties, Florida

VICINITY MAP



S.R. 45 (U.S. 41)



S.R. 700 (U.S. 98)

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LOCATION HYDRAULICS REPORT

S.R. 45 (U.S. 41) / S.R. 700 (U.S. 98)

From S.R. 52 to C.R. 485B

Pasco and Hernando Counties, Florida

EXISTING TYPICAL SECTION

would include a rural four-lane divided facility with provisions for future expansion to an ultimate six-lane divided section. From Moreland Road to 1,400 feet north of Springhill Road, the facility is to be improved to an urban six-lane divided section. A rural six-lane divided section is proposed from 1,400 feet north of Springhill Road to 1,400 feet south of Mason Smith Road. From 1,400 feet south of Mason Smith Road to S.R. 700, the facility is to be improved to an urban six-lane divided section. The improvement on S.R. 700 from S.R. 45 to C.R. 485B would be an urban four-lane divided section. Typical sections of the proposed improvements are provided in Exhibit 4. The bridge structure located at Scotts Big "D" Creek is recommended to be replaced. At Canal C-534, the existing bridge is recommended to be retained. Further details regarding the proposed improvements are shown in a separate Preliminary Engineering Report for this project.

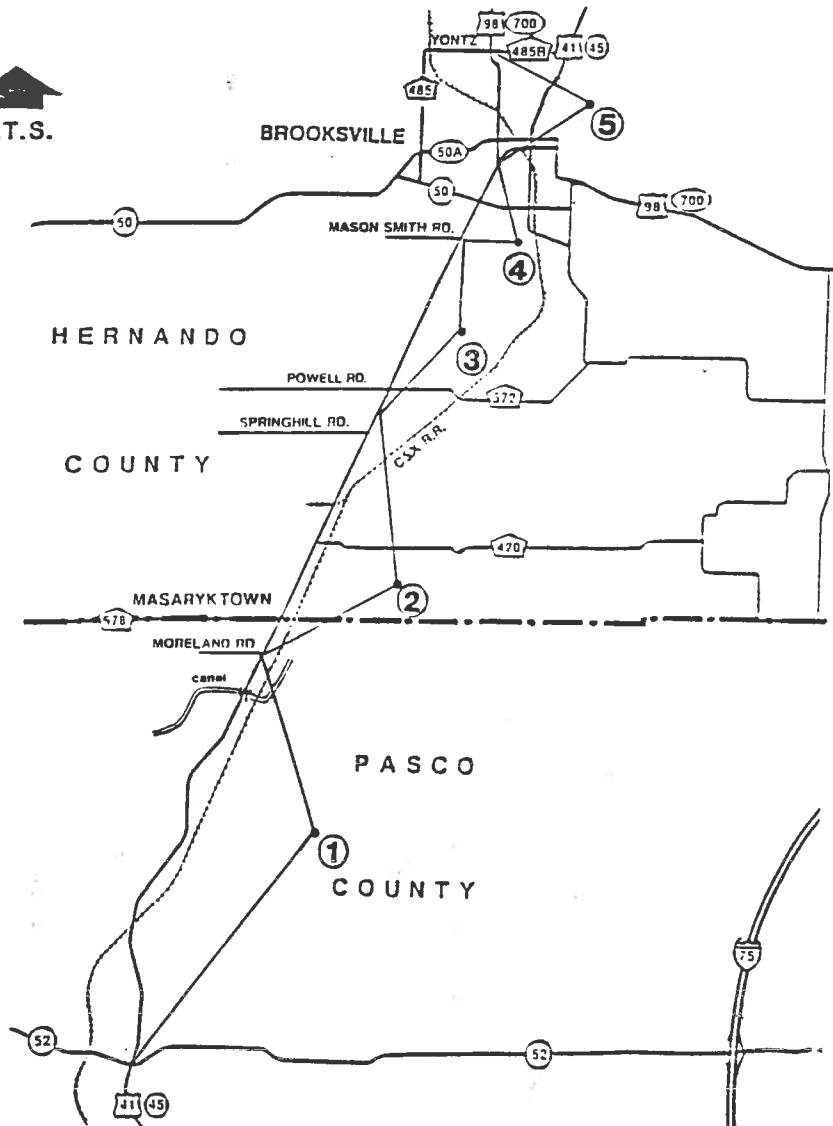
DRAINAGE ANALYSIS

Sources of Information

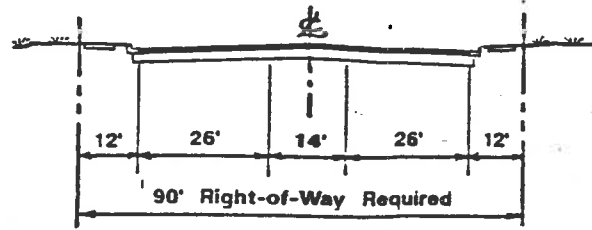
The sources of information used in the preparation of this Location Hydraulic Report include the following:

- * U.S. Geological Service (USGS) Quadrangle Maps.
- * FDOT Drainage Maps.
- * Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps.
- * Interviews with FDOT Maintenance Personnel and County Drainage Engineers.

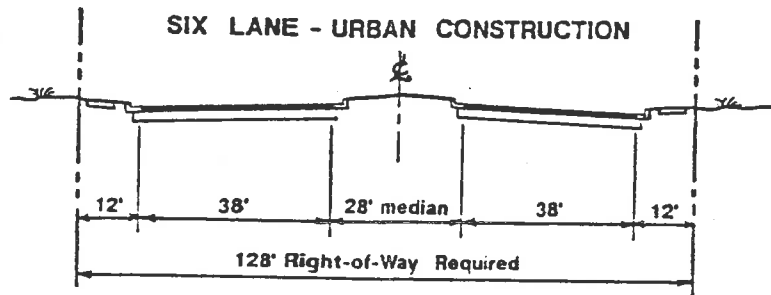
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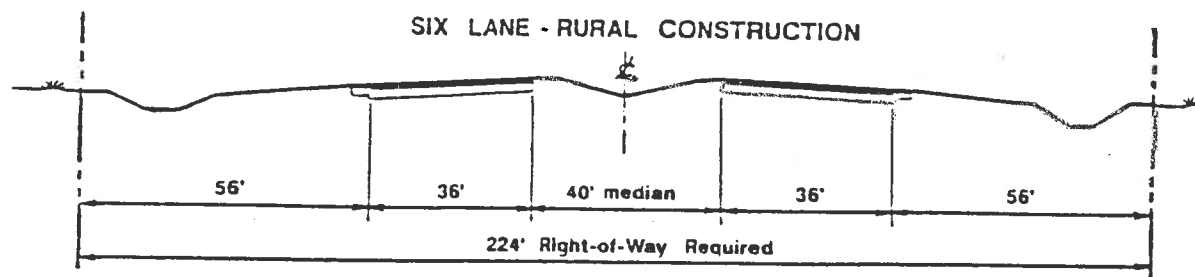
⑤ FOUR LANE - URBAN CONSTRUCTION



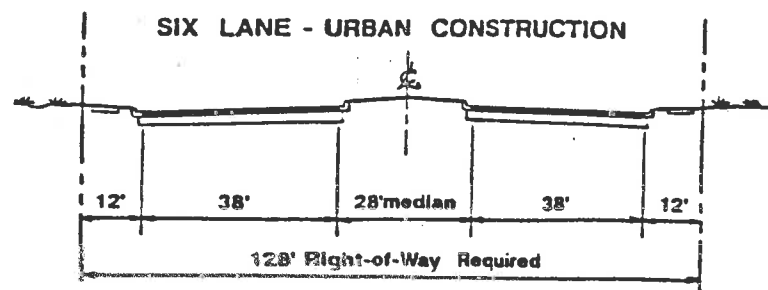
④ SIX LANE - URBAN CONSTRUCTION



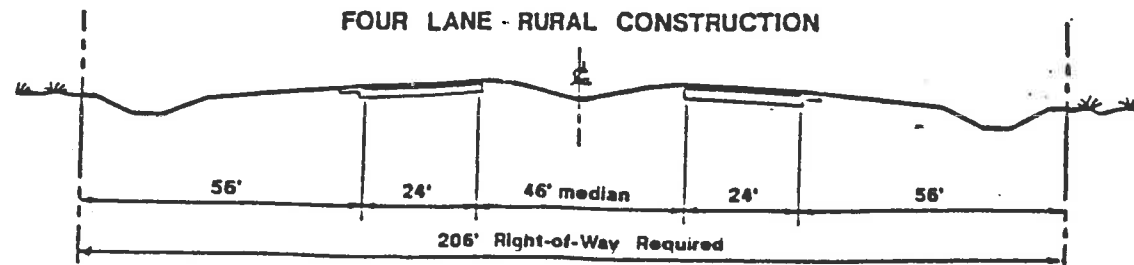
③ SIX LANE - RURAL CONSTRUCTION



② SIX LANE - URBAN CONSTRUCTION



① FOUR LANE - RURAL CONSTRUCTION



FLORIDA DEPARTMENT OF TRANSPORTATION

LOCATION HYDRAULICS REPORT
S.R. 45 (U.S. 41)/ S.R. 700 (U.S.98)
From S.R. 52 to C.R. 485B
Pasco and Hernando Counties, Florida

PROPOSED TYPICAL SECTIONS

- * Soil Conservation Service (SCS) Soil Surveys for Hernando and Pasco Counties.
- * Southwest Florida Water Management District (SWFWMD) aerials with one-foot contours.

Floodplains

The 100-year floodplains immediately adjacent to and crossing S.R. 45/S.R. 700 are associated with lakes and large cypress stands in the southern portion of the project, and intermittent streams in the northern portion of the project.

From the FEMA Flood Insurance Rate Maps (FIRM), flood zones, boundaries and appropriate FIRM map panel numbers along the corridor are illustrated on the 1" = 400' scale aerials in Appendix B. Table 1 indicates FIRM Community Panel Numbers used in identifying the floodplain limits and flood zones. An explanation of the flood zone designations is presented in Table 2. There are no designated floodways within the project limits. The project corridor is considered outside of areas of tidal storm surge.

**TABLE 1
FIRM COMMUNITY MAP PANEL NUMBERS**

| <u>Pasco County</u> | <u>City of Brooksville</u> | <u>Hernando County</u> |
|--------------------------------|------------------------------------|--------------------------------|
| 120230 0425C | 120333 0001C | 120110 0175B |
| 120230 0250C | | 120110 0325B |
| 120230 0225C | | |
| Map Revised: March 15, 1984 | Map Revised: September 18, 1986 | Map Revised: April 17, 1984 |

**TABLE 2
FEMA FLOOD ZONE DESIGNATIONS**

| <u>Zone</u> | <u>Explanation</u> |
|-------------|---|
| "A" | Areas of 100-year flood; base flood elevations and flood hazard factors not determined. |
| "B" | Areas between limits of 100- and 500-year flood. |
| "C" | Areas of minimal flooding. |

Potential For Interruption Of Emergency Service Or Evacuation Routes

Within the project boundaries, S.R. 45/S.R. 700 is considered a Secondary Evacuation Route. The FDOT roadway maintenance and drainage staff for Hernando and Pasco counties were interviewed, and the only record of the road being overtopped is at the existing 30-inch RCP cross-drain located approximately 3,250 feet south of S.R. 50. Therefore, the potential for interruption of emergency service or evacuation routes is considered minimal.

Existing Drainage Problems

Hernando County and FDOT roadway maintenance and drainage staff were interviewed regarding existing drainage problems with the S.R. 45/S.R. 700 project corridor. Structure S-30 (30-inch RCP), approximately 3,250 feet south of S.R. 50, is the only location where overtopping of the road has been recorded within the project limits. The roadway is overtopped approximately every two years. The flooding problem is caused by a combination of an undersized cross-drain structure and inadequate channel capacity downstream.

DESCRIPTION OF DRAINAGE STRUCTURES

Within the project area, S.R. 45 (U.S. 41) is predominantly a two-lane rural highway with shoulder drainage to roadside swales. Forty-one cross-drain structures were identified within the project limits and are numbered 1 through 41, starting with number 1 as the southernmost structure. Table 3 lists the 41 existing drainage structures and briefly describes each structure.

Sheets 1 through 9 of Appendix C show the location of each cross-drain structure along with each contributing drainage basin. The drainage basin areas and existing structures were located using the best available information and on-site inspections.

South of the Masaryktown Canal (Structure S-14), the drainage features are predominantly lakes and cypress heads either isolated or interconnected by man-made ditches. Structure S-1, which crosses a tributary of the Pithlachascotee River, is currently being analyzed and designed under the S.R. 52 roadway project and will not be addressed in this report.

The central portion of the project, north of the Masaryktown Canal, is generally a flat plain with well draining soils. There are no records of drainage problems in this area.

North of the Brooksville Airport, the terrain is generally hilly with well-defined channels. The soil in this area contains a high percentage of finely grained particles. The soil, combined with the steeper slopes, generates higher runoff and cross drain structures tend to be larger in the northern section of the project.

TABLE 6
SUMMARY OF MAJOR CROSS DRAINS

| Structure Number | Existing Size | Replacement Size | 50-Year HW Elevation (ft NGVD) | Road Crest Elevation (ft NGVD) | HeadLoss Across The Proposed Structure | | INVERT ELEVATIONS (FT NGVD) | | | | CHANNEL GEOMETRY | |
|------------------|-----------------|------------------|--------------------------------|--------------------------------|--|----------|-----------------------------|-------------|-------------|-------------|------------------|-----------|
| | | | | | 50-Year | 100-Year | Existing HW | Existing TW | Proposed HW | Proposed TW | Base (ft) | Sideslope |
| 3 | 6' x 4' CBC | 2-8.5' x 4' CBC | 40.1 | 41.7 | 0.9 | 1.8 | 35.9 | 35.5 | 35.5 | 35.3 | 35 | 1:1 |
| 7 | 2-8' x 6' CBC | EXTENDED | 45.8 | 49.3 | 2.0 | 3.8 | 35.8 | 35.6 | | | | |
| 9 | 2-24" RCP | 2-60" x 38" RCP | 39.2 | 40.0 | 0.7 | 1.9 | 35.7 | 35.5 | | | | |
| 11 | 4-10' x 9' CBC | 6-10' x 9' CBC | 6.3 | 10.8 | 1.4 | 2.9 | -4.4 | -4.6 | | | 105 | 3:1 |
| 13 | 36" RCP | 2-48" RCP | 19.3 | 21.5 | 1.6 | 2.2 | 14.7 | 14.6 | | | | |
| 14 | 6' x 5' CBC | 12' x 6' CBC | 18.4 | 19.5 | 1.2 | 1.6 | 10 | 9.9 | | | 15 | 1.5:1 |
| 15 | 54" RCP | 2-8' x 4' CBC | 15.8 | 16.8 | 0.8 | 1.1 | 10.25 | 10 | | | 15 | 1.5:1 |
| 17 | 36" & 24" RCP | 2-42" RCP | 17.4 | 18.2 | 2.1 | 2.8 | 12.2 | 11.8 | | | | |
| 18 | 3-12' x 12' CBC | EXTENDED | -1.0 | 9.8 | 1.3 | 1.8 | -5.29 | -5.34 | | | | |
| 20 | 30" RCP | 5' x 3' CBC | 15.4 | 16.4 | 2.5 | 3.4 | 10.5 | 9.9 | | | | |
| 24 | 2-9' x 5' CBC | 3-9' x 5' CBC | 4.1 | 8.8 | 2.0 | 3.5 | -4.0 | -4.2 | | | 55 | 2:1 |
| 28 | 2-8' x 7' CBC | EXTENDED | 6.3 | 9.5 | 1.2 | 1.5 | -1.88 | -1.90 | | | | |

NOTE: Detailed analysis of all structures can be found in Appendix A.

TABLE 7
SUMMARY OF MINOR CROSS DRAINS

| Structure Number | Existing Size | Replacement Size | 50-Year HW Elevation (ft NGVD) | Road Crest Elevation (ft NGVD) | Headloss Across The Proposed Structure (ft of water) | | INVERT ELEVATIONS (FT NGVD) | |
|------------------|-----------------|------------------|--------------------------------|--------------------------------|--|----------|-----------------------------|-------------|
| | | | | | 50-Year | 100-Year | Existing HW | Proposed HW |
| 1 | 30" RCP | 36" RCP | 40.7 | 42.2 | 2.1 | 2.8 | 34.1 | 33.7 |
| 2 | 36" RCP | EXTENDED | 39.9 | 41.5 | 2.3 | 2.9 | 36.5 | 36.2 |
| 2A | 24" RCP | EXTENDED | 39.7 | 41.7 | 3.8 | 4.7 | 35.0 | 34.6 |
| 4 | 30" RCP | 42" RCP | 45.4 | 46.9 | 1.7 | 2.0 | 41.7 | 41.3 |
| 5 | 24" RCP | 53" X 34" RECP | 50.1 | 50.7 | 1 | 1.3 | 46.6 | 46.3 |
| 6 | 24" RCP | 53" X 34" RECP | 50.6 | 51.2 | 0.9 | 1.6 | 48.1 | 47.7 |
| 8 | 34" RCP | 42" RCP | 42.1 | 45 | 3.1 | 3.6 | 35.2 | 33.7 |
| 10 | 24" RCP | 48" RCP | 29.2 | 31.5 | 2.7 | 3.2 | 24.6 | 24.2 |
| 12 | 30" RCP | 42" RCP | 19.5 | 20.7 | 1.7 | 2.2 | 14.9 | 14.3 |
| 16 | 2-24" RCP | 36" & 30" RCP | 18.1 | 18.9 | 1.8 | 2.4 | 14.0 | 13.8 |
| 19 | 30" RCP | 36" RCP | 12.7 | 14.3 | 1.2 | 1.6 | 8.7 | 8.1 |
| 21 | 18" RCP | EXTENDED | 12.4 | 14.5 | 1.9 | 2.5 | 9.2 | 9 |
| 22 | 18" RCP | EXTENDED | 11.0 | 14.2 | 0.5 | 0.6 | 9.1 | 9 |
| 23 | 18" RCP | EXTENDED | 11.6 | 14.8 | 0.7 | 0.9 | 9.1 | 9 |
| 25 | 2-3.5' X 2' CBC | EXTENDED | 6.0 | 8.2 | 1.4 | 3.0 | 2.6 | 2.5 |
| 26 | 24" RCP | EXTENDED | 5.4 | 7.8 | 1.3 | 1.7 | 2.3 | 2.1 |
| 27 | 24" RCP | 36" RCP | 6.1 | 7.5 | 1.2 | 1.5 | 1.9 | 1.8 |

NOTE: Detailed analysis of all structures can be found in Appendix A.

There are two bridge structures, S-10 and S-14, within the project corridor. The bridge at Scotts Big "O" Creek, S-10, has a gaging station with records dating back to May 1964. The extreme gage height is 66.8 ft. NGVD and was recorded September 18, 1964. This elevation corresponded to a flow of 920 ft³/sec. From the SWFWMD 1"=200' aerial (April 1978), the top of the bridge is at 70.0 ft. NGVD.

Canal C-534, which is spanned by structure S-14, is a canal constructed by the U.S. Army Corps of Engineers as part of the Four Rivers Basin project. According to SWFWMD personnel, the canal was built to alleviate flooding by lowering the water table east of S.R. 45. The canal is usually dry, but when there is water, it represents the water surface elevation of Crews Lake, the canal's discharge point.

FDOT maintenance staff have no record of flooding at the two locations.

From site visits, most existing cross-drain structures appear to be in good condition and functioning properly although some siltation has occurred.

The proposed project follows the existing alignment of S.R. 45/S.R. 700. Drainage modifications will be primarily extensions of existing cross-drainage structures to place headwalls outside of the clear recovery area of the widened roadway. In addition, several existing cross-drains will require upgrading as a result of the roadway improvements.

DRAINAGE STRUCTURE CATEGORIZATION

In accordance with the requirements set forth in FHPM 6-7-3(2), Paragraph 7, the project corridor was evaluated to determine the impact of the proposed structure improvements. The structure improvements were categorized based upon the type of the improvement and estimated floodplain impact. The structures within the project corridor fall within Categories 3, 4, and 5.

Category 3: Projects Involving Modification to Existing Drainage Structures

Activities within this category will not involve the replacement of any existing drainage structures or the construction of any new structures. This category applies only to those projects which modify existing structures (e.g., extending cross-drains or adding headwalls). All existing cross-drain structures within the project corridor except S-30, S-33, and S-36 are considered Category 3 structures.

The small box culverts (1.5' x 1.5' and 2' x 2'), found within the project limits, are no longer in common use. It may be more economical to replace or lengthen these structures with an equivalent sized circular concrete pipe.

An analysis to determine worst-case conditions on headwater for structures in Category 3 is included in Appendix A. Structure S-13 was evaluated to determine the increased headloss caused by extending the cross-drains. The analysis shows no significant (less than 0.1 feet) increase in headloss from the extension of the cross-drain, as presented in Appendix A. This is considered a typical worst-case condition for structures in Category 3.

The proposed modifications to Category 3 structures will not reduce structure conveyance significantly. No significant changes to flood heights will result from the modifications. It is therefore stated for Category 3 structures that:

"Drainage structure modifications included in this project will result in an insignificant change in their capacity to carry floodwater. This change will cause minimal increases in flood heights and flood limits.

These minimal increases will not result in any significant adverse impacts on the natural and beneficial floodplain volumes or any significant change in flood risks or damage. There will not be a significant change in the potential for interruption or termination of emergency service or emergency evacuation routes. Therefore, it has been determined that this encroachment is not significant." (FDOT Drainage Manual, 1987)

Category 4: Projects on Existing Alignment Involving Replacement of Existing Drainage Structures with No Record of Drainage Problems

This category excludes replacement activities that would reduce the hydraulic performance of existing facilities. For this category to be applicable, there should be no record of drainage problems and no unresolved drainage complaints from residents in the area. Three structures within the project limits fall within this category, and both the existing and proposed structures are shown in Table 4.

**TABLE 4
CATEGORY 4 STRUCTURES**

| <u>Structure Number</u> | <u>Existing Size</u> | <u>Existing Length (ft)</u> | <u>Proposed Size</u> | <u>Proposed Length (ft)</u> |
|-------------------------|----------------------|-----------------------------|----------------------|-----------------------------|
| S-33 | 5' x 4' BC | 140 | * | * |
| S-36 | 24" RCP | 55 | (2)38" x 24" ERCP | 130' |

* A discussion of alternatives is presented below.

An analysis to determine the impacts on headwater elevations for the existing and proposed structures is included in Appendix A. Using the flows generated (see Methodology section), the culverts were evaluated using the Federal Highway Administration (FHWA) HY-8 computer program. The replacement structures were also evaluated for the 100-year storm event flow rates.

In the existing condition, Structure S-33 is a 5' x 4' CBC which flows east to west into a junction box. On the north side of the junction box, an existing metal pipe conveys flow north approximately 140 feet to an existing channel. Instead of replacing both pipes and the junction box, which would have to be moved because of the road widening, it is proposed that the new pipe be constructed at a skewed angle to the road and travel directly to the outfall ditch. This would reduce headloss due to the junction box, and also shorten the length of pipe needed to be replaced. No analysis was conducted to size the proposed structure. More information about existing roadway drainage, utilities, and other factors would be required to evaluate a skewed structure. If the structure is to remain with a junction box, upsizing of the existing structure will be needed. Detailed design and survey information for the junction box would be needed before the proposed structure could be sized.

For structure S-36, no record of flooding has been reported; however, a preliminary analysis of the structure and basin suggests overtopping of the road could occur during low frequency storm events. The structure analysis (Appendix A) indicates that two 38" x 24" ERCP would convey the runoff generated from a 100-year storm event. If adequate cover is available, a 30" RCP is the equivalent of a 38" x 24" ERCP and could be used.

At this time, survey information of channel characteristics, road profiles and pipe inverts is not available. Elevations were obtained or estimated from existing FDOT drainage maps, SWFWMD aerials with contours, and USGS Quadrangle Maps. A detailed culvert analysis should be performed during the final design phase of the project to identify the exact culvert inverts, dimensions, and design highwater elevations. The following statement can be made for Category 4 structures:

"The proposed structure will perform hydraulically in a manner equal to or greater than the existing structure, and backwater surface elevations are not expected to increase. As a result, there will be no significant adverse impacts on natural and beneficial floodplain values. There will be no significant change in flood risk, and there will not be a significant change in the potential for interruption or termination of emergency service or emergency evacuation routes. Therefore, it has been determined that this encroachment is not significant." (FDOT Drainage Manual, 1987)

Category 5: Projects on Existing Alignment Involving Replacement of Structures in Heavily Urbanized Floodplains

The structures in this category include those replacement projects in flood-sensitive, heavily urbanized floodplains, where the condition of flooding is largely attributable to the low lying terrain. Structure S-30 is the only structure within the project limits which falls into this category.

According to FDOT maintenance personnel and local residents, S.R. 45 is overtopped approximately every other year at Structure S-30. The flow over the road is in a westerly direction. Before overtopping occurs, considerable flooding exists both up and downstream of Structure S-30. Upstream flooding can be attributed to the low-lying area, the inadequacy of the structure, or the existing tailwater conditions. A detailed study of the area with survey data will be required to evaluate which condition is the cause of the flooding.

According to local business owners, when the road is overtopped, the flooding upstream is at a point where any increase in stage will cause damage. Therefore, raising the road and not replacing the structure is not a viable alternative.

Using HY-8, a 76" x 48" ERCP or equivalent was found to reduce upstream stage elevations enough to prevent the 100-year flood from overtopping S.R. 45 at this location.

Downstream flooding is attributed to the lack of conveyance to an adequate outfall. The existing swale into which S-30 discharges, flows in a westerly direction and ends approximately 300 feet downstream from the road. This swale will need to be extended farther west or a conveyance system will be needed to the channel at Structure S-29, approximately 1,100 feet south, if Structure S-30 was upgraded. An alternative would be to construct a detention pond on the west side of the road to alleviate the downstream flooding.

The following general statement can be made for Category 5 structures:

"Replacement drainage structures for this project are limited to hydraulically equivalent structures. The limitations to the hydraulic equivalency being proposed are basically due to restrictions imposed by the geometrics of design, existing development, cost feasibility, or practicability. An alternative encroachment location is not considered in this category since it defeats the project purpose or is economically unfeasible. Since flooding conditions in the project area are inherent in the topography or are a result of other outside contributing sources, and there is no practical alternative to totally eradicate flood impacts or even reduce them in any significant amount, existing flooding will continue, but not be increased. The proposed structure will be hydraulically equivalent to or greater than the existing structure, and backwater surface elevations are not expected to increase. As a result, the project will not affect existing flood heights or floodplain limits. This project will not result in any new or increased adverse environmental impacts. There will be no significant change in the potential for interruption or termination of emergency service or emergency evacuation routes. Therefore, it has been determined that this encroachment is not significant." (FDOT Drainage Manual, 1987)

Methodology

Design flows were estimated using the Soil Conservation Service (SCS-NEH-4) Methods, and the SCSUNIT (Advanced Engineering Technologies, Inc.) computer program. The project area has a large percentage of depressional storage (lakes, cypress heads, and land depression); therefore, the Interconnected Pond Routing (ICPR) (Advanced Engineering Technologies, Inc.) was used to account for the storage. ICPR routes the runoff hydrograph generated by SCSUNIT through a stage-storage reservoir (depressional storage) and generates an output hydrograph for a given outfall structure. These flows were then utilized to evaluate the existing cross-drain structures.

REGULATORY AGENCY COORDINATION

Local Agencies

The local agencies which will be impacted by the proposed S.R. 45/S.R. 700 improvements include Hernando County, Pasco County, and the City of Brooksville. Coordination with these agencies will be required during preliminary design to address floodplain and stormwater quantity impacts, as well as proposed modifications to the existing drainage systems.

State Agencies

The state agencies that have permitting responsibilities relevant to the proposed S.R. 45/S.R. 700 project include the Department of Environmental Regulation (DER) and SWFWMD.

APPENDIX A

US 41 NORTH 50YR 24HR BASIN 13

BASIN INPUT DATA

=====

| | | |
|-----------------------|-------|---------|
| BASIN AREA | 72.00 | ACRES |
| SCS CURVE NUMBER | 50.00 | |
| INITIAL ABSTRACTION | 2.00 | INCHES |
| TIME OF CONCENTRATION | 59.00 | MINUTES |
| SCS SHAPE FACTOR | 256 | |

OUTPUT SUMMARY

=====

| | | |
|-------------------|-------|--------|
| STORM RAINFALL | 10.50 | INCHES |
| STORM DURATION | 24.00 | HOURS |
| TOTAL RUNOFF | 3.90 | INCHES |
| PEAK RUNOFF RATE | 76.45 | CFS |
| TIME OF PEAK | 12.75 | HOURS |
| UNIT GRAPH VOLUME | 1.00 | INCHES |

REFERENCE FILES

=====

| | |
|-----------------------|---------------|
| INPUT DATA | D:\LASTFI.DAT |
| OUTPUT TO DISK | US41N |
| RAINFALL DISTRIBUTION | RAIN3.RAI |
| UNIT HYDROGRAPH | UNIT1.UHG |

US41 NORTH 100YR 24HR BASIN 13

BASIN INPUT DATA

=====

| | | |
|-----------------------|-------|---------|
| BASIN AREA | 72.00 | ACRES |
| SCS CURVE NUMBER | 50.00 | |
| INITIAL ABSTRACTION | 2.00 | INCHES |
| TIME OF CONCENTRATION | 59.00 | MINUTES |
| SCS SHAPE FACTOR | 256 | |

OUTPUT SUMMARY

=====

| | | |
|-------------------|--------|--------|
| STORM RAINEALL | 12.50 | INCHES |
| STORM DURATION | 24.00 | HOURS |
| TOTAL RUNOFF | 5.37 | INCHES |
| PEAK RUNOFF RATE | 108.48 | CFS |
| TIME OF PEAK | 12.75 | HOURS |
| UNIT GRAPH VOLUME | 1.00 | INCHES |

REFERENCE FILES

=====

| | |
|-----------------------|-------------|
| INPUT DATA | D:US41N.DAT |
| OUTPUT TO DISK | US41N |
| RAINEALL DISTRIBUTION | RAIN3.RAI |
| UNIT HYDROGRAPH | UNIT1.UHG |

CULVERT ANALYSIS 1.1
 CULVERT FILE NAME: S-13 **EXISTING**

DATE: 2-15-89
 SUMMARY TABLE

| A - SITE DATA | | | B - CULVERT SHAPE, MATERIAL, INLET | | | | | |
|---------------|-------------|--------------|------------------------------------|---------------|-----------|-----------|---------|--------------|
| L | INLET ELEV. | OUTLET ELEV. | CULVERT LENGTH | BARRELS SHAPE | SPAN (IN) | RISE (IN) | MANN. N | INLET TYPE |
| NO. | (FT) | (FT) | (FT) | MATERIAL | | | | |
| 1 | 59.50 | 57.70 | 55 | 1 -RCB | 48 | 48 | 0.012 | CONVENTIONAL |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |

TO EDIT DATA PRESS (A) FOR SITE DATA
 (B) FOR CULVERT SHAPE, MATERIAL, OR INLET DATA,
 (C) FOR DISCHARGE RANGE,
 (D) FOR TAILWATER DATA,
 (E) FOR OVERTOPPING DATA,
 (F) TO ADD OR DELETE CULVERTS,
 (RET) TO CONTINUE ANALYSIS.

SUMMARY OF CULVERT FLOWS (CFS) file: S-13 date:2-15-89

| ELEV (FT) | TOTAL | 1 | 2 | 3 | 4 | 5 | 6 | OVERTOP | ITER |
|-----------|-------|-----|---|---|---|---|---|---------|------|
| 59.50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60.63 | 11 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 61.11 | 22 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 61.61 | 32 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 62.05 | 43 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 62.46 | 54 | 54 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 62.84 | 65 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 63.21 | 76 | 76 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 63.58 | 86 | 86 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 63.96 | 97 | 97 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 64.35 | 108 | 108 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |

PRESS:
 (1) TO PLOT TOTAL RATING CURVE
 (2) TO DETERMINE SPECIFIC INFORMATION ABOUT EACH CULVERT
 (3) TO SEE MULTIPLE CULVERT COMPUTATIONAL ERROR TABLE
 (ENTER) TO RETURN FOR NEW RUN OR EXIT

CULVERT # 1 PERFORMANCE CURVE
FOR 1 BARRELS

| Q (cfs) | HW (ft) | TWE (ft) | ICH (ft) | OCH (ft) | TWH (ft) | VD (fcs) |
|------------|------------|-------------|-------------|-------------|-------------|-------------|
| 0.00 | 60.50 | 60.50 | 0.00 | 1.00 | 2.80 | 0.00 |
| 10.80 | 60.63 | 60.50 | 1.01 | 1.13 | 2.80 | 0.96 |
| 21.60 | 61.11 | 60.50 | 1.61 | 1.29 | 2.80 | 1.93 |
| 32.40 | 61.61 | 60.50 | 2.11 | 1.45 | 2.80 | 2.89 |
| 43.20 | 62.05 | 60.50 | 2.55 | 1.58 | 2.80 | 3.86 |
| 54.00 | 62.46 | 60.50 | 2.96 | 1.76 | 2.80 | 4.82 |
| 64.80 | 62.84 | 60.50 | 3.34 | 1.97 | 2.80 | 5.79 |
| 75.60 | 63.21 | 60.50 | 3.71 | 2.20 | 2.80 | 6.75 |
| 86.40 | 63.58 | 60.50 | 4.08 | 2.45 | 2.80 | 7.71 |
| 97.20 | 63.96 | 60.50 | 4.46 | 2.78 | 2.80 | 8.68 |
| 108.00 | 64.35 | 60.50 | 4.85 | 3.15 | 2.80 | 9.64 |

PRESS <V> TO PLOT

PRESS <ENTER> TO CONTINUE

| A - SITE DATA | | | | B - CULVERT SHAPE, MATERIAL, INLET | | | | |
|---------------|------------------|-------------------|---------------------|------------------------------------|-----------|-----------|---------|--------------|
| NO. | INLET ELEV. (FT) | OUTLET ELEV. (FT) | CULVERT LENGTH (FT) | BARRELS SHAPE MATERIAL | SPAN (IN) | RISE (IN) | MANN. N | INLET TYPE |
| 1 | 59.50 | 56.50 | 155 | 1 -RCB | 48 | 48 | 0.012 | CONVENTIONAL |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |

TO EDIT DATA PRESS (A) FOR SITE DATA
 (B) FOR CULVERT SHAPE, MATERIAL, OR INLET DATA,
 (C) FOR DISCHARGE RANGE,
 (D) FOR TAILWATER DATA,
 (E) FOR OVERTOPPING DATA,
 (F) TO ADD OR DELETE CULVERTS,
 (RET) TO CONTINUE ANALYSIS.

SUMMARY OF CULVERT FLOWS (CFB) file: S-13 date:2-15-89

| ELEV (FT) | TOTAL | 1 | 2 | 3 | 4 | 5 | 6 | OVERTOP | ITER |
|-----------|-------|-----|---|---|---|---|---|---------|------|
| 59.50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60.60 | 11 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 61.13 | 22 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 61.63 | 32 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 62.07 | 43 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 62.48 | 54 | 54 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 62.87 | 65 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 63.24 | 76 | 76 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 63.61 | 86 | 86 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 63.98 | 97 | 97 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 64.37 | 108 | 108 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |

PRESS:

- (1) TO PLOT TOTAL RATING CURVE
- (2) TO DETERMINE SPECIFIC INFORMATION ABOUT EACH CULVERT
- (3) TO SEE MULTIPLE CULVERT COMPUTATIONAL ERROR TABLE
- (ENTER) TO RETURN FOR NEW RUN OR EXIT

CULVERT # 1 PERFORMANCE CURVE
FOR 1 BARRELS

| Q (cfs) | HW (ft) | TWE (ft) | ICH (ft) | OCH (ft) | TWH (ft) | VO (fps) |
|------------|------------|-------------|-------------|-------------|-------------|-------------|
| 0.00 | 60.50 | 60.50 | 0.00 | 1.00 | 4.00 | 0.00 |
| 10.80 | 60.60 | 60.50 | 1.03 | 1.10 | 4.00 | 0.66 |
| 21.60 | 61.13 | 60.50 | 1.63 | 1.25 | 4.00 | 1.35 |
| 32.40 | 61.63 | 60.50 | 2.13 | 1.13 | 4.00 | 2.03 |
| 43.20 | 62.07 | 60.50 | 2.57 | 1.24 | 4.00 | 2.70 |
| 54.00 | 62.48 | 60.50 | 2.98 | 1.37 | 4.00 | 3.38 |
| 64.80 | 62.87 | 60.50 | 3.37 | 1.54 | 4.00 | 4.05 |
| 75.60 | 63.24 | 60.50 | 3.74 | 1.74 | 4.00 | 4.72 |
| 86.40 | 63.61 | 60.50 | 4.11 | 1.96 | 4.00 | 5.40 |
| 97.20 | 63.98 | 60.50 | 4.48 | 2.22 | 4.00 | 6.08 |
| 108.00 | 64.37 | 60.50 | 4.87 | 2.51 | 4.00 | 6.75 |

PRESS <V> TO PLOT

PRESS <ENTER> TO CONTINUE

US 41 NORTH 50YR 24HR BASIN 29

BASIN INPUT DATA

=====

| | | |
|-----------------------|-------|---------|
| BASIN AREA | 63.00 | ACRES |
| SCS CURVE NUMBER | 81.00 | |
| INITIAL ABSTRACTION | 0.47 | INCHES |
| TIME OF CONCENTRATION | 76.00 | MINUTES |
| SCS SHAPE FACTOR | 256 | |

OUTPUT SUMMARY

=====

| | | |
|-------------------|--------|--------|
| STORM RAINFALL | 11.00 | INCHES |
| STORM DURATION | 24.00 | HOURS |
| TOTAL RUNOFF | 8.60 | INCHES |
| PEAK RUNOFF RATE | 133.84 | CFS |
| TIME OF PEAK | 12.85 | HOURS |
| UNIT GRAPH VOLUME | 1.00 | INCHES |

REFERENCE FILES

=====

| | |
|-----------------------|---------------|
| INPUT DATA | D:\LASTFI.DAT |
| OUTPUT TO DISK | US41NN |
| RAINFALL DISTRIBUTION | RAIN3.RAI |
| UNIT HYDROGRAPH | UNIT1.UHG |

US41 100YR 24HR BASIN 29

BASIN INPUT DATA

=====

| | | |
|-----------------------|-------|---------|
| BASIN AREA | 63.00 | ACRES |
| SCS CURVE NUMBER | 81.00 | |
| INITIAL ABSTRACTION | 0.47 | INCHES |
| TIME OF CONCENTRATION | 76.00 | MINUTES |
| SCS SHAPE FACTOR | 256 | |

OUTPUT SUMMARY

=====

| | | |
|-------------------|--------|--------|
| STORM RAINEALL | 13.00 | INCHES |
| STORM DURATION | 24.00 | HOURS |
| TOTAL RUNOFF | 10.54 | INCHES |
| PEAK RUNOFF RATE | 163.29 | CFS |
| TIME OF PEAK | 12.85 | HOURS |
| UNIT GRAPH VOLUME | 1.00 | INCHES |

REFERENCE FILES

=====

| | |
|-----------------------|--------------|
| INPUT DATA | D:LASTFI.DAT |
| OUTPUT TO DISK | US41NN |
| RAINEALL DISTRIBUTION | RAIN3.RAI |
| UNIT HYDROGRAPH | UNIT1.UHG |

CULVERT ANALYSIS 1.1

CULVERT FILE NAME: US41930 *Proposed S-30*

DATE: 3-31-89

SUMMARY TABLE

| A - SITE DATA | | | | B - CULVERT SHAPE, MATERIAL, INLET | | | | |
|---------------|------------------|-------------------|---------------------|------------------------------------|-----------|-----------|---------|--------------|
| NO. | INLET ELEV. (FT) | OUTLET ELEV. (FT) | CULVERT LENGTH (FT) | BARRELS SHAPE MATERIAL | SPAN (IN) | RISE (IN) | MANN. N | INLET TYPE |
| 1 | 88.30 | 85.50 | 155 | 1 -RCPE | 76 | 48 | 0.012 | CONVENTIONAL |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |

TO EDIT DATA PRESS (A) FOR SITE DATA
 (B) FOR CULVERT SHAPE, MATERIAL, OR INLET DATA,
 (C) FOR DISCHARGE RANGE,
 (D) FOR TAILWATER DATA,
 (E) FOR OVERTOPPING DATA,
 (F) TO ADD OR DELETE CULVERTS,
 (RET) TO CONTINUE ANALYSIS.

SUMMARY OF CULVERT FLOWS (CF8) file: US41930 date:3-31-89

| ELEV (FT) | TOTAL | 1 | 2 | 3 | 4 | 5 | 6 | OVERTOP | ITER |
|-----------|-------|-----|---|---|---|---|---|---------|------|
| 88.30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 89.50 | 16 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 90.05 | 33 | 33 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 90.51 | 49 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 90.97 | 65 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 91.42 | 82 | 82 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 91.90 | 98 | 98 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 92.44 | 114 | 114 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 93.06 | 130 | 130 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 93.82 | 147 | 147 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 94.21 | 163 | 154 | 0 | 0 | 0 | 0 | 0 | 12 | 3 |

PRESS:

- (1) TO PLOT TOTAL RATING CURVE
- (2) TO DETERMINE SPECIFIC INFORMATION ABOUT EACH CULVERT
- (3) TO SEE MULTIPLE CULVERT COMPUTATIONAL ERROR TABLE
- (ENTER) TO RETURN FOR NEW RUN OR EXIT

US 41 NORTH 50YR 24HR BASIN 36

BASIN INPUT DATA

=====

| | | |
|-----------------------|-------|---------|
| BASIN AREA | 23.00 | ACRES |
| SCS CURVE NUMBER | 85.00 | |
| INITIAL ABSTRACTION | 0.35 | INCHES |
| TIME OF CONCENTRATION | 40.00 | MINUTES |
| SCS SHAPE FACTOR | 256 | |

OUTPUT SUMMARY

=====

| | | |
|-------------------|-------|--------|
| STORM RAINFALL | 11.00 | INCHES |
| STORM DURATION | 24.00 | HOURS |
| TOTAL RUNOFF | 9.12 | INCHES |
| PEAK RUNOFF RATE | 76.52 | CFS |
| TIME OF PEAK | 12.50 | HOURS |
| UNIT GRAPH VOLUME | 1.00 | INCHES |

REFERENCE FILES

=====

| | |
|-----------------------|--------------|
| INPUT DATA | D:LASTFI.DAT |
| OUTPUT TO DISK | US41NN |
| RAINFALL DISTRIBUTION | RAIN3.RAI |
| UNIT HYDROGRAPH | UNIT1.UHG |

US41 100YR 24HR BASIN 36

BASIN INPUT DATA

```
=====
BASIN AREA          23.00  ACRES
SCS CURVE NUMBER    85.00
INITIAL ABSTRACTION 0.35  INCHES
TIME OF CONCENTRATION 40.00 MINUTES
SCS SHAPE FACTOR    256
```

OUTPUT SUMMARY

```
=====
STORM RAINFALL      13.00  INCHES
STORM DURATION      24.00  HOURS
TOTAL RUNOFF        11.08  INCHES
PEAK RUNOFF RATE    92.22  CFS
TIME OF PEAK        12.50  HOURS
UNIT GRAPH VOLUME   1.00  INCHES
```

REFERENCE FILES

```
=====
INPUT DATA          D:LASTFI.DAT
OUTPUT TO DISK       US41NN
RAINFALL DISTRIBUTION RAIN3.RAI
UNIT HYDROGRAPH      UNIT1.UHG
```

US-41N B-36
2-28-89

*** CONTROL DATA ***

Simulation time increment (mins) --> 1
Simulation duration (hrs) --> 20
Starting time (hrs) --> 0
Print interval --> 30

*** NODE AND INITIALIZATION DATA ***

| NODE # | NODE TYPE | INITIAL STAGE |
|-----------|--------------|------------------|
| 100 | 1 | 117.000 |
| 200 | 2 | 117.000 |

US-41N S-36
2-28-89

*** STAGE/STORAGE/TIME DATA ***

NODE # 100

| | | | | | |
|---------|---------|---------|---------|-------|-------|
| STAGE | 117.000 | 119.000 | 121.000 | 0.000 | 0.000 |
| STORAGE | 0.000 | 0.240 | 0.480 | 0.000 | 0.000 |
| STAGE | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| STORAGE | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| STAGE | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| STORAGE | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

NODE # 200

| | | | | | |
|-------|---------|---------|---------|-------|-------|
| STAGE | 117.000 | 119.000 | 117.000 | 0.000 | 0.000 |
| TIME | 0.000 | 14.000 | 20.000 | 0.000 | 0.000 |
| STAGE | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| TIME | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| STAGE | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| TIME | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

US-41N S-36
 2-28-89

 *** REACH DATA ***

NOTE: Type 1 for sharp crested weir/gate and orifice
 Type 2 for broad crested weir/gate and orifice
 * Type 3 for culvert
 * Type 4 for trapezoidal channel
 * Type 5 for parabolic channel
 Type 6 for rating curve

* (Negative type indicates riser)

| REACH # | FROM NODE | TO NODE | REACH TYPE |
|---------|-----------|---------|------------|
| 1 | 100 | 200 | 3 |
| 2 | 100 | 200 | 2 |

REACH # 1 from node # 100 -- to node # 200

-> Elliptical Culvert <-

Spar (inches) --> 38
 Rise (inches) --> 24
 Length (feet) --> 130
 Manning's n --> .012
 Headwater invert (feet) --> 117
 Tailwater invert (feet) --> 116.5
 Energy loss coefficient --> 1
 Entrnc loss coefficient --> .5
 # of culverts/channels --> 2

REACH # 2 from node # 100 -- to node # 200

Broad Crested Weir/Gate and Orifice <-

Crest elevation (feet) --> 121
 Crest length (feet) --> 50
 Weir discharge coefficient --> 2.6
 Weir exponent --> 1.5
 % to effective submergence --> 67
 Gate opening (feet) --> 99
 # of end contractions --> 0
 Discharge coef for gate under ori flw --> 0
 Circular orifice centerline (feet) --> 999
 Orifice diameter (feet) --> 0
 Orifice discharge coefficient --> 0
 # identical orifices --> 0

US-41N S-36
2-28-89

*** INFLOW HYDROGRAPHS ***

INFLOW HYDROGRAPHS TO BE READ FROM DISK FILE

US-41N S-34
 2-28-89

| NODE # | TIME (hrs) | STAGE (feet) | STORAGE (acft) | INFLOW (cfs) | OUTFLOW (cfs) | | TOTAL |
|--------|------------|--------------|----------------|--------------|---------------|-------|-------|
| | | | | | # 1 | # 2 | |
| 100 | 0.00 | 117.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 200 | 0.00 | 117.00 | 0.00 | 0.00 | ----- | ----- | 0.00 |
| 100 | 0.50 | 117.01 | 0.00 | 0.00 | -0.05 | 0.00 | -0.05 |
| 200 | 0.50 | 117.07 | -0.00 | -0.05 | ----- | ----- | 0.00 |
| 100 | 1.00 | 117.06 | 0.01 | 0.00 | -0.25 | 0.00 | -0.25 |
| 200 | 1.00 | 117.14 | -0.01 | -0.25 | ----- | ----- | 0.00 |
| 100 | 1.50 | 117.19 | 0.02 | 0.00 | -0.44 | 0.00 | -0.44 |
| 200 | 1.50 | 117.21 | -0.02 | -0.44 | ----- | ----- | 0.00 |
| 100 | 2.00 | 117.28 | 0.03 | 0.00 | -0.22 | 0.00 | -0.22 |
| 200 | 2.00 | 117.29 | -0.03 | -0.22 | ----- | ----- | 0.00 |
| 100 | 2.50 | 117.36 | 0.04 | 0.00 | -0.22 | 0.00 | -0.22 |
| 200 | 2.50 | 117.36 | -0.04 | -0.22 | ----- | ----- | 0.00 |
| 100 | 3.00 | 117.42 | 0.05 | 0.00 | -0.33 | 0.00 | -0.33 |
| 200 | 3.00 | 117.43 | -0.05 | -0.33 | ----- | ----- | 0.00 |
| 100 | 3.50 | 117.50 | 0.06 | 0.07 | 0.40 | 0.00 | 0.40 |
| 200 | 3.50 | 117.50 | -0.06 | 0.40 | ----- | ----- | 0.00 |
| 100 | 4.00 | 117.58 | 0.07 | 0.21 | 0.94 | 0.00 | 0.94 |
| 200 | 4.00 | 117.57 | -0.06 | 0.94 | ----- | ----- | 0.00 |
| 100 | 4.50 | 117.65 | 0.08 | 0.42 | 0.51 | 0.00 | 0.51 |
| 200 | 4.50 | 117.64 | -0.06 | 0.51 | ----- | ----- | 0.00 |
| 100 | 5.00 | 117.72 | 0.09 | 0.64 | 0.57 | 0.00 | 0.57 |
| 200 | 5.00 | 117.71 | -0.04 | 0.57 | ----- | ----- | 0.00 |
| 100 | 5.50 | 117.79 | 0.10 | 0.89 | 0.45 | 0.00 | 0.45 |
| 200 | 5.50 | 117.79 | -0.02 | 0.45 | ----- | ----- | 0.00 |
| 100 | 6.00 | 117.86 | 0.10 | 1.20 | 1.58 | 0.00 | 1.58 |
| 200 | 6.00 | 117.86 | 0.01 | 1.58 | ----- | ----- | 0.00 |
| 100 | 6.50 | 117.94 | 0.11 | 1.52 | 1.38 | 0.00 | 1.38 |
| 200 | 6.50 | 117.93 | 0.06 | 1.38 | ----- | ----- | 0.00 |

US-41N S-36
 2-28-89

| NODE # | TIME (hrs) | STAGE (feet) | STORAGE (acft) | INFLOW (cfs) | OUTFLOW (cfs) | | TOTAL |
|--------|------------|--------------|----------------|--------------|---------------|-------|-------|
| | | | | | # 1 | # 2 | |
| 100 | 7.00 | 118.00 | 0.12 | 1.88 | 0.00 | 0.00 | 0.00 |
| 200 | 7.00 | 118.00 | 0.12 | 0.00 | ----- | ----- | 0.00 |
| 100 | 7.50 | 118.07 | 0.13 | 2.28 | -0.96 | 0.00 | -0.96 |
| 200 | 7.50 | 118.07 | 0.20 | -0.96 | ----- | ----- | 0.00 |
| 100 | 8.00 | 118.14 | 0.14 | 3.08 | 0.99 | 0.00 | 0.99 |
| 200 | 8.00 | 118.14 | 0.30 | 0.99 | ----- | ----- | 0.00 |
| 100 | 8.50 | 118.23 | 0.15 | 4.01 | 4.45 | 0.00 | 4.45 |
| 200 | 8.50 | 118.21 | 0.44 | 4.45 | ----- | ----- | 0.00 |
| 100 | 9.00 | 118.29 | 0.16 | 4.97 | 2.37 | 0.00 | 2.37 |
| 200 | 9.00 | 118.29 | 0.61 | 2.37 | ----- | ----- | 0.00 |
| 100 | 9.50 | 118.38 | 0.17 | 6.05 | 6.50 | 0.00 | 6.50 |
| 200 | 9.50 | 118.36 | 0.83 | 6.50 | ----- | ----- | 0.00 |
| 100 | 10.00 | 118.45 | 0.17 | 7.22 | 6.77 | 0.00 | 6.77 |
| 200 | 10.00 | 118.43 | 1.10 | 6.77 | ----- | ----- | 0.00 |
| 100 | 10.50 | 118.53 | 0.18 | 8.73 | 6.41 | 0.00 | 6.41 |
| 200 | 10.50 | 118.50 | 1.41 | 6.41 | ----- | ----- | 0.00 |
| 100 | 11.00 | 118.63 | 0.20 | 10.97 | 10.72 | 0.00 | 10.72 |
| 200 | 11.00 | 118.57 | 1.80 | 10.72 | ----- | ----- | 0.00 |
| 100 | 11.50 | 118.75 | 0.21 | 14.42 | 14.11 | 0.00 | 14.11 |
| 200 | 11.50 | 118.64 | 2.31 | 14.11 | ----- | ----- | 0.00 |
| 100 | 12.00 | 119.03 | 0.24 | 27.24 | 25.76 | 0.00 | 25.76 |
| 200 | 12.00 | 118.71 | 3.05 | 25.76 | ----- | ----- | 0.00 |
| 100 | 12.50 | 120.46 | 0.42 | 71.10 | 66.68 | 0.00 | 66.68 |
| 200 | 12.50 | 118.79 | 4.92 | 66.68 | ----- | ----- | 0.00 |
| 100 | 13.00 | 120.60 | 0.43 | 65.76 | 67.98 | 0.00 | 67.98 |
| 200 | 13.00 | 118.86 | 7.89 | 67.98 | ----- | ----- | 0.00 |
| 100 | 13.50 | 119.90 | 0.35 | 49.61 | 50.68 | 0.00 | 50.68 |
| 200 | 13.50 | 118.93 | 10.33 | 50.68 | ----- | ----- | 0.00 |

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| NODE # | TIME (hrs) | STAGE (feet) | STORAGE (acft) | INFLOW (cfs) | OUTFLOW (cfs) | | TOTAL |
|--------|------------|--------------|----------------|--------------|---------------|-------|-------|
| | | | | | # 1 | # 2 | |
| 100 | 14.00 | 119.57 | 0.31 | 38.50 | 38.98 | 0.00 | 38.98 |
| 200 | 14.00 | 119.00 | 12.18 | 38.98 | ----- | ----- | 0.00 |
| 100 | 14.50 | 119.21 | 0.27 | 30.98 | 31.76 | 0.00 | 31.76 |
| 200 | 14.50 | 118.83 | 13.64 | 31.76 | ----- | ----- | 0.00 |
| 100 | 15.00 | 119.01 | 0.24 | 26.10 | 26.79 | 0.00 | 26.79 |
| 200 | 15.00 | 118.67 | 14.84 | 26.79 | ----- | ----- | 0.00 |
| 100 | 15.50 | 118.75 | 0.21 | 21.56 | 22.20 | 0.00 | 22.20 |
| 200 | 15.50 | 118.50 | 15.86 | 22.20 | ----- | ----- | 0.00 |
| 100 | 16.00 | 118.48 | 0.18 | 17.22 | 17.73 | 0.00 | 17.73 |
| 200 | 16.00 | 118.33 | 16.69 | 17.73 | ----- | ----- | 0.00 |
| 100 | 16.50 | 118.29 | 0.16 | 13.87 | 14.34 | 0.00 | 14.34 |
| 200 | 16.50 | 118.17 | 17.35 | 14.34 | ----- | ----- | 0.00 |
| 100 | 17.00 | 118.12 | 0.13 | 11.14 | 11.70 | 0.00 | 11.70 |
| 200 | 17.00 | 118.00 | 17.89 | 11.70 | ----- | ----- | 0.00 |
| 100 | 17.50 | 117.94 | 0.11 | 8.56 | 8.89 | 0.00 | 8.89 |
| 200 | 17.50 | 117.83 | 18.31 | 8.89 | ----- | ----- | 0.00 |
| 100 | 18.00 | 117.81 | 0.10 | 7.28 | 7.61 | 0.00 | 7.61 |
| 200 | 18.00 | 117.67 | 18.65 | 7.61 | ----- | ----- | 0.00 |
| 100 | 18.50 | 117.74 | 0.09 | 6.37 | 6.37 | 0.00 | 6.37 |
| 200 | 18.50 | 117.50 | 18.94 | 6.37 | ----- | ----- | 0.00 |
| 100 | 19.00 | 117.69 | 0.08 | 5.59 | 5.69 | 0.00 | 5.69 |
| 200 | 19.00 | 117.33 | 19.19 | 5.69 | ----- | ----- | 0.00 |
| 100 | 19.50 | 117.65 | 0.08 | 5.10 | 5.19 | 0.00 | 5.19 |
| 200 | 19.50 | 117.17 | 19.42 | 5.19 | ----- | ----- | 0.00 |
| 100 | 20.00 | 117.62 | 0.07 | 4.68 | 4.76 | 0.00 | 4.76 |
| 200 | 20.00 | 117.00 | 19.62 | 4.76 | ----- | ----- | 0.00 |

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*** PEAK CONDITIONS SUMMARY ***

| NODE # | PEAK STAGE (feet) | PEAK STORAGE (acft) | TIME TO PEAK (hrs) | PEAK OUTFLOW (cfs) | TIME TO PEAK (hrs) |
|--------|-------------------|---------------------|--------------------|--------------------|--------------------|
| 100 | 120.89 | 0.47 | 12.73 | 74.18 | 12.72 |
| 200 | 119.00 | 12.18 | 14.00 | 0.00 | 0.02 |

| FROM NODE | TO NODE | PEAK OUTFLOW (cfs) | TIME TO PEAK (hrs) |
|-----------|---------|--------------------|--------------------|
| 100 | 200 | 74.18 | 12.72 |
| 100 | 200 | 0.00 | 0.02 |

