DESIGN PLAN

FOR

SOUTH ROBBINSDALE

DRAINAGE BASIN

DECEMBER 1994

REGISTERED PROFESSIONAL ENGINEER
REG. NO.
3643
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SOUTH DAKOTA

PREPARED FOR:

CITY OF RAPID CITY

RAPID CITY, SOUTH DAKOTA

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December 23, 1993

Mr. Rod Sudbeck P.E.
Engineering Division Manager
City of Rapid City
300 Sixth Street
Rapid City, SD 57701

RE: Design Plan for South Robbinsdale Drainage Basin

Dear Mr. Sudbeck:

Presented herewith is our DESIGN PLAN FOR SOUTH ROBBINSDALE DRAINAGE BASIN. The plan is a comprehensive basinwide design plan for stormwater management in the South Robbinsdale Drainage Basin. It will provide guidance to the City, Pennington County, developers, and others in the basin. It contains the necessary information to insure the basin is developed with proper stormwater controls.

Please be assured of our readiness to meet with City Officials to discuss the contents of the report. We are available to answer any questions and are prepared to proceed with the design of the recommended improvements if desired.

Thank you for the opportunity to be of service.

Respectfully submitted,

FMG, Inc.

Jerry Foster

Jerry D. Foster P.E.

cc: File 7571

Civil Engineering
Geotechnical Engineering
Materials Testing Laboratory
Land Surveying
Environmental Services
Water Resources

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BACKGROUND

Proper management of urban drainage has historically been neglected as cities develop. Management has consisted of piecemeal planning, crisis control, after the fact corrective solutions, and generally hoping the problem will go away or not happen again. Development has been allowed with little or no consideration given to basinwide impacts on flooding. Consequently severe and damaging flooding has occurred.

The City of Rapid City has recognized that this traditional method of urban drainage management is no longer appropriate. Rapid City now views drainage control as a significant component of the urban infrastructure system rather than a problem that is simply tolerated. Consequently the City of Rapid City has implemented a program for comprehensive basinwide drainage design planning. This design plan was thus prepared by FMG, Inc., for the South Robbinsdale Drainage Basin. It is one of many design plans prepared for drainage basins in and around the City of Rapid City.

OBJECTIVE

The purpose of this design plan is to define existing and future stormwater related problems in the study area and to present a conceptual design plan for prevention and control of the problems. This conceptual design plan is intended to provide stormwater guidance to the City, Pennington County, developers, and others in the basin. It provides the necessary information to insure the basin is developed with proper stormwater controls.

DESIGN PLAN LIMITATIONS

It was beyond the scope of work to provide final engineering drawings suitable for construction. The design plan presented herein is conceptual and is intended to provide the general information necessary for the final working design of an efficient, planned system. The design plan is based on a practical hydraulic system which is suitable for further evaluation and implementation as the basin develops.

It is unlikely that the final design of any recommended improvement will exactly follow guidelines presented in this report; therefore, it will be necessary to make a final detailed technical analysis of the proposed improvements prior to their construction. Time lags play an important role in a planned basinwide system; thus, the final project design must include a computer analysis of the entire system even if individual element design flows are smaller than those proposed in this report. The computer models used in the design plan allow the final design analysis to be performed quite easily as well as allowing for easy updating or changing of the design plan.

Since the plan lends itself to updating or revisions, users of the plan are advised to contact the City of Rapid City to determine if this original document has been modified.

It should be noted that this design plan provides for only major drainage. Unless specifically addressed in the report, localized or minor drainage was beyond the scope of the study.

It should also be noted that the design plan runoff/routing analysis is considered an approximation since storms rarely follow ideal patterns and other factors such as ground cover, infiltration, and channel conditions may vary with time or from assumed conditions. The intent of a hydrologic runoff/routing analysis is to provide a reasonably dependable and consistent approximation of rainfall-runoff characteristics.

BASIN DESCRIPTION

BASIN DESCRIPTION

GENERAL INFORMATION

The South Robbinsdale Drainage Basin is in the Rapid Creek drainage basin with the study area discharge point located east of the railroad tracks in the northwest quarter of Section 17, T1N, R7E. Note that the basin does not discharge directly to Rapid Creek; rather, it discharges into a major Rapid Creek tributary at a location about 3000 feet southwest of Rapid Creek.

The basin originates approximately 3 miles west of the discharge point and includes an area of approximately 1,635 acres. Figure 1 shows the South Robbinsdale Drainage Basin.

SUB-BASIN DESCRIPTION

The complete drainage basin was subdivided in 15 smaller drainage basins as shown on Figure 2.

Subdivision of a drainage basin provides a more realistic approach to stormwater design as it allows flows to be calculated at various locations and then routed though a basin rather than simply assuming all runoff reaches the outlet simultaneously. There is no established rule for basin subdivision and it is primarily based on specific project engineering needs and engineering judgment. The sub-basins used in the final design plan were arrived at after reviewing project needs and discussions with city staff. It should be noted that sub-basins were added or changed during the study as necessary for proper modeling of proposed improvements.

Sub-basin boundaries were established following major flow patterns and unaccounted for sub-basin transfer may occur. Unless otherwise specified it is intended that sub-basin transfer will be prevented upon plan implementation; however, owing to map scale limitations, difficulties in establishing exact flow patterns, etc., some sub-basin transfer may still occur.

Basin boundaries were determined from aerial topography maps where possible. It should be noted that contours shown on the USGS quadrangle maps do not necessarily reflect all effects of urbanization and are misleading as to certain drainage boundaries.

LAND USE

In accordance with the City of Rapid City Drainage Criteria Manual this design plan is based on a fully developed drainage basin. To ensure that facilities are sized properly it was necessary to make a realistic forecast of how the study area will develop.

The South Robbinsdale basin is presently about 35% developed. Existing development primarily consists of industrial use, commercial use, low to medium density residential use, and recreational use. It is expected that future development in the study area will follow existing trends with the basin being primarily developed as residential with other mixed uses included. Special land use assumptions were required due to the unique nature of certain future developments in the basin. These special assumptions were:

1. The proposed "South Town Heights" Planned Residential Development is located within the study area in Section 14. Percent imperviousness for the proposed development was determined using the PRD plan on file at the City of Rapid City Planning Office.

2. Existing undeveloped areas west of existing and proposed Fifth Street with slopes of 20% or more were assumed to be undevelopable and 1% imperviousness was assumed. USGS quadrangle maps were used to approximate areas of 20% slopes.

   Existing undeveloped areas west of Fifth Street with slopes less than 20%, except for areas shown for multi-family, were assumed to have single family type developments with 35% to 40% imperviousness. Multi-family areas west of Fifth Street were assumed to have an imperviousness of 70%.

3. Future office complexes were assumed to have an imperviousness of 70%.

4. The future school site was assumed to have a 50% imperviousness in both sub-basin 20 and sub-basin 30.

5. The future park/recreation area in sub-basin 30 was assumed to have an imperviousness of 13%.

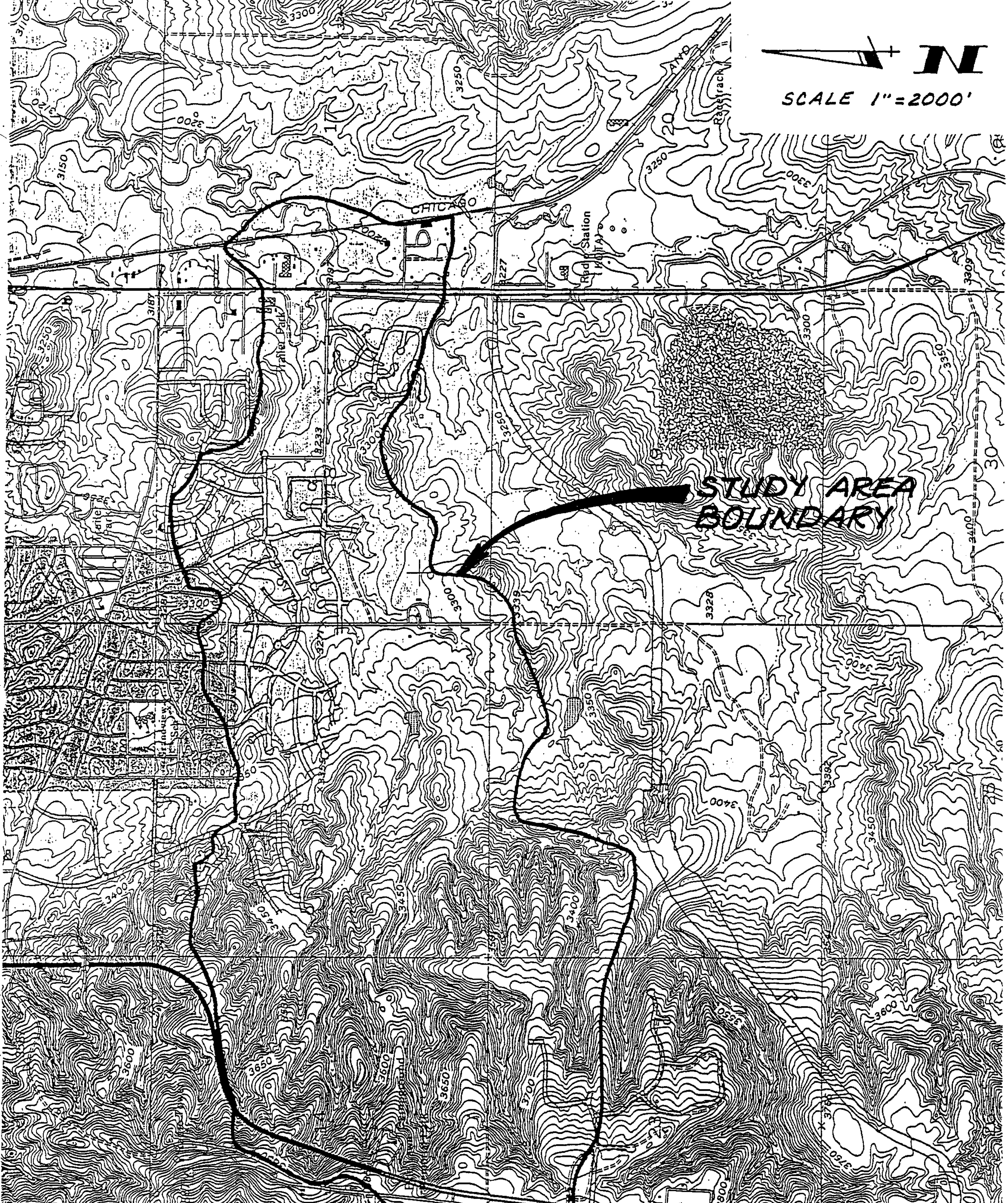
6. It was assumed that the area in sub-basin 2 between LaCroix Links Golf Course and Minnesota Street would be developed as a park/recreation facility with 7% imperviousness. If the area is developed differently it will be necessary to rerun the models with the proposed development. If the resulting flows exceed capacity of the downstream structures it will be necessary to increase the structure sizes or use on-site detention.

Figure 3 at the rear of this chapter is a map of the anticipated future land use conditions used during preparation of this design plan. City officials were involved in future land use projections.

TOPOGRAPHY AND SPECIAL FEATURES

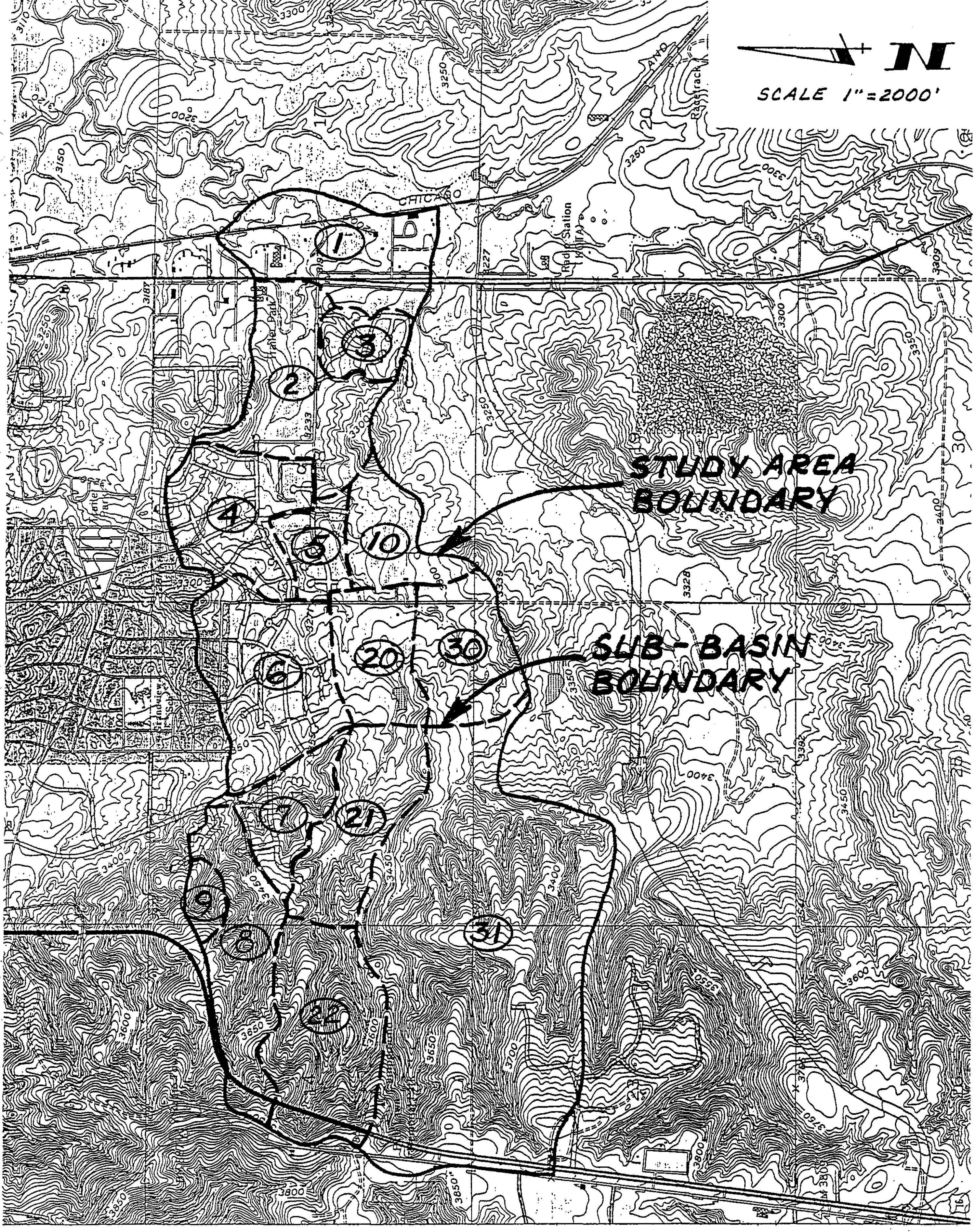
Basin topography is characteristic of the eastern foothills region of the Black Hills. Elevations vary from approximately 3,160 feet at the stream confluence to a maximum of approximately 3,870 feet at the basin divide.

Proposed extensions of Fifth Street, Minnesota Street, Elm Avenue, and Parkview Drive are located in the study area. Numerous other roadways and utilities are located in or planned for the study area. Maps of these items are too large for inclusion in this report and are on file at the City Engineering Department.



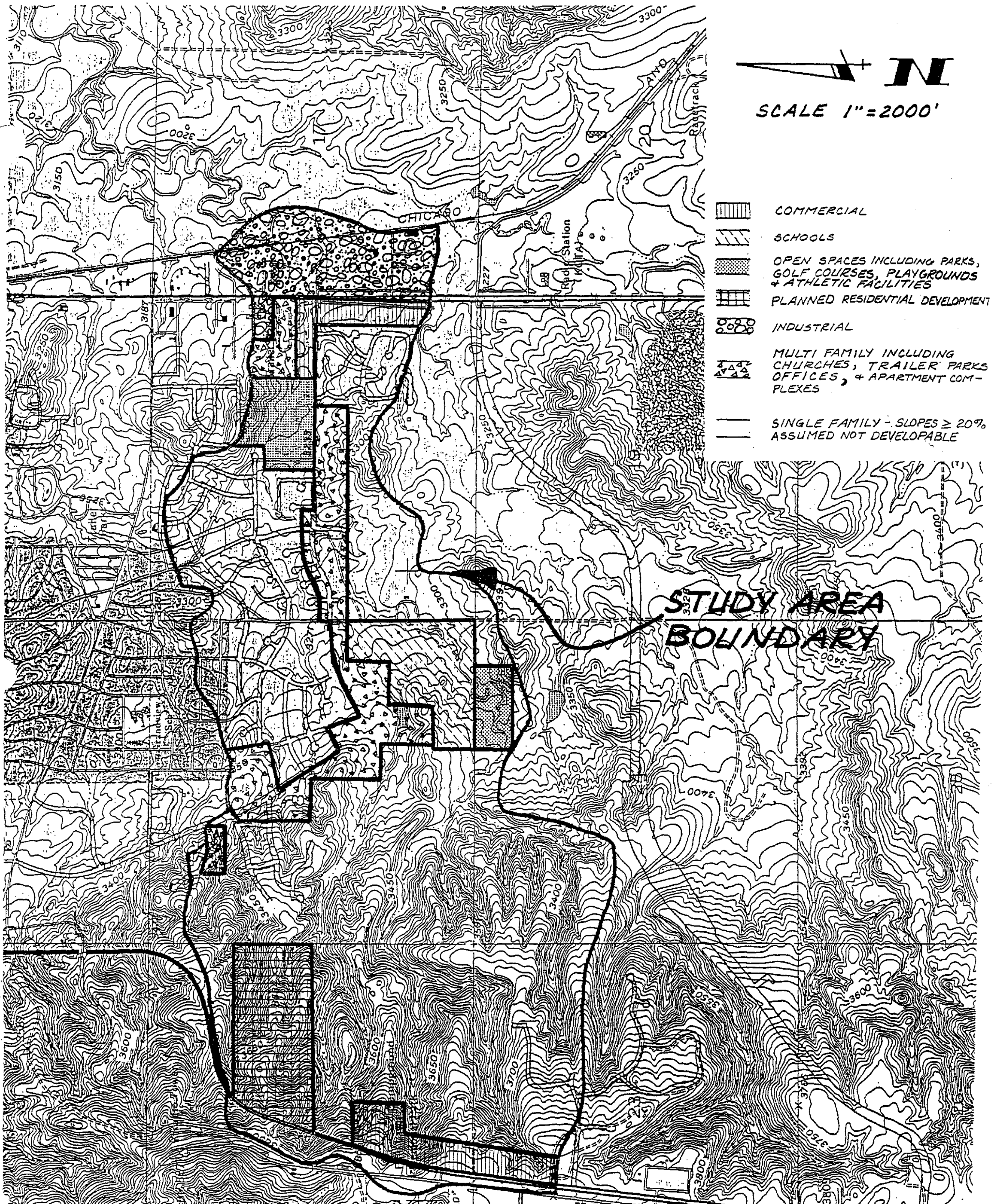
STUDY AREA

FIGURE 1



SUB-BASIN BOUNDARIES

FIGURE 2



FUTURE LAND USE

FIGURE 3

DESIGN PLAN

DESIGN PLAN

GENERAL

Preparing the design plan involved completion of various tasks in an orderly process. The process involved sub-basin flow calculations, routing of the flows, problem identification, and evaluation of proposed solutions. A basinwide approach was used to determine effects of flows, problems, and improvements on the entire basin.

The entire basin was subdivided into numerous smaller basins with a network of hydraulic elements connecting the sub-basins. Flows were then calculated and routed using CUHPE/PC and UDSWM2-PC computer models. After flows were calculated for various scenarios it was possible to identify problems and begin the design analysis.

After completion of the above steps, the analysis became a systematic evaluation of solutions. Evaluation of time lags between various points was an important part of the process. Economics, development needs, restrictions from existing infrastructure, and engineering judgment were included in the design plan evaluation and recommendation process.

The result of the above process is the SOUTH ROBBINSDALE DRAINAGE BASIN DESIGN PLAN. This plan is not intended to be a final project design suitable for construction and a detailed engineering analysis and design is necessary prior to implementation of any proposed improvement. The design plan presented herein is conceptual and is intended to provide the general information necessary for the final design of an efficient, planned system. It has been prepared within the limits of computer modeling to provide a functional drainage development guide. Rarely will a drainage basin respond and develop exactly as assumed; thus, this design is based on a practical hydraulic system. The plan is suitable for further evaluation as the basin develops, improvements become necessary, or various changes are requested.

Since the plan lends itself to updating or revisions, users of the plan are advised to check with the City of Rapid City to determine if this original document has been modified.

DESIGN PLAN OVERVIEW

In accordance with the City of Rapid City Drainage Criteria Manual the design plan presented herein is based on a 100 year storm occurring in a fully developed basin.

The proposed design plan is generally described as a series of detention ponds interconnected with open channels. The design plan requires major channel improvements, new roadway crossings, new storm sewers, and construction or modification of detention ponds.

It was beyond the scope of this study to establish or study floodplain boundaries. Except at the lower end of the basin, it is judged that the existing floodmaps for the area are adequate. Major channel improvements are recommended at the lower end of the basin and revised flood maps can be prepared at time of channel reconstruction. Floodplain maps are discussed in further detail in the HYDRAULICS chapter of this report.

Numerous plan summaries are given in figures and tables at the back of this chapter; however, the user is cautioned to refer to the INDIVIDUAL ELEMENT DESIGN section for a complete understanding of the design plan. The user should also be familiar with the HYDROLOGY and HYDRAULICS chapters. A summary of the design plan recommendations and estimated costs of each element is given as Table 1, a summary of future condition peak flows for the sub-basins is given as Table 2, and a summary of individual element peak routed flows with design plan conditions is given as Table 3. A schematic of the design plan hydrologic routing network is shown on Figure 4.

Design plan hydrographs for sub-basins, direct flow elements, and detention ponds are included as Appendix A. Design plan CUHPE/PC and UDSWM2 computer printouts are included as Appendix B and aerial photos depicting the design plan are included under separate cover.

COST ESTIMATE

Recommended design plan improvements are estimated to cost $2,365,000. The cost estimate is itemized by element on Table 1. A complete description of each recommended improvement is given in the INDIVIDUAL ELEMENT DESIGN section of this chapter.

The total cost estimate includes a 5% contingency cost and 25% engineering/administration costs. Cost estimates do not include costs of land or easement acquisition as it has been assumed that easements or right-of-way would be dedicated in accordance with city subdivision regulations. Cost estimates do not include any costs for multiple purpose improvements.

INDIVIDUAL ELEMENT DESIGN

Following is a discussion of each element used in the design plan. This section expands on the summarized information presented in the design plan overview. Included is a description of each element, special problems encountered, design data, recommendations, and other appropriate information.

Element 1

Element 1 represents the existing open channel beginning at the South Robbinsdale Basin discharge point and ending at the Highway 79 box culvert. A railroad bridge crosses Element 1 about 900 feet east of Highway 79. The channel has several sharp bends and is generally choked with vegetation. Improvements to the entire reach of channel are recommended.

Flood carrying capacity downstream of the railroad is adequate; however, the FEMA floodplain is quite wide. It is assumed that developers will request to improve the channel to maximize developable land thus the recommendation for channel improvement downstream of the railroad.

Improvements are recommended between Highway 79 and the railroad to prevent flooding of existing structures, provide a maintainable channel, eliminate the sharp 90 degree channel bend, and allow for development of adjacent property.

It is recommended that the Element 1 channel be improved with a 35 foot wide bottom, 5:1 side slopes, a longitudinal slope of 0.005 ft/ft, and an n value of 0.050. Drop structures will be necessary and a concrete trickle channel is recommended for inclusion in the new channel. The sharp channel bends upstream of the railroad should be improved with appropriate radius curves. Peak routed flow in Element 1 is 1,231 cfs; however, the flow used for design is 1,463 cfs from Element 100. Normal depth for 1,463 cfs with the recommended Element 1 channel is about 5.0 feet at a velocity of approximately 5 fps.

The railroad bridge is adequate; however, backwater from the bridge should be accounted for when designing the upstream channel.

The typical channel for Element 1 UDSWM2 routing used a 35 foot bottom, 5:1 side slopes, an n value of 0.063, and an invert slope of 0.005 ft/ft.

Element 2

Element 2 represents the existing open channel beginning at the Highway 79 box culvert and ending at the confluence of Elements 3 and 4. Improvements are recommended.

Flood carrying capacity is adequate; however, the FEMA floodplain is quite wide. Furthermore, the channel is steep, subject to erosion, and choked with vegetation. The channel will be difficult, if not impossible, to maintain if it is not improved. It is recommended that the channel be reconstructed to improve flow carrying characteristics and to allow for development of adjacent property.

It is recommended that the Element 2 channel be improved with a 35 foot wide bottom, 5:1 side slopes, a longitudinal slope of 0.005 ft/ft, and an n value of 0.050. Drop structures will be necessary and a concrete trickle channel is recommended for inclusion into the new channel. Peak routed flow in Element 2 is 1,178 cfs; however, the flow used for design is 1,467 cfs from Element 101. Normal depth for 1,467 cfs with the recommended Element 2 channel is about 5.0 feet at a velocity of approximately 5 fps.

The box culvert under Highway 79 is a triple 8' (S) x 6' (R) RC box culvert. The culvert will convey the 1,467 cfs flow with about 6" of freeboard. Backwater from the box culvert should be accounted for in the final design of Element 2.

Element 2 was UDSWM2 modeled with a 35 foot bottom, 5:1 side slopes, an n value of 0.063, and an invert slope of 0.005 ft/ft.

Element 3

Element 3 represents the existing open channel beginning at the upstream end of Element 2 and ending at the Element 200 detention pond. Channel capacity is adequate and no improvements are necessary other than shaping as desired when adjacent property is developed.

Element 3 was UDSWM2 modeled with a 3 foot wide bottom, 3:1 side slopes, an n value of 0.050, and an invert slope of 0.020 ft/ft. Peak routed flow is 61 cfs at a UDSWM2 calculated flow depth of 1.7 feet.

Element 4

Element 4 represents the existing open channel beginning at the upstream end of Element 2 and ending at Centennial Park at the downstream end of Element 5. Much of the channel has a concrete trickle channel. Improvements are recommended at the upstream and downstream ends of the channel. No improvements are recommended for the remainder of the channel.

The downstream reach to be improved is located between LaCroix Links golf course and Element 2, a reach length of about 600 feet. It is recommended that this reach be improved similar to the recommendations for Element 2. The recommended channel has a 35 foot wide bottom, 5:1 side slopes, and a longitudinal slope of 0.005 ft/ft. Drop structures will be necessary and a concrete trickle channel is recommended for inclusion into the new channel.

Improvements are also recommended at the upstream end of Element 4 in the vicinity of Centennial Park. A short pedestrian bridge crosses the channel at this location. It was beyond the scope of the study to perform detailed bridge modeling; however, a cursory analysis indicates the bridge will constrict flow and cause backwater flooding. It is judged the backwater flooding will adversely affect the upstream channel as well as the Centennial Street overflow. Furthermore, the channel at the bridge is only about 10 wide and has steep side slopes.

It is recommended that the bridge be replaced with a clear span bridge approximately 70' long. The bridge deck should be elevated as required to prevent backwater flooding. The channel bottom at the bridge should be widened to about 25' to 30' in order to match the adjacent channels. An alternate to bridge replacement is a low water crossing with culverts and overtopping in lieu of a larger bridge.

Bridges in the golf course downstream of Centennial Park will also restrict flow and cause backwater flooding. This is judged to be acceptable in the golf course and no improvements are recommended.

Element 4 was UDSWM2 modeled with a 25 foot wide bottom, 4:1 side slopes, an n value of 0.050, and an invert slope of 0.0085 ft/ft. Peak routed flow is 1,164 cfs and UDSWM2 calculated flow depth is 4.6 feet. UDSWM2 modeling data differs from the recommended channel at the lower end in order to provide average Element 4 data.

<u>Element 5</u>

Element 5 represents the existing open channel beginning at the upstream end of Element 4 and ending at the Elm Avenue bridge. The channel has a concrete trickle channel and also has a grouted riprap channel and drop structure downstream of the bridge. Channel and bridge capacity are adequate and no improvements are recommended. The only improvement recommended is construction of additional inlets on Elm Avenue at the bridge.

The Elm Avenue bridge is adequate and no improvements are necessary. The bridge opening is 24' X 5.7' with a concrete lined floor and vertical concrete abutments. The bridge will convey the 939 cfs flow (Element 103) under Elm Avenue with about 2 feet of freeboard. HY8 was used to determine bridge capacity since the bridge resembles a box culvert. The HY8 data is included as Appendix E.

Additional inlets are recommended on Elm Avenue at the bridge. It is recommended that inlets with capacity of about 40 cfs be installed to intercept all flow from the south on Elm Avenue. The bridge is not at a street sag and any flow that bypasses the bridge flows to Centennial Street and increases Centennial Street flooding. Slotted drain may be cost effective at this location.

Element 5 was UDSWM2 modeled with a 20 foot wide bottom, 4:1 side slopes, an n value of 0.050, and an invert slope of 0.008 ft/ft. Peak routed flow is 944 cfs and UDSWM2 calculated flow depth is 4.5 feet.

Element 6

Element 6 represents the existing open channel beginning at the Elm Avenue bridge and ending at the confluence of Element 7 and Element 20. The City of Rapid City is currently constructing a phased project to improve this channel. No improvements other than completion of the current project are necessary.

The current project includes construction of a concrete trickle channel, repairs to existing drop structures, channel clearing, and construction of a channel drop structure.

Element 6 was UDSWM2 modeled with a 30 foot wide bottom, 3:1 side slopes, an n value of 0.050, and an invert slope of 0.0085 ft/ft. Peak routed flow is 779 cfs and UDSWM2 calculated flow depth is 3.6 feet.

Element 7

Element 7 represents the existing open channel beginning at the confluence of Element 7 and Element 20 and ending at the Parkview Drive crossing. The City of Rapid City is currently constructing a phased project to improve this channel. No improvements other than completion of the current project are necessary.

The current project includes construction of a concrete trickle channel, channel clearing, and construction of a grouted riprap outlet structure at the Parkview Drive crossing.

Element 7 was UDSWM2 modeled with a 25 foot wide bottom, 3:1 side slopes, an n value of 0.050, and an invert slope of 0.010 ft/ft. Peak routed flow is 561 cfs and UDSWM2 calculated flow depth is 3.1 feet.

Element 8

Element 8 represents the existing open channel beginning at the Parkview Drive crossing and ending at Fifth Street at detention pond Element 201. Maple Street and Wisconsin Avenue cross Element 8. Improvements to the reach of channel between Parkview Drive and Maple Street are recommended. Improvements at the Parkview Drive crossing are also recommended.

The total flow calculated at the Parkview Drive crossing (Element 104) is 568 cfs. This peak flow is almost entirely generated by sub-basin 6. A significant portion of the sub-basin 6 flow does not reach the inlet end of the Parkview Drive culverts; rather, it is conveyed on streets to the vertical street sag at the crossing. Based on interpolation of flows, it is calculated that the peak flow reaching the Parkview Drive crossing via the upstream channel is approximately 320 cfs while the remaining 250 cfs is carried on streets to the crossing. The 250 cfs street flow will enter the channel system by overtopping of Parkview Drive at the crossing where a street sag exists. Overtopping to the channel will occur on the east side Parkview Drive.

Parkview Drive between the crossing and Centennial Street does not have capacity to carry the 10 year street flow in accordance with RCDCM criteria. The 10 year flow is about 120 cfs; however, street capacity prior to curb overtop is only about 25 cfs. It is recommended that a 36" RCP be extended from the downstream side of the Parkview Drive crossing to Centennial Street to carry the 10 year excess flow of 95 cfs. Inlets and pipe should be extended upstream from the Parkview Drive - Centennial Street intersection as necessary to properly intercept the flow.

Installation of the recommended pipe will reduce the 100 year street flow reaching the Parkview Drive sag to 155 cfs (250 cfs - 95 cfs pipe). Improvements are necessary for overflow to occur without exceeding the 1 foot depth above curb allowed by the RCDCM. These improvements consist of grading the area behind the curb to an elevation at or below the curb elevation. Reconstruction of the sidewalk to an elevation at or below the curb is also required. It is assumed that the recommended 36" RCP pipe will be installed on the east side of Parkview Drive; therefore, grading and sidewalk reconstruction can be completed as part of that project.

The Parkview Drive pipe crossing, 4 - 42" RCP's with a sump inlet, is adequate to convey the 320 cfs flow with no overtopping. The pipes have capacity for about 450 cfs prior to roadway overtop.

The Maple Street crossing, twin 36" RCP culverts, is adequate. The 100 year flow to the crossing is about 100 cfs while the crossing capacity is about 110 cfs prior to street overtopping.

The Wisconsin Street crossing, twin 36" RCP culverts, is adequate. The 100 year flow to the crossing is about 75 cfs while the crossing capacity is about 100 cfs prior to street overtopping.

Channel improvements are recommended for the section of channel between Parkview Drive and Maple Street. The channel should be designed to convey 300 to 350 cfs and backwater from the Parkview Drive crossing should be accounted for. The recommended channel has a 20 foot wide bottom, 5:1 side slopes, a longitudinal slope of 0.010 ft/ft, and an n value of 0.040. Drop structures will be necessary and a concrete trickle channel is recommended for inclusion into the new channel. The recommended slope is steeper than that normally associated with grass lined channels; however, was judged appropriate due to the relatively low and short duration peak flow. Normal depth for the recommended channel with 350 cfs is about 2 feet at a velocity of about 6 fps.

Element 8 was UDSWM2 modeled with a 20 foot wide bottom, 5:1 side slopes, an n value of 0.050, and an average invert slope of 0.017 ft/ft. Peak routed flow is 32 cfs. The

UDSWM2 modeling slope differs from the recommended lower reach slope in order to model the average Element 8 slope.

Element 9

Element 9 is a proposed 42" RCP storm sewer. It begins at the Element 201 detention pond and ends at the existing Element 10 42" RCP.

The 42" RCP will replace a current open channel and will be installed as part of a future Fifth Street improvement project. The pipe primarily serves to convey discharge from the Element 202 pond although inlets on Fifth Street can also be connected to the pipe. The design discharge from Element 202 is about 70 cfs; however, it is recommended that the pipe be designed to convey 150 cfs which is the maximum flow that can be discharged from Element 202 under emergency conditions.

The typical pipe for UDSWM2 routing is a 42" RCP with an n value of 0.016 and an invert slope of 0.030 ft/ft. Peak routed flow is 70 cfs.

Element 10

Element 10 represents the existing 42" RCP outlet pipe from the Element 202 detention pond. It begins at the pond standpipe upstream of Texas Street and ends just downstream of Texas Street. No improvements are necessary.

The typical pipe for UDSWM2 routing is a 42" RCP with an n value of 0.016 and an invert slope of 0.019 ft/ft. Peak routed flow is 70 cfs.

Element 11

Element 11 is an existing open channel beginning at the Element 202 detention pond and ending at the Element 203 detention pond. No improvements are necessary.

The typical channel for UDSWM2 routing used a 20 foot wide channel, side slopes of 10:1, n value of 0.075, and an invert slope of 0.024 ft/ft. Peak routed flow is 11 cfs.

Element 12

Element 12 is an existing open channel beginning near the Elm Avenue bridge and ending at the proposed Element 300 detention pond. Minnesota Street crosses Element 12. Improvements to the channel downstream of Minnesota Street are recommended.

The existing channel downstream of Minnesota Street is experiencing erosion problems and is difficult to maintain. It is recommended that the channel be regraded and the floor of the channel lined with concrete. The recommended channel configuration is a 4' wide bottom, 4:1 side slopes, n value of 0.02, and slope of 0.005 ft/ft. The channel should be designed to carry about 100 cfs as it will convey some sub-basin 5 flow in addition to the 70 cfs routed flow. Normal depth in the recommended channel for 100 cfs is about 2 feet.

The Minnesota Street crossing, a 36" RCP, is adequate for the 100 year flow as is the channel upstream of Minnesota Street.

The typical channel for UDSWM2 routing used a 4 foot wide channel, side slopes of 4:1, average n value of 0.025, and an average invert slope of 0.01 ft/ft. Peak routed flow is 70 cfs.

Element 20

Element 20 is an existing open channel beginning at Element 6 and ending just upstream of Minnesota Street. Channel improvements are recommended as is completion of the Minnesota Street crossing.

The recommended channel configuration is a 30' wide bottom, 4:1 side slopes, n value of 0.04, and slope of 0.005 ft/ft. Drop structures will be necessary and a concrete trickle channel is recommended for inclusion in the new channel. The channel should be designed to carry 658 cfs as calculated at Element 120. Normal depth in the recommended channel for 658 cfs is about 3.5 feet at a velocity of about 5 fps. The recommended channel shape and grade is close to that proposed when the adjacent subdivision was developed.

The Minnesota Street Crossing should be completed by replacing the small temporary pipes with a permanent crossing. It appears that the future street will not have a vertical sag located at the channel; therefore, it is recommended that the entire 658 cfs be conveyed under the roadway. The recommended crossing consists of 3 - 66" RCP culverts with capacity of 658 cfs.

The typical channel for UDSWM2 routing used a 30 foot wide channel, side slopes of 4:1, average n value of 0.050, and an invert slope of 0.050 ft/ft. Peak routed flow is 658 cfs.

Element 21

Element 21 is an existing open channel beginning at Minnesota Street and ending at the proposed Element 301 detention pond. Parkview Drive crosses the channel. Improvements are recommended to the channel and the Parkview Drive crossing.

The existing channel is adequate; however, the profile is very steep and subject to erosion. Furthermore, it was assumed adjacent property owners will desire a defined channel to maximize developable area.

It is recommended that the Element 21 channel be improved with a 15 foot wide bottom, 4:1 side slopes, a longitudinal slope of 0.005 ft/ft, and an n value of 0.040. Drop structures will be necessary and concrete trickle channel is recommended for inclusion into the new channel. Peak routed flow in Element 21 is 144 cfs; however, the flow used for design is about 285 cfs as calculated at Element 121. Normal depth for the recommended channel with 285 cfs is about 2.8 feet at a velocity of approximately 4 fps.

The existing stock dam near the west end of Element 21 will be breached as part of the channel improvements.

The Parkview Drive crossing should be improved with twin 42" RCP culverts with capacity of about 150 cfs. This design flow is higher than the 10 year flow of 130 cfs and is used to allow the 100 year peak from Detention Pond 301 to pass under the roadway. The roadway profile should be designed to allow the remaining 135 cfs (285 cfs - 150 cfs) to overtop the roadway in accordance with the RCDCM.

The typical channel for UDSWM2 routing used a 15 foot wide channel, side slopes of 4:1, average n value of 0.050, and an invert slope of 0.050 ft/ft. Peak routed flow is 144 cfs.

Element 22

Element 22 is an existing open channel beginning at the proposed Element 301 detention pond and ending at sub-basin 22. No improvements are necessary.

The typical channel for UDSWM2 routing used a 20 foot wide channel, side slopes of 5:1, n value of 0.075, and an invert slope of 0.031 ft/ft. Peak routed flow is 236 cfs at a UDSWM2 calculated flow depth of 1.9 feet.

Element 30

Element 30 is an existing channel beginning at Minnesota Street and ending at the proposed Element 302 detention pond. Parkview Drive crosses Element 30. Channel improvements and a new Parkview Drive crossing are recommended. The improvements to the Parkview Drive crossing are discussed under Element 302.

The recommended channel configuration is a 20' wide bottom, 4:1 side slopes, n value of 0.04, and slope of 0.005 ft/ft. Drop structures will be necessary and a concrete trickle channel is recommended for inclusion in the new channel. The channel should be designed to carry 500 cfs. Normal depth in the recommended channel for 500 cfs is about 3.5 feet at a velocity of about 4.6 fps.

The typical channel for UDSWM2 routing used a 20 foot wide channel, side slopes of 4:1, n value of 0.050, and an invert slope of 0.005 ft/ft. Peak routed flow is 498 cfs.

Element 31

Element 31 is an existing open channel beginning at Detention Pond Element 302 and ending at Fifth Street at Detention Pond Element 303. Channel improvements are recommended.

The existing natural channel is adequate; however, the profile is very steep and subject to erosion. Furthermore, it was assumed adjacent property owners will desire a defined channel to maximize developable area.

It is recommended that the Element 31 channel be improved with a 20 foot wide bottom, 4:1 side slopes, a longitudinal slope of 0.005 ft/ft, and an n value of 0.040. Drop structures will be necessary and a concrete trickle channel is recommended for inclusion into the new channel. Peak routed flow in Element 31 is 483 cfs; however, the flow used for design is 503 cfs as calculated at Element 130. Normal depth for the recommended channel with 503 cfs is about 3.5 feet at a velocity of approximately 5 fps.

The typical channel for UDSWM2 routing used a 20 foot wide channel, side slopes of 4:1, n value of 0.050, and an invert slope of 0.005 ft/ft.

Element 100

Element 100 is direct flow element. It is used to summarize flows from sub-basin 1 and Element 1. The flow calculated at this element is the total discharge from the South Robbinsdale Drainage Basin. Peak discharge is 1,463 cfs.

Element 101

Element 101 is a direct flow element. It summarizes flows from sub-basin 2 and Element 2 to provide an inflow hydrograph to Element 1. The flow calculated at this element is the flow reaching the Highway 79 crossing. Peak discharge is 1,467 cfs.

Element 102

Element 102 is a direct flow element located in Centennial Park. It summarizes flows from sub-basin 4 and Element 5. Peak discharge is 1,247 cfs.

Element 103

Element 103 is a direct flow element located at Elm Avenue. It summarizes flows from sub-basin 5, Element 6, and Element 12. Flow calculated at this Element 103 is the flow reaching the Elm Avenue bridge. Peak discharge is 939 cfs.

Element 104

Element 104 is a direct flow element located at Parkview Drive. It summarizes flows from sub-basin 6 and Element 8. As discussed under Element 7, some of the flow calculated at this location enters the channel system downstream of Parkview Drive. Peak discharge at Element 104 is 568 cfs.

Element 105

Element 105 is a direct flow element. It summarizes flows from sub-basin 7 and Element 9 to provide the inflow hydrograph to detention pond Element 201. Peak discharge is 232 cfs.

Element 106

Element 106 is a direct flow element. It summarizes flows from sub-basin 8 and Element 11 to provide an inflow hydrograph to detention pond Element 202 Peak discharge is 181 cfs.

Element 120

Element 120 is a direct flow element just upstream of Minnesota Street. It summarizes flows from Element 30 and Element 121 to provide an inflow hydrograph to Element 20. Peak discharge is 658 cfs. This is the flow reaching the Minnesota Street crossing.

Element 121

Element 121 is a direct flow element located near Minnesota Street and Parkview Drive. It summarizes flows from sub-basin 20 and Element 21. Peak discharge is 285 cfs.

Element 122

Element 122 is a direct flow element. It summarizes flows from sub-basin 21 and Element 22 to provide an inflow hydrograph to detention pond Element 301. Peak discharge is 456 cfs.

Element 130

Element 130 is a direct flow element. It summarizes flows from sub-basin 30 and Element 31 to provide an inflow hydrograph to detention pond Element 302. Peak discharge is 503 cfs.

Element 200

Element 200 is an existing detention pond located south of Minnesota Street in Dakota Ridge Subdivision. The pond is adequate and no improvements are necessary.

Peak inflow is 138 cfs, peak outflow is 61 cfs, and required storage is 4 acre-feet. Top of pool is at approximate elevation 3211, top of embankment is at approximate elevation 3212, and bottom of pond is at elevation 3206

The outlet works is a staged system with a 24" RCP serving as the primary outlet and a 48" diameter standpipe serving as a secondary outlet. Both the 24" RCP and standpipe are connected to a 36" RCP discharge pipe under Minnesota Street. The 24" RCP is at elevation 3206 and top of standpipe is at elevation 3210. Stage/storage/discharge data for the pond is given below.

STAGE/STORAGE/DISCHARGE DATA - ELEMENT 200		
ELEV.	STORAGE (AC-FT)	DISCHARGE (CFS)
3206	0.0	0
3208	1.2	14
3210	2.8	28
3212	4.8	85

Element 201

Element 201 is an existing detention pond located at Fifth Street. It is recommended that the pond remain as a detention pond with increased storage capacity. Modifications to the outlet pipe are also necessary.

The bottom of the pond should be excavated and lowered from approximate elevation 3328.5 to elevation 3326.5. Only the southern portion of the pond can be lowered to the recommended bottom elevation in order to maintain cover over a sanitary sewer. The pond must also be enlarged to the north and south to meet the storage requirement.

Additional storage will be obtained by constructing a small berm on the west side of Fifth Street. Preliminary plans for Fifth Street improvements indicate the street low point will be at elevation 3335.5. Design high water is slightly above elevation 3336 and it is recommended that the berm on the west side be constructed to elevation 3337.5. The berm will provide 1 foot plus of freeboard.

The existing discharge pipe is a 24" RCP with the inlet reduced to 21" by a poured concrete obstruction. The recommended outlet is a 21" RCP and it is recommended that a 21" RCP be used full length in lieu of the 24" RCP with obstructed inlet. It will be necessary to move the outlet pipe to the south portion of the pond in order to clear the sewer. Grading to daylight the pipe outlet will also be necessary.

Peak inflow is 232 cfs, peak outflow is 32 cfs, and required storage is 10.8 acre-feet. Top of pool is at approximate elevation 3336, top of embankment is proposed at elevation 3337.5, and bottom of pond is proposed at elevation 3326.5. Stage/storage/discharge data for the pond is given below.

STAGE/STORAGE/DISCHARGE DATA - ELEMENT 201		
ELEV.	STORAGE (AC-FT)	DISCHARGE (CFS)
3326.5	0.0	0
3328	0.8	8
3330	2.8	19
3332	5.1	24
3334	7.5	29
3336	10.5	32
3338	14.0	35

Runoff from property south of pond is to be directed to the Element 201 pond when the property is developed. The sub-basin boundaries reflect this requirement.

Element 202

Element 202 is an existing detention pond located at Texas Street west of Fifth Street. No improvements are necessary.

The detention pond outlet consists of a poured concrete standpipe with 7" diameter orifices at elevation 3362.5 (pond bottom) and 3364.5. The standpipe acts as a secondary outlet with the top at elevation 3373.2. The standpipe is 5'4" x 5'5" inside dimension. Discharge from the standpipe is conveyed in a 42" RCP.

Peak inflow is 181 cfs, peak outflow is 70 cfs, and required storage is 12.6 acre-feet. Top of pool is at approximate elevation 3374.2, top of embankment is at approximate elevation 3375 and bottom of pond is at approximate elevation 3362.5. Stage/storage/discharge data for the pond is given below.

STAGE/STORAGE/DISCHARGE DATA - ELEMENT 202		
ELEV.	STORAGE (AC-FT)	DISCHARGE (CFS)
3362.5	0.0	0
3364	0.2	1
3366	1.1	4
3368	2.8	5
3370	5.2	6
3372	8.3	7
3373.2	10.2	7
3374	12.3	60
3475	14.5	150

Element 203

Element 203 is an existing detention pond located south of Fox Run Drive. No improvements are necessary.

The detention pond outlet consists of a 24" diameter standpipe with 6" diameter orifices at elevations 3387.5 (pond bottom), 3390, and 3392. The standpipe acts as a secondary outlet with the top elevation at elevation 3398. The standpipe is connected to a 12" RCP discharge pipe.

Peak inflow is 114 cfs, peak outflow is 11 cfs, and required storage is 2.8 acre-feet. Top of pool is at approximate elevation 3400, top of embankment is at approximate elevation 3404 and bottom of pond is at approximate elevation 3387.5. Stage/storage/discharge data for the pond is given below.

STAGE/STORAGE/DISCHARGE DATA - ELEMENT 203		
ELEV.	STORAGE (AC-FT)	DISCHARGE (CFS)
3387.5	0.0	0
3390	0.1	2
3392	0.4	3
3394	0.7	6
3396	1.3	7
3398	2.0	8
3400	2.8	11
3402	3.7	12
3404	4.8	12

<u>Element 300</u>

Element 300 is a proposed detention pond located west of Elm Avenue and upstream of an existing apartment complex. A 36" RCP culvert and embankment currently exist at the site although existing storage is minimal. The detention pond will be created by increasing the storage area and lowering the pipe inlet. This pond is important in reducing the peak discharge reaching the Elm Avenue bridge.

The 36" RCP inlet should be lowered about one foot to elevation 3253. The storage area will be lowered and enlarged by grading to provide required storage. Depending upon final street grades it may also be necessary to construct a small embankment along Elm Avenue to prevent overflow onto the street. Also, depending upon final design, it may be possible to leave the pipe at the current elevation and increase dam height.

Peak inflow is 193 cfs, peak outflow is 70 cfs, and required storage is 5.6 acre-feet. Top of pool is at approximate elevation 3258.5 and bottom of pond is at elevation 3253. Stage/storage/discharge data for the pond is given below.

STAGE/STORAGE/DISCHARGE DATA - ELEMENT 300		
ELEV.	STORAGE (AC-FT)	DISCHARGE (CFS)
3253	0.0	0
3254	0.2	8
3256	1.8	37
3258	4.5	64
3260	7.5	80

Inlets and pipes will be required on Elm Avenue to convey flows to the pond from Elm Avenue and the area east of Elm Avenue.

Element 301

Element 301 is a proposed detention pond located just southwest of the future intersection of Minnesota Street and Fifth Street. The pond will be created by construction of the Fifth Street roadway embankment, grading of the storage pool, and installation of a 36" RCP outlet pipe. This pond creates a substantial flow reduction throughout the downstream basin.

Peak inflow is 456 cfs, peak outflow is 144 cfs, and required storage is 21.5 acre-feet. Top of pool is at approximate elevation 3341 and bottom of pond is at elevation 3322. Stage/storage/discharge data for the pond is given below.

STAGE/STORAGE/DISCHARGE DATA - ELEMENT 301		
ELEV.	STORAGE (AC-FT)	DISCHARGE (CFS)
3322	0.0	0
3325	0.5	35
3330	4.5	88
3335	10.5	117
3340	19.5	142
3342	24.5	148

Grading for the storage pool will require removal of the "ridge" between the primary channel and a smaller channel to the south. The storage curve assumes an area for development will remain between future Minnesota Street and the detention pond. Preliminary grades for Fifth Street from the South Robbinsdale Infrastructure Study were used for pond design.

Element 302

Element 302 is a proposed detention pond near future Parkview Drive. The pond will be created by construction of an embankment, grading of the storage pool, and construction of a staged outlet system. Improvements to the Parkview Drive crossing downstream of the pond are also necessary.

This pond creates a significant flow reduction throughout the downstream basin even though peak flow out of the pond is only slightly lower than peak flow in. This is because the pond meters sub-basin 30 flows prior to the arrival of peak flows from Detention Pond 303.

Peak inflow is 503 cfs, peak outflow is 499 cfs, and required storage is 15.4 acre-feet. Top of pool is at approximate elevation 3296 and bottom of pond is at elevation 3288. The outlet system is staged and consists of a 24" RCP at elevation 3288 and a 60 foot long overflow weir at elevation 3294.

The embankment will likely be created by a combination of the Parkview Drive roadway embankment and a normal dam embankment across the channel. Other embankment alternatives, including realignment of Parkview Drive, can be investigated at final design.

Stage/storage/discharge data for the pond is given below.

STAGE/STORAGE/DISCHARGE DATA - ELEMENT 302		
ELEV.	STORAGE (AC-FT)	DISCHARGE (CFS)
3288	0.0	0
3290	1.0	13
3292	4.0	25
3294	9.0	34
3295	12.0	220
3296	16.0	550

It is recommended that the Parkview Drive crossing downstream of the dam be improved by installation of 2 - 48" RCP culverts. The culverts will convey the 10 year flow of 208 cfs under the roadway. The future roadway profile should be such that the 100 year flow of 500 cfs is then conveyed by a combination of the culverts and roadway overtopping in accordance with the RCDCM.

In the event that the dam embankment is created entirely by the roadway embankment, it will be necessary for the roadway profile to resemble a 60 foot long weir. A design exception would be required as 10 year flow will overtop the roadway. A possible alternate may be to use a different staging system to prevent 10 year roadway overtopping.

Element 303

Element 303 is a proposed detention pond at future Fifth Street. The pond will be created by construction of the roadway embankment, construction of a small secondary embankment to prevent flow splits, grading of the storage pool, and installation of outlet pipes.

Peak inflow is 677 cfs, peak outflow is 489 cfs, and required storage is 19.3 acre-feet. Top of pool is at approximate elevation 3337.5 and bottom of pond is at elevation 3328. The outlet consists of 2 - 60" RCP culverts under Fifth Street.

The embankment will be created by the Fifth Street roadway embankment. A small embankment along the south side of the storage pool is also required to prevent overtopping into the "Truck Bypass Drainage Basin."

Stage/storage/discharge data for the pond is given below.

STAGE/STORAGE/DISCHARGE DATA - ELEMENT 303		
ELEV.	STORAGE (AC-FT)	DISCHARGE (CFS)
3328	0.0	0
3330	1.0	60
3332	4.5	180
3334	9.0	320
3336	14.5	430
3338	21.0	510
3340	28.0	580

MISCELLANEOUS AREA IMPROVEMENTS

Various drainage improvement projects are recommended in the study area in addition to those recommended in the computer modeled areas. Following are recommendations for known or easily identifiable problem areas.

1. Centennial Street

Flow on Centennial Street within sub-basin 4 exceeds RCDCM criteria. The 10 year flow is about 160 cfs and the 100 year flow is about 325 cfs. Flow capacity prior to curb overtop is only about 50 cfs and existing inlets and storm sewers along the street have capacity for an additional 50 cfs.

It is recommended that additional inlets and storm sewer be added for 110 cfs (160 cfs 10 yr. flow - 50 cfs inlets). It is necessary to intercept the entire 10 year flow to prevent curb overtopping at the sag near Centennial Park.

A main line storm sewer is judged not necessary as various cross pipes drain from Centennial Street to the Element 5 Channel. The 24" RCP just east of Elm Street and the 24" RCP at Redwood Street can have extra inlets added without exceeding pipe capacity.

Larger pipes and additional inlets are recommended at the existing 18" RCP at Ivy Street and at the existing 15" RC pipe at Locust Street. It is recommended that both pipes be replaced with 30" RCP with capacity of about 50 cfs each.

It is also recommended that the overflow from Centennial Street at Centennial Park be improved to allow 165 cfs (325 cfs 100 yr. flow - 160 cfs pipe capacity above) to overflow through the park at a maximum depth of about 1 foot above curb. This will require lowering the sidewalk to an elevation at or below the curb and general grading in the park.

2. Highway 79

Improved inlets on Highway 79 at the box culvert crossing are recommended. It is recommended that the existing grated inlets be replaced with curb opening inlets.

3. Minnesota Street west of Parkview Drive

Storm sewer installation in conjunction with the future extension of Minnesota Street is recommended. This storm sewer is considered minor drainage and it is beyond the scope of the report to make size recommendations. Discussion is included in this report simply to recommend that the system discharge to the Element 21 channel. The sub-basin boundaries reflect this recommendation.

RECOMMENDATIONS

1. Implementation Schedule

It was beyond the scope of the project to determine a complete detailed improvement schedule for the entire basin, however a generalized discussion of improvement scheduling follows.

Certain flooding problems already exist in the basin therefore implementation of the design plan should begin immediately. Simple economics dictate that complete plan implementation will take many years, thus priority should be given to projects that provide immediate benefit.

Projects that can be completed in conjunction with street project, utility projects, and subdivision development should be given priority. This suggestion is made since concurrent projects will be more economical than separate projects.

It is suggested that improvements to detention pond Element 301 be given the highest priority. Improvements to Element 301 will reduce existing condition flows to approximately match the flows used for FEMA floodplain maps.

Bridge replacement in Element 4 should be given high priority to prevent possible backwater flooding.

Completion of Element 1 improvements between the railroad and Highway 79 are also suggested for priority due to potential flooding of structures near the channel bend. It should be noted that these structures are in a designated floodplain and purchase of flood insurance may be an alternative until the channel can be improved in conjunction with adjacent property development.

The balance of the recommended improvements can be implemented on an as needed basis or in conjunction with adjacent property development.

2. Final Design Recommendations

As mentioned earlier it was beyond the scope of the project to provide final construction design plans and the recommendations given in the plan are conceptual in nature. It will be necessary to prepare final engineering plans for the improvements and the following recommendations are made for use during the final project design phase.

1. All improvements should be designed in accordance with proper engineering standards and in accordance with the Rapid City Drainage Criteria Manual.

2. Improvements should be designed in accordance with FEMA rules and regulations.

3. If final detention pond curves are not practically identical to the plan recommended curves, it is necessary to perform a new computer analysis of the actual design to review basinwide impacts.

4. During final design, the conceptual sections, sizes, grades, etc., recommended in the design plan shall be checked for applicability to actual project requirements. Final design should include flow carrying characteristics, constructability, economics, etc,. A new computer analysis using final design should be performed to review any basinwide impacts.

5. Street crossings should be designed to also serve as drop structures wherever possible.

6.. HEC-2 should be used to calculate water surface profiles for all open channel designs. The water surface profiles should then be made a part of the subdivision plans.

7. All topography and elevation data should be confirmed with field surveys prior to plan implementation or final design of recommended improvements.

3. Additional Recommendations

1 . The design plan should be adopted as part of the City's comprehensive plan.

2. The design plan should be reviewed and updated on a regular basis as the basin develops.

TABLE 1
SUMMARY OF DESIGN PLAN
RECOMMENDED IMPROVEMENTS AND ESTIMATED COSTS

ELEMENT NUMBER	RECOMMENDED IMPROVEMENT	ESTIMATED COST
1	Regrade and improve channel including trickle channel and drop structures.	$230,000
2	Regrade and improve channel including trickle channel and drop structures.	$150,000
3	No improvements.	N.C.
4	Regrade and improve lower reach channel including trickle channel and drop structures. Replace bridge and regrade channel at Centennial Park.	$130,000
5	Construct storm inlets on Elm Avenue at bridge.	$25,000
6	No improvements.	N.C.
7	No improvements.	N.C.
8	Improve channel between Parkview Drive and Maple Street including regrading, trickle channel, and drop structures. Install 36" RCP storm sewer on Parkview Drive and improve Parkview Drive overflow.	$165,000
9	No improvements.	N.C.
10	Install 42" RCP storm sewer.	$50,000
11	No improvements.	N.C.
12	Regrade portion of channel and line bottom with concrete.	$25,000
20	Regrade and improve channel including trickle channel and drop structures. Improve Minnesota Street crossing with 3 - 66" RCP.	$130,000
21	Regrade and improve channel including trickle channel and drop structures. Improve Parkview Drive crossing with 2 - 42" RCP.	$190,000
22	No improvements.	N.C.
30	Regrade and improve channel including trickle channel and drop structures. Improve Parkview Drive crossing with 2 - 48" RCP.	$140,000
31	Regrade and improve channel including trickle channel and drop structures.	$260,000
200	No improvements.	N.C.
201	Improve existing detention pond. Raise embankment and excavate pool to increase storage capacity. Install 21" RCP discharge pipe.	$25,000
202	No improvements.	N.C.
203	No improvements.	N.C.
300	Construct new detention pond. 36" RCP discharge pipe.	$25,000
301	Construct new detention pond. 36" RCP discharge pipe.	$50,000
302	Construct new detention pond. Staged discharge with 24" RCP and 60' weir.	$45,000
303	Construct new detention pond. 2 - 60" RCP discharge pipes.	$75,000
--	Miscellaneous Areas	
	Install pipes and inlets along Centennial Street.	$75,000
	Replace existing inlets on Highway 79.	$10,000
	Recommended Improvements Sub-Total	$1,800,000
	5% Contingency	$90,000
	25% Engineering/Administration	$475,000
TOTAL COST OF RECOMMENDED DESIGN PLAN IMPROVEMENTS		$2,365,000

TABLE 2

SUMMARY OF DESIGN PLAN
PEAK SUB-BASIN FLOWS WITH FUTURE LAND USE CONDITIONS

SUB-BASIN NUMBER	AREA (SQ MI)	10 YR (CFS)	100 YR (CFS)
1	0.172	295	512
2	0.177	165	377
3	0.058	70	138
4	0.148	207	416
5	0.053	89	169
6	0.206	279	564
7	0.074	110	229
8	0.156	64	174
9	0.032	48	114
10	0.085	96	193
20	0.105	129	259
21	0.152	117	283
22	0.204	102	282
30	0.125	136	286
31	0.813	244	677

TABLE 3 - SUMMARY OF DESIGN PLAN
HYDRAULIC ELEMENT PEAK FLOWS
FUTURE LAND USE AND DESIGN PLAN HYDRAULIC CONDITIONS

ELEMENT NUMBER	10 YR (CFS)	100 YR (CFS)
1*	490	1,231
2*	514	1,178
3*	21	61
4*	505	1,164
5*	431	944
6*	364	779
7*	274	561
8*	19	32
9*	6	70
10*	6	70
11*	6	11
12*	40	70
20*	308	658
21*	89	144
22*	73	236
30*	206	498
31*	201	483
100	585	1,463
101	616	1,467
102	565	1,247
103	442	939
104	280	568
105	111	232
106	68	181
120	309	658
121	141	285
122	155	456
130	220	503
200	21	61
201	19	32
202	6	70
203	6	11
300	40	70
301	91	144
302	208	499
303	207	489

*ROUTED FLOWS ONLY, SEE APPENDIX A OR HYDRAULICS CHAPTER FOR EXPLANATION.

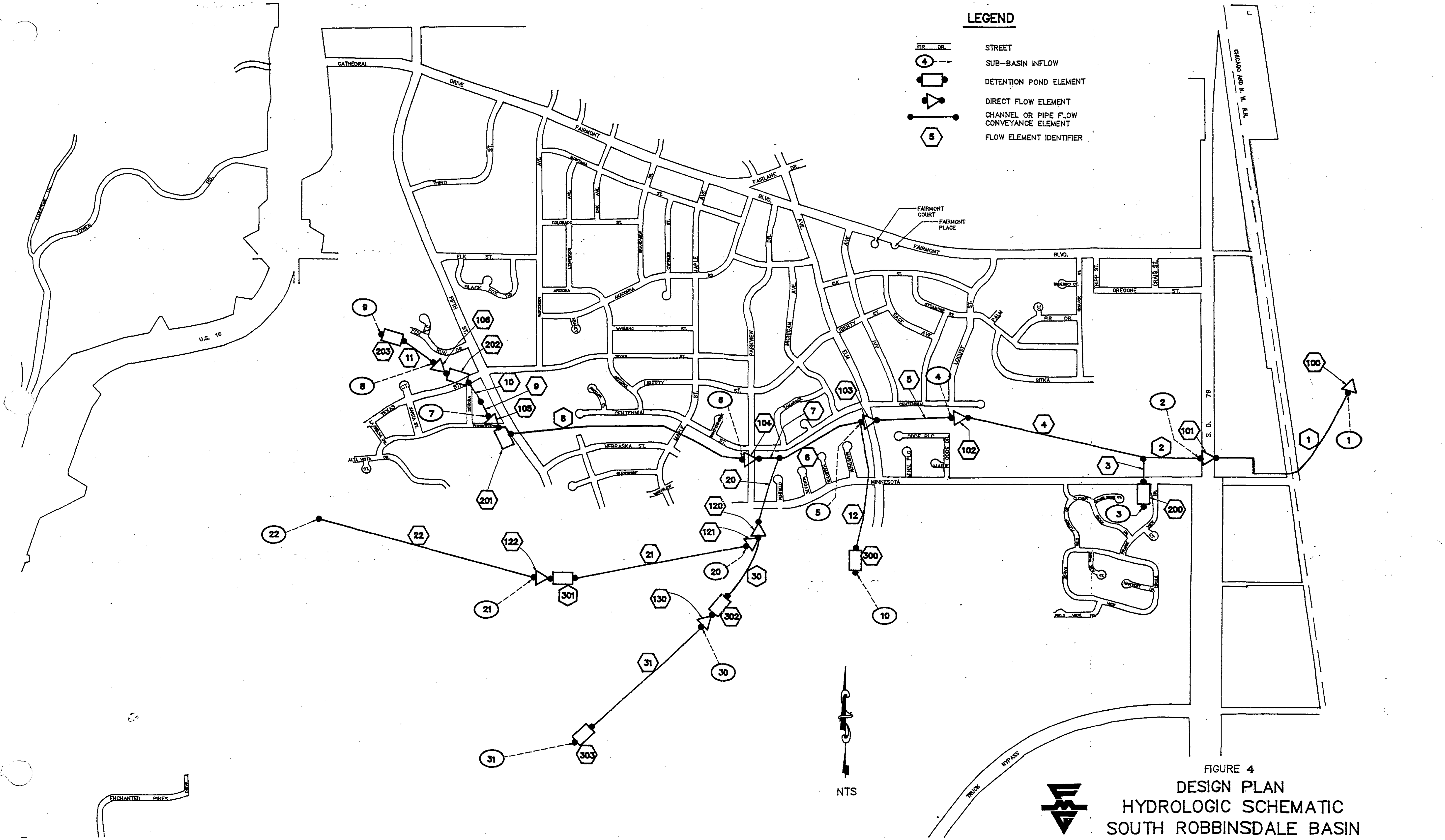


FIGURE 4
DESIGN PLAN
HYDROLOGIC SCHEMATIC
SOUTH ROBBINSDALE BASIN

HYDROLOGY

HYDROLOGY

METHODOLOGY

Before any drainage design can be performed it is necessary to determine runoff peaks and volumes from the various sub-basins. Numerous methods of making these determinations are available varying from the simple rational method to very complex statistical methods.

In accordance with the City of Rapid City Drainage Criteria Manual the method used for runoff determination in this design plan is a computerized version of the Colorado Urban Hydrograph Procedure (CUHPE/PC). This model allows the design plan to be easily updated should the conditions change from those assumed in this study.

It should be noted that a runoff/routing analysis is only an approximation since storms rarely follow ideal patterns and other factors such as ground cover, infiltration, and channel conditions may vary with time or from assumed conditions. The intent of a runoff/routing analysis is to provide a reasonably dependable and consistent approximation of rainfall-runoff characteristics.

INPUT PARAMETERS

1. Storm Recurrence Interval and Rainfall

In accordance with the City of Rapid City Drainage Criteria Manual, the design plan presented in this report is based on the 100 year one-hour storm with fully developed land use conditions. The 100 year one-hour storm used in Rapid City is 2.95 inches per hour. Note that the CUHPE/PC model transfers the one-hour rain to a two-hour design storm hyetograph totaling 3.41 inches of precipitation for use in the CUHPE/PC runoff calculations.

Ten year flows were also calculated to help in evaluation of problems and proposed improvements. The 10 year one-hour storm is 1.86 inches per hour. The 10 year two-hour design storm hyetograph calculated by CUHPE/PC totals 2.15 inches of precipitation.

2. Sub-basin Characteristics

As previously mentioned the design plan is based on the anticipated future land use of the basin.

The CUHPE/PC program requires input of numerous parameters to represent sub-basin characteristics. The reader is referred to the program user's manual and the City of Rapid City Drainage Criteria Manual for a complete description of the input requirements. Input data was developed following guidelines in the manuals. Data sources included USGS topographic maps, 1"=200' aerial photos with 2 foot and 10 foot contours, SCS soil maps, field reconnaissance, engineering equations, and engineering judgment. Soils information is included as Figure 5.

Future land use is discussed in the BASIN DESCRIPTION section of the report. If higher than assumed imperviousness results during future development it will be necessary to provide on site detention to reduce flows to the assumed imperviousness rate.

A complete listing of all data used for runoff analysis is included on the CUHPE/PC printouts.

SUB-BASIN FLOWS

Peak sub-basin flows with future land use conditions for both the 10 year and 100 year storms are given on Table 4. Peak sub-basin flows with existing land use conditions for both the 10 year and 100 year storms are given on Table 5. Hydrographs for future 100 year flows are located in Appendix A and computer printouts of future land use 10 year and 100 year CUHPE/PC models are located in Appendix B.

TABLE 4

PEAK SUB-BASIN FLOWS
WITH FUTURE LAND USE CONDITIONS

SUB-BASIN NUMBER	AREA (SQ MI)	10 YR (CFS)	100 YR (CFS)
1	0.172	295	512
2	0.177	165	377
3	0.058	70	138
4	0.148	207	416
5	0.053	89	169
6	0.206	279	564
7	0.074	110	229
8	0.156	64	174
9	0.032	48	114
10	0.085	96	193
20	0.105	129	259
21	0.152	117	283
22	0.204	102	282
30	0.125	136	286
31	0.813	244	677

TABLE 5

PEAK SUB-BASIN FLOWS
EXISTING LAND USE CONDITIONS

SUB-BASIN NUMBER	AREA (SQ MI)	10 YR (CFS)	100 YR (CFS)
1	0.172	191	375
2	0.177	87	233
3	0.058	70	138
4	0.148	207	416
5	0.053	73	143
6	0.206	251	521
7	0.074	96	216
8	0.156	45	109
9	0.032	44	94
10	0.085	55	147
20	0.105	41	157
21	0.152	38	149
22	0.204	58	226
30	0.125	54	201
31	0.813	124	475

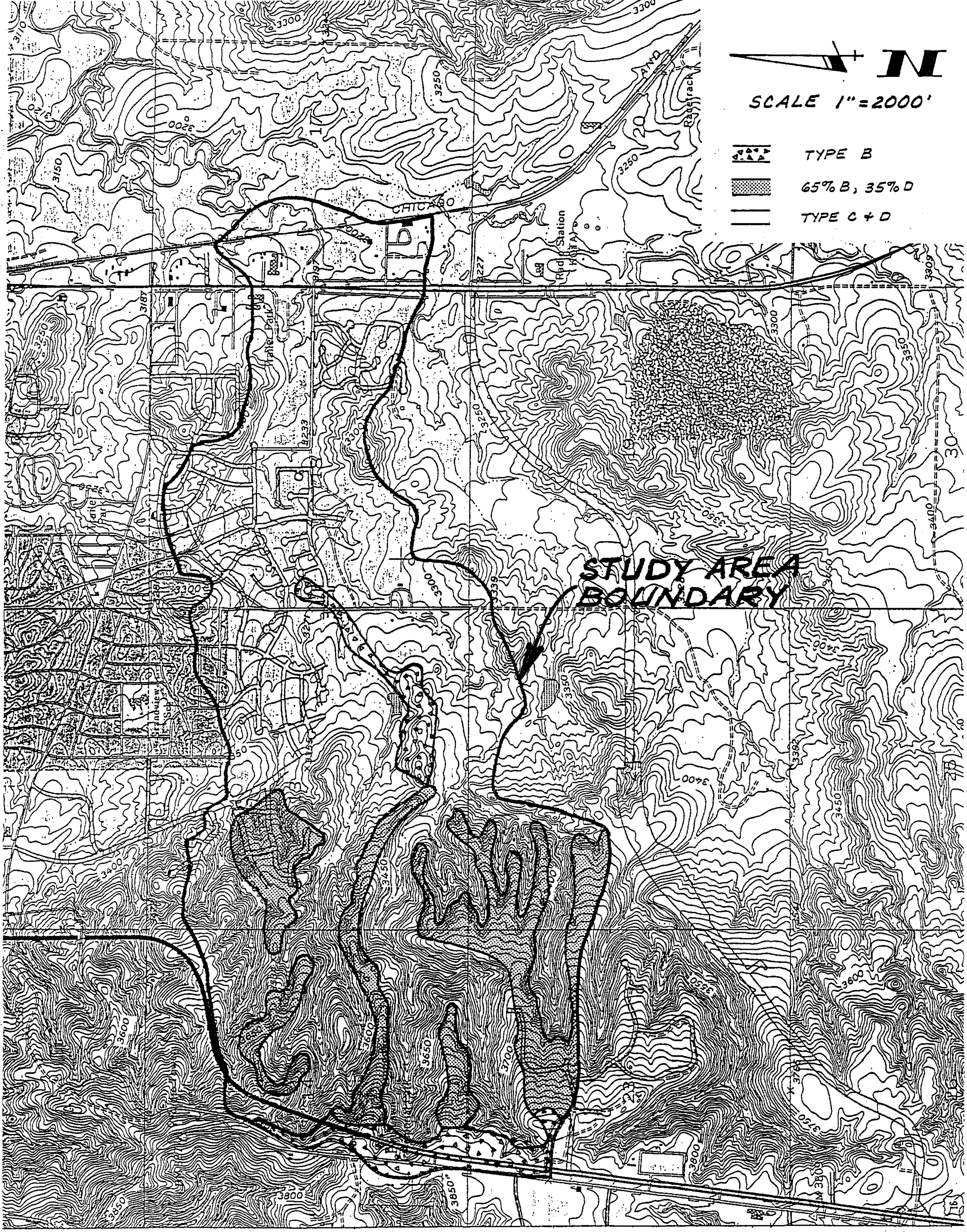


FIGURE 5

SOILS TYPE SUMMARY

HYDRAULICS

HYDRAULICS

METHODOLOGY

In order to use peak flows and sub-basin hydrographs effectively and arrive at a realistic determination of time varied flows it is necessary to account for basin hydraulic characteristics. This process involves routing and combining hydrographs. This is a key step in the design process as it is where various design options are proposed and basinwide results investigated.

Numerous methods are available for performing these calculations ranging from simple hand approximations to complex computer modeling. In accordance with the City of Rapid City Drainage Criteria Manual the method used for the hydraulic routing is a computer model known as the Urban Drainage Storm Water Management Model (UDSWM2-PC). This model allows the design plan to be easily updated should conditions change from those assumed in the design.

HYDRAULIC ROUTING NETWORK

Prior to routing and calculating combined hydrographs it is necessary to conceptually represent the drainage system as a system of interconnected hydraulic elements. Hydraulic properties of each element are then characterized by various parameters and flows routed through the elements.

It should be noted that the drainage system subdivision could be taken to infinitesimal detail in theory; however, computation and manpower requirements become prohibitive. No established rule is available for this subdivision and it is primarily based on engineering needs and judgment. The hydraulic subdivision used in this design provides a sufficient number of elements for suitable modeling. The network allows for sub-basin inflow at sub-basin design points and provides hydraulic flow elements between tributary junctions, between design points, at numerous road crossings, at detention ponds, and at other locations judged necessary.

As with sub-basin delineation the hydraulic routing system was established following major flow patterns and unaccounted for sub-basin transfer could occur.

The schematic of the existing condition hydraulic system network is included as Figure 6 at the end of this chapter. The Design Plan hydraulic network schematic is included as Figure 4 in DESIGN PLAN chapter. The hydraulic routing elements are also shown on the aerial photos.

INPUT PARAMETERS

The UDSWM2-PC model requires input of numerous parameters to represent hydraulic element characteristics. The reader is referred to the program user's manual and the City of Rapid City Drainage Criteria Manual for a detailed explanation of input requirements and methods.

Input parameters were determined following guidelines in the program user's manual and the Drainage Criteria Manual. Data sources included aerial contour maps, as-built drawings, field reconnaissance, engineering equations, and engineering judgment.

Input data used with the UDSWM2-PC model is included on the computer printouts in the appendices. An explanation of the various flow element types shown on the schematics and methods used for characterizing them follows. A description of each individual element is included in the DESIGN PLAN part of the report.

1. Direct Sub-basin Inflow

These are not hydraulic elements but rather denote inflow into the system from the various sub-basins. The computer model assumes that the inflow enters the hydraulic network at the sub-basin design point. It ignores the possibility that a portion of the sub-basin inflow may enter the adjacent hydraulic element above the sub-basin design point. Inflows used for these elements are the calculated hydrographs determined in the HYDROLOGY chapter of this report.

2. Detention Pond Elements

This element type allows the program to account for effects of storage at detention ponds. The flow calculated by the program for the referenced element is the outflow. The inflow to these elements is provided by other types of routing elements as shown on the routing schematic.

Input required for detention pond elements consists of a storage versus discharge data set. Storage data was determined from aerial contour maps, City of Rapid City topographic surveys, and as-built engineering drawings. Design plan storage curves for expanded ponds or new ponds were developed using engineering judgment and were checked for reasonableness against existing ground contours.

Discharge curves were developed using culvert discharge curves and standard engineering equations for orifices and weirs. Discharge curves assume unobstructed flow conditions.

Certain culverts and road crossings were not modeled as detention pond elements, rather they were assumed simply to be a portion of the adjacent routing element. Modeling limitations, insignificant backwater or storage effects, minor flow lengths, and/or overtopping characteristics warranted this assumption.

3. Direct Flow Elements

Direct flow elements are not true hydraulic conveyance elements, rather they serve to provide summarized hydrographs. They are included in this study to summarize upstream flows and to provide inflow hydrographs for other elements.

4. Flow Conveyance Elements

These elements are trapezoidal open channels, storm sewer pipes, or combinations thereof. Flow conveyance elements may have overflow sections.

Overflow conveyance elements are used at various locations. Overflow elements are the same as pipe or channel elements except that an additional trapezoidal channel is specified to accept flows exceeding the capacity of the initial channel section or pipe. Bottom width of the overflow section does not include the top width of the initial section and therefore may be zero. Depth data required by the program is depth of initial channel and combined depth of the initial channel and overflow section.

Input parameters consist of slope, roughness, and section geometry. Slopes were determined from aerial contour maps, as-built plans, or in the case of new facilities, in accordance with the proposed design. Unless otherwise noted, a maximum slope of 0.005 ft/ft was assumed for the slope for proposed new channels. This assumption follows Section 7.5.2 of the RCDCM which states "Grass lined channels will normally have slopes of 0.2 percent to 0.5 percent. Where the natural topography is steeper than desirable, drop structures should be utilized to maintain design velocities."

Roughness coefficients were selected to represent conditions as they exist in the field or assumed design coefficients for new facilities. Roughness coefficients were then increased by 25% for use in UDSWM2 flow routing in accordance with the program user's manual. Unobstructed flow was assumed in all UDSWM2 elements unless otherwise reflected in the n value.

During input preparation it was assumed that channels would essentially remain in existing condition unless changed specifically by the design plan. Natural channels change shapes and slopes infinitely through the elements thus it is necessary to approximate a natural channel as a trapezoid and assume it as typical throughout the length of the element.

It should be noted that the program routes only flows entering the upstream end of the open channel or pipe and ignores the possibility that any adjacent sub-basin flow may be entering. Due to this program limitation the user should exercise caution when using channel or pipe peak flows and hydrographs for design. Flows for design should be increased appropriately using engineering judgment to reflect incoming sub-basin flows.

Additionally the user should not use conveyance element flow depths since flows are calculated as normal depth and effects of backwater, changing sections, etc., are not accounted for. The UDSWM2 calculations do not provide a flood boundary analysis.

5. Flow Element Numbers

Each hydraulic element is identified with a unique number. Element numbers are separated into a set of ranges for specific identification of types. Numbers 1-99 are used to represent channel or pipe flow elements, 100 series numbers represent direct flow elements, 200 series numbers represent detention ponds, and 300 series numbers represent recommended new design plan facilities.

HYDRAULIC ELEMENT FLOWS

Routed flows were calculated at all elements using methods and parameters presented above. Flows were calculated for both the 10 year and 100 year storms.

Flows were first calculated using CUHPE/PC with existing condition land use and UDSWM2-PC with hydraulic conditions as they exist today. Flows were then calculated with future land use and existing hydraulic conditions. This second scenario represents what would happen in the basin if complete land development occurs with no stormwater management improvements. These two scenarios provide the basis for problem identification and as a starting point for design planning.

The design process then consisted of numerous flow calculations using fully developed land use conditions and UDSWM2-PC routing of various design proposals. The result is the SOUTH ROBBINSDALE DRAINAGE BASIN DESIGN PLAN as presented in the DESIGN PLAN section of this report.

Peak 10 year and 100 year flows for existing land use and existing hydraulic conditions are given on Table 6. Peak 100 year storm flows for (1) existing land use and existing hydraulic conditions, (2) fully developed land use conditions with existing hydraulic conditions, and (3) design plan conditions are given on Table 7. Peak 10 year and 100 year flows for design plan conditions are given on Table 8. Design plan flows are also given in the DESIGN PLAN chapter of this report.

Hydrographs for direct flow elements and detention ponds are given in Appendix A. UDSWM2-PC printouts for recommended Design Plan hydraulic conditions are given in Appendix B. UDSWM2-PC printouts for existing land use and existing hydraulic conditions are given in Appendix C and printouts for existing hydraulic conditions with future land use are given in Appendix D.

FLOODPLAIN

FEMA prepared detailed floodmaps for a portion of the study area in 1981. The floodplain maps were revised in 1990 based on an analysis completed by the City of Rapid City. The City analysis incorporated the effects of detention facilities and channel work and resulted in a revised floodmap between Highway 79 and the upstream limit. Copies of the FEMA floodplain maps (Panels 9 and 10, Sept 1990) are included in the pocket at the rear of this report binder.

Flows calculated by FEMA and the City of Rapid City were compared to the existing condition flows determined in this South Robbinsdale DBDP study. Flows for certain common locations between studies are given on Table 9. Note that existing condition DBDP flows are higher than those calculated by FEMA and the City of Rapid City. Primary reasons for the higher flows are:

(1) FEMA discharges (1981) were taken from regional discharge curves. These discharge curves are based on data from several gaging stations located in undeveloped basins in and around the Black Hills. It is expected that flows from even a partially urbanized South Robbinsdale Basin would be higher than those from the regional curves.

(2) City of Rapid City runoff calculations for the 1990 revision used a one-hour rainfall of 2.7 inches per hour which was the City of Rapid City modeling criteria at that time. The South Robbinsdale Drainage Basin Design Plan calculations use a higher rainfall of 2.95 inches per hour which is the design rainfall now specified by the RCDCM.

(3) Additional subdivision development has occurred in the basin since the City calculations were made.

It was beyond the scope of work to establish floodplain boundaries. In order to minimize the need for future map revisions, a goal for the DBDP was for future flows to be less than or equal to the FEMA flows. Except at the basin discharge point, Highway 79, and immediately downstream of Parkview Drive this goal has generally been met (see Table 9) and it is judged that existing floodplain maps will be adequate. It appears that channels have not significantly changed since the floodmaps were prepared and it was therefore assumed the existing maps will be accurate for flows that generally match the flows used for the floodmap preparation. It should be noted that the existing floodplain map was not checked for accuracy.

Flows near Highway 79 and at the basin discharge are slightly higher than FEMA floodmapping flows; however, major channel reconstruction is recommended in this area (Elements 1, 2, and a portion of 4) and revised flood maps can be prepared at time of channel reconstruction. Furthermore, it is judged that a map revision is not warranted in the event the channels are not improved since DBDP flows are only slightly above FEMA flows. It is also likely that DBDP flows will be reduced somewhat if channels are not improved due to channel storage created by broad floodplains and high n values.

An additional location where future flows will be slightly higher than FEMA flows is at the channel just downstream of Parkview Drive (Element 7). Proposed flows are 561 cfs while the FEMA flow is 459 cfs. It is our opinion that the FEMA maps do not require revision at this location since (1) the normal depth variation between the two flows is less than 4" (2.73' vs 2.44'), (2) total depth of the channel upon completion of channel repairs will be about 5' providing in excess of 2 feet of freeboard, (3) top width of the water surface from normal depth calculations will be about 41.4 feet wide (561 cfs) compared to about 39.7 feet (459 cfs) , and (4) the FEMA floodplain, an approximate Zone A map, is drawn about 80 feet wide or twice the required width.

TABLE 6
HYDRAULIC ELEMENT PEAK FLOWS
EXISTING LAND USE & EXISTING HYDRAULICS CONDITIONS

ELEMENT NUMBER	10 YR (CFS)	100 YR (CFS)
1*	430	1,453
2*	438	1,421
3*	21	61
4*	424	1,359
5*	355	1,241
6*	290	1,112
7*	249	521
8*	18	39
9*	6	53
10*	6	53
11*	6	10
12*	45	134
20*	221	917
21*	69	314
22*	42	192
30*	136	533
31*	120	460
100	499	1,587
101	510	1,604
102	476	1,381
103	361	1,240
104	252	524
105	96	216
106	49	146
120	222	920
121	88	407
122	74	331
130	138	535
200	21	41
201	19	37
202	6	53
203	6	10

*ROUTED FLOWS ONLY, SEE APPENDIX A OR HYDRAULICS CHAPTER FOR EXPLANATION.

TABLE 7

HYDRAULIC ELEMENT PEAK FLOWS - 100 YEAR STORM

ELEMENT NUMBER	(1) EXISTING CONDITIONS (CFS)	(2) FULLY DEVELOPED LAND USE & EXISTING HYDRAULICS (CFS)	(3) DESIGN PLAN (CFS)
1*	1,453	1,925	1,231
2*	1,421	1,951	1,178
3*	61	61	61
4*	1,359	1,898	1,164
5*	1,241	1,737	944
6*	1,112	1,557	779
7*	521	562	561
8*	39	72	32
9*	53	70	70
10*	53	70	70
11*	10	11	11
12*	134	177	70
20*	917	1,315	658
21*	314	426	144
22*	192	236	236
30*	533	778	498
31*	460	658	483
100	1,587	2,076	1,463
101	1,604	2,172	1,467
102	1,381	1,934	1,247
103	1,240	1,737	939
104	524	568	568
105	216	231	232
106	146	181	181
120	920	1,313	658
121	407	584	285
122	331	456	456
130	535	785	503
200	61	61	61
201	37	76	32
202	53	70	70
203	10	11	11
300	N.A.	N.A.	70
301	N.A.	N.A.	144
302	N.A	N.A.	499
303	N.A	N.A.	489

*ROUTED FLOWS ONLY, SEE APPENDIX A OR HYDRAULICS CHAPTER FOR EXPLANATION.

TABLE 8 - SUMMARY OF DESIGN PLAN

HYDRAULIC ELEMENT PEAK FLOWS
FUTURE LAND USE AND DESIGN PLAN HYDRAULIC CONDITIONS

ELEMENT NUMBER	10 YR (CFS)	100 YR (CFS)
1*	489	1,231
2*	518	1,178
3*	21	61
4*	505	1,164
5*	431	944
6*	364	779
7*	274	561
8*	19	32
9*	6	70
10*	6	70
11*	6	11
12*	40	70
20*	308	658
21*	89	144
22*	73	236
30*	206	498
31*	201	483
100	585	1,463
101	621	1,467
102	565	1,247
103	442	939
104	280	568
105	111	232
106	68	181
120	309	658
121	141	285
122	155	456
130	220	503
200	21	61
201	19	32
202	6	70
203	6	11
300	40	70
301	91	144
302	208	499
303	207	489

*ROUTED FLOWS ONLY, SEE APPENDIX A OR HYDRAULICS CHAPTER FOR EXPLANATION.

TABLE 9

FEMA - DBDP FLOW COMPARISON

100 YEAR FLOWS AT CERTAIN COMMON MODELING LOCATIONS BETWEEN STUDIES

LOCATION	1981 FEMA	1990 CITY OF RAPID CITY	S. ROBB. DBDP Existing Conditions	S. ROBB. DBDP Design Plan Conditions
Basin Discharge (Element 100)	1,390 cfs	N.A.	1,587 cfs	1,463 cfs
Highway 79 (Element 101)	N.A.	1,391 cfs	1,604 cfs	1,467 cfs
Elm Street (Element 103)	N.A.	1,036 cfs	1,240 cfs	939 cfs
Channel Upstream Of Elm Ave. (Element 6)	N.A.	936 cfs	1,112 cfs	779 cfs
Channel Downstream of Parkview Dr. (Element 7)	N.A.	459 cfs	521 cfs	561 cfs
Minnesota Street (Element 120)	N.A.	722 cfs	920 cfs	658 cfs

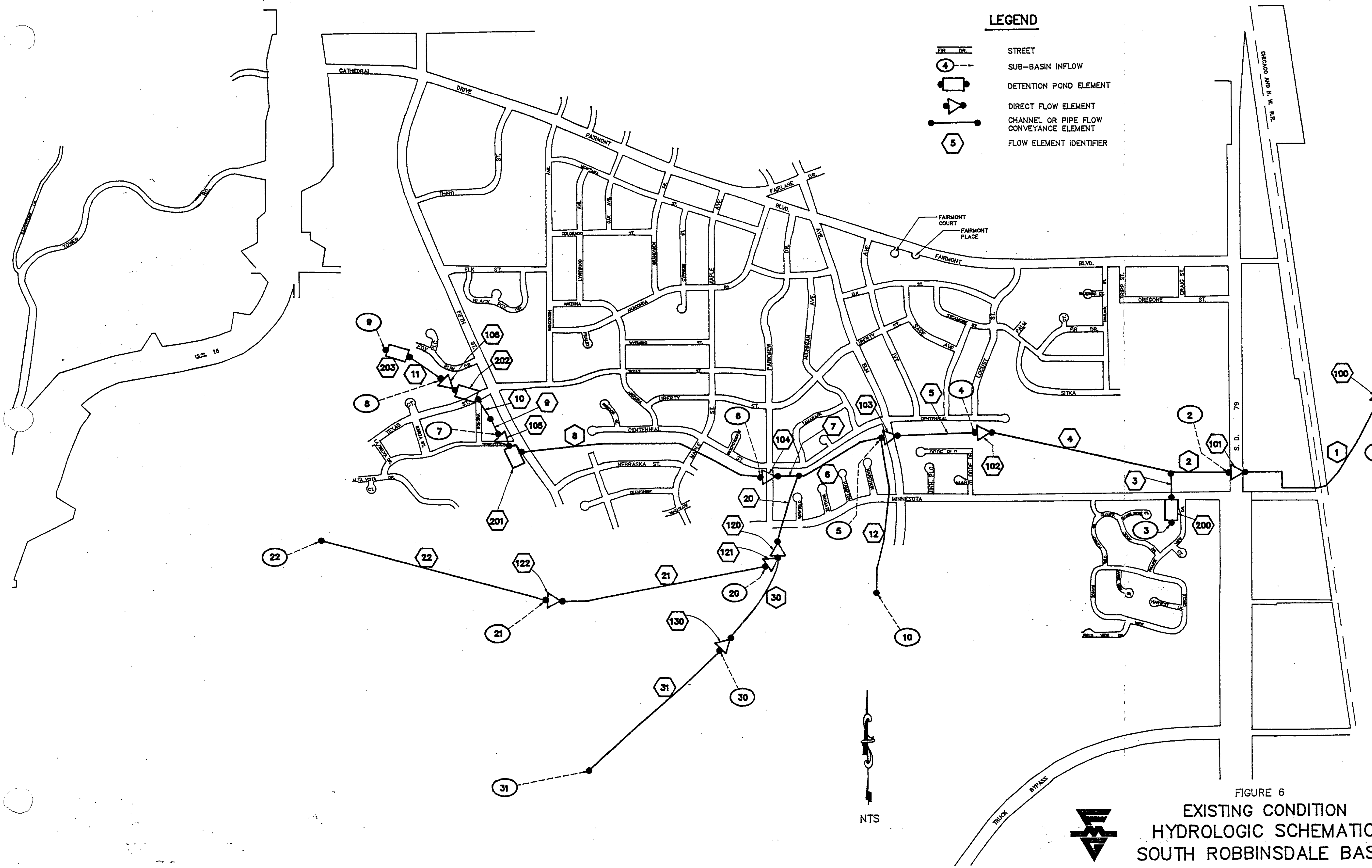


FIGURE 6
EXISTING CONDITION
HYDROLOGIC SCHEMATIC
SOUTH ROBBINSDALE BASIN

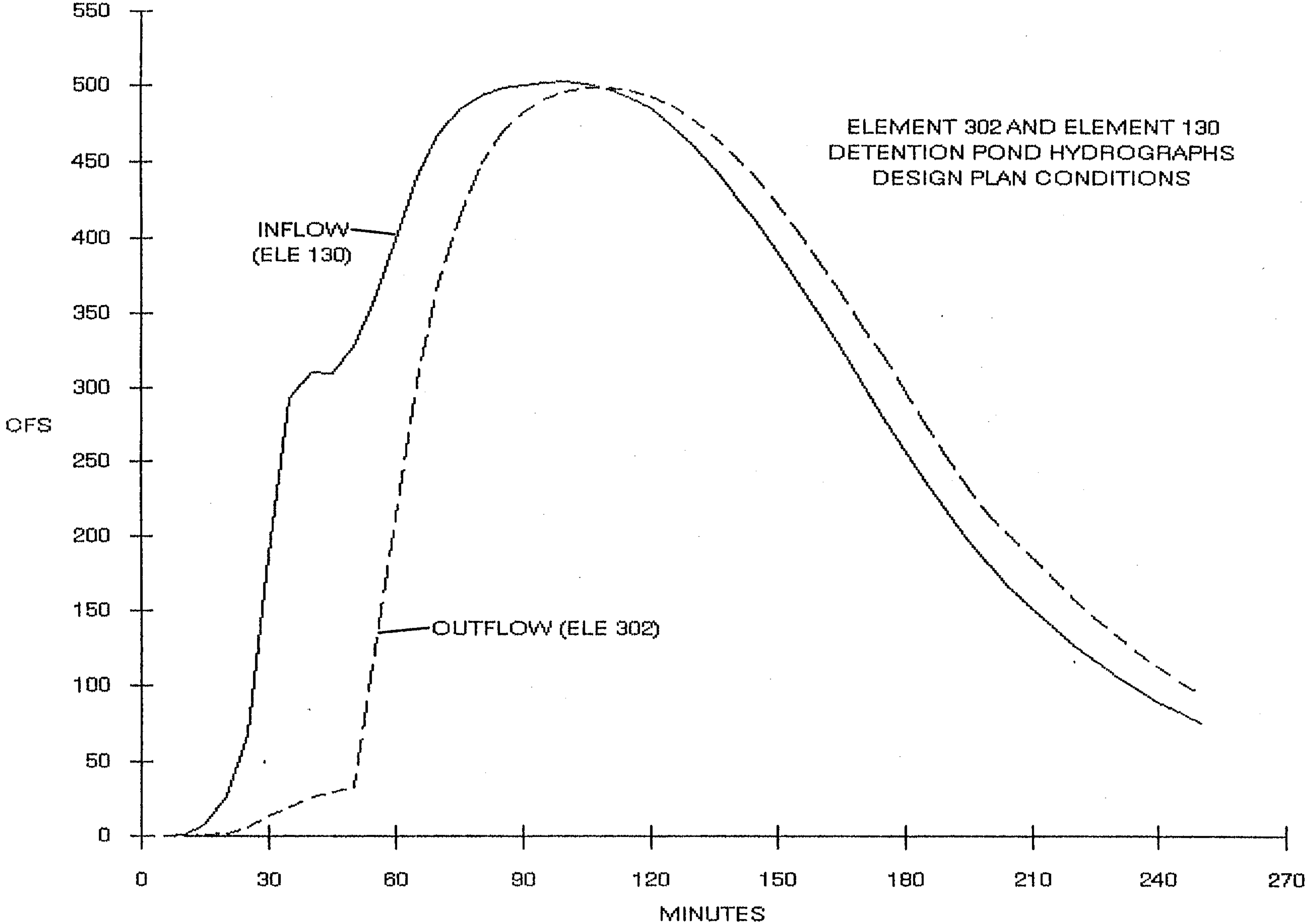
APPENDIX A

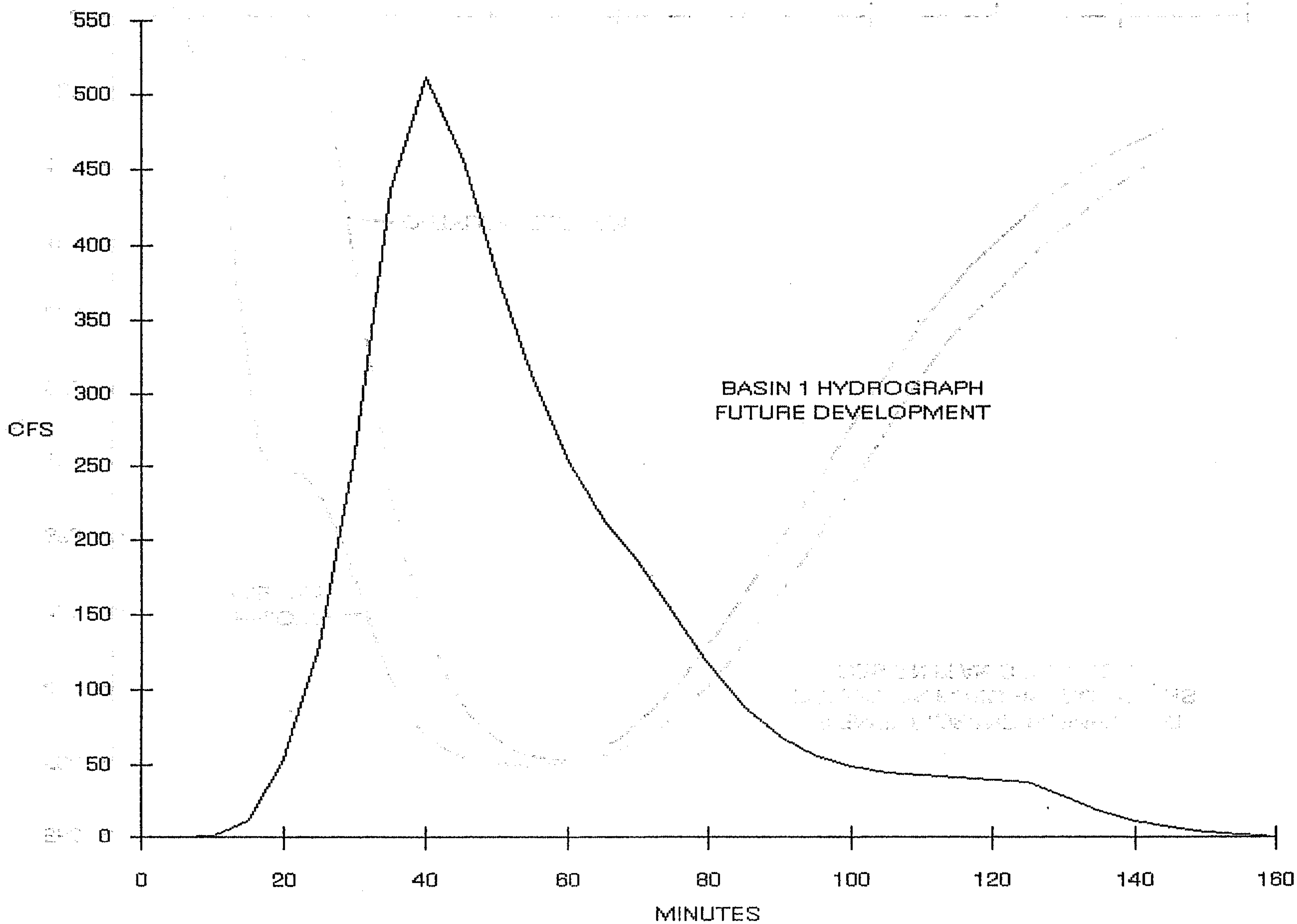
DESIGN PLAN HYDROGRAPHS

This appendix contains design plan hydrographs for sub-basins, direct flow elements and detention ponds. The hydrographs are for design plan conditions which are future land use and design plan hydraulic conditions. The hydrographs are in numerical order.

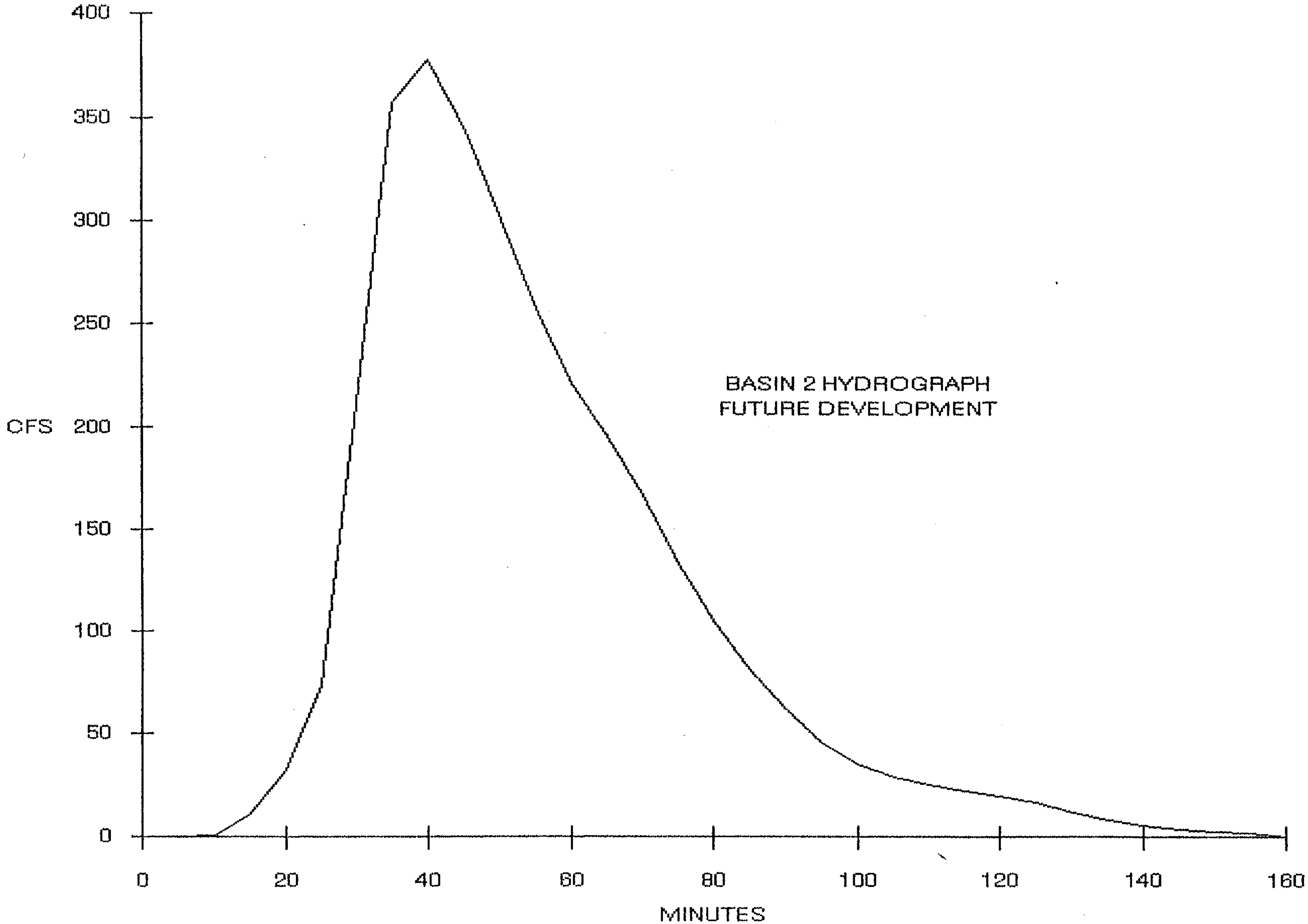
CAUTION STATEMENT

The user is advised to use caution when using flow conveyance element (channels and pipes) peak flows and hydrographs given in this report. The UDSWM2-PC model assumes that all adjacent sub-basin flow enters the flow conveyance element at the sub-basin design point or the downstream end of the element. The flow conveyance element is simply routing the upstream incoming flow and ignoring the possibility that additional flow may be entering from the adjacent sub-basin. Due to this model limitation flow used for channel or pipe design should be increased appropriately using engineering judgment to reflect incoming sub-basin flow.

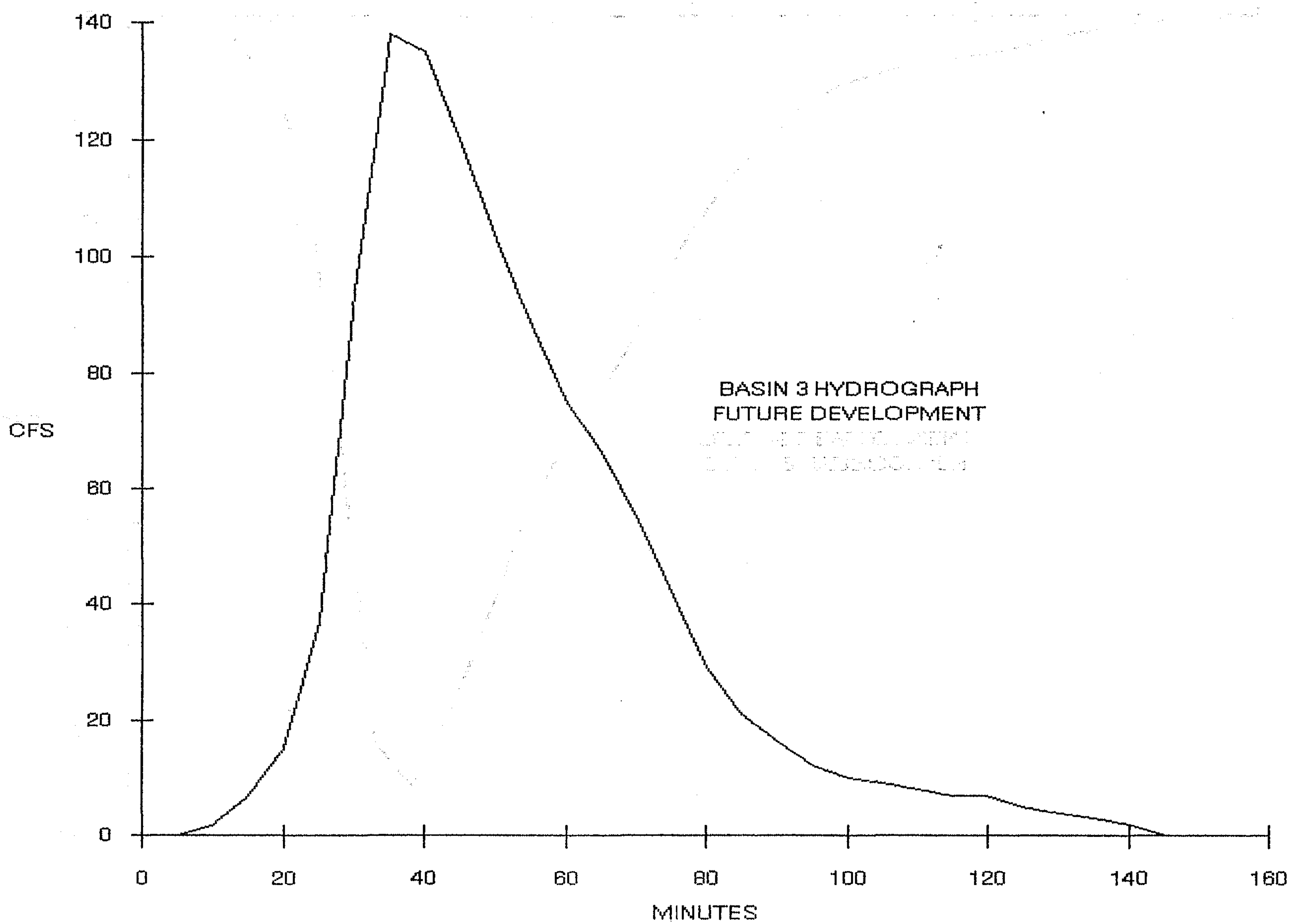

ELEMENT 302 AND ELEMENT 130
DETENTION POND HYDROGRAPHS
DESIGN PLAN CONDITIONS
INFLOW
(ELE 130)
OUTFLOW (ELE 302)
CFS
550
500
450
400
350
300
250
200
150
100
50
0
0
30
60
90
120
150
180
210
240
270
MINUTES



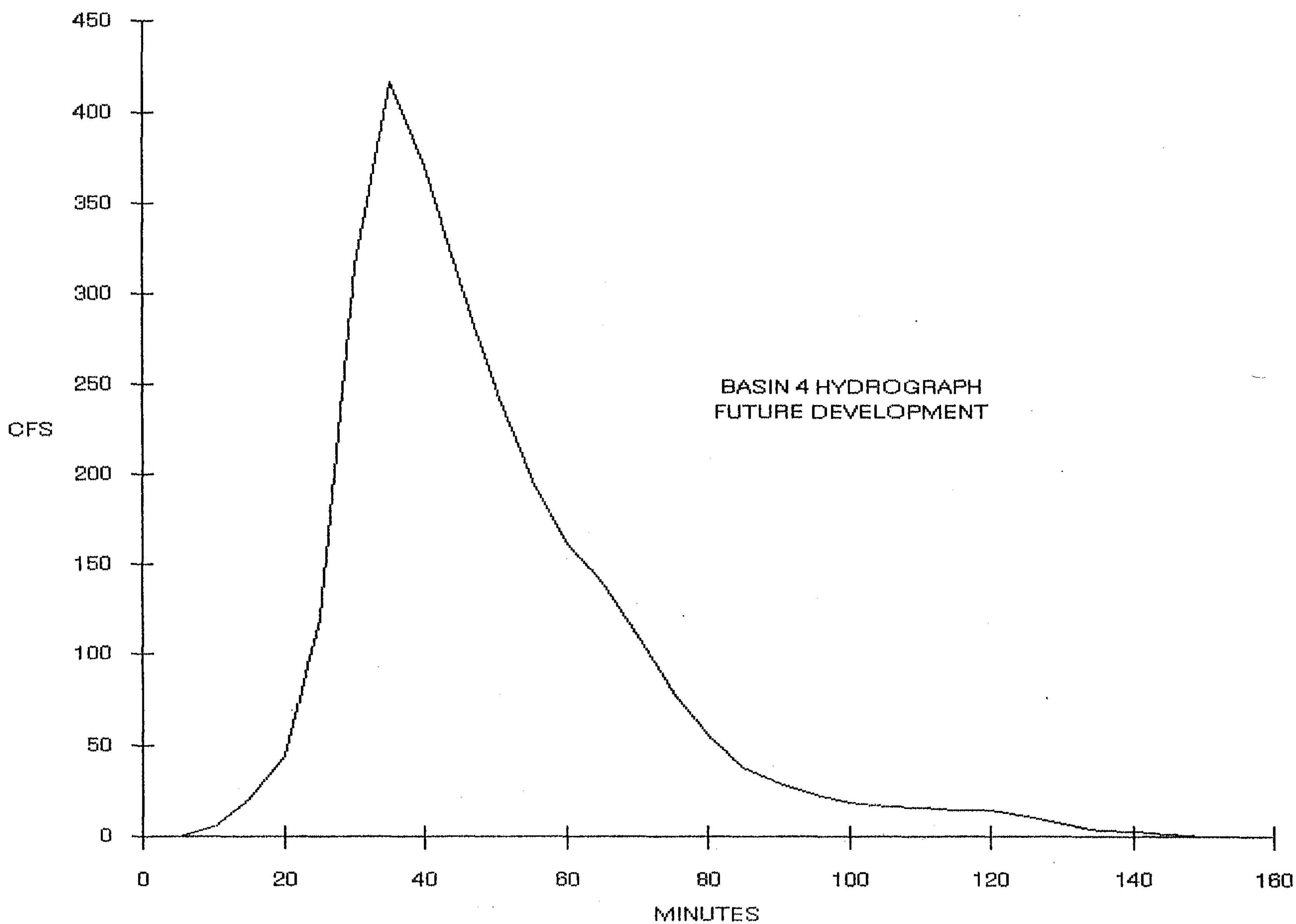
BASIN 1 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
550
500
450
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
120
140
160
MINUTES

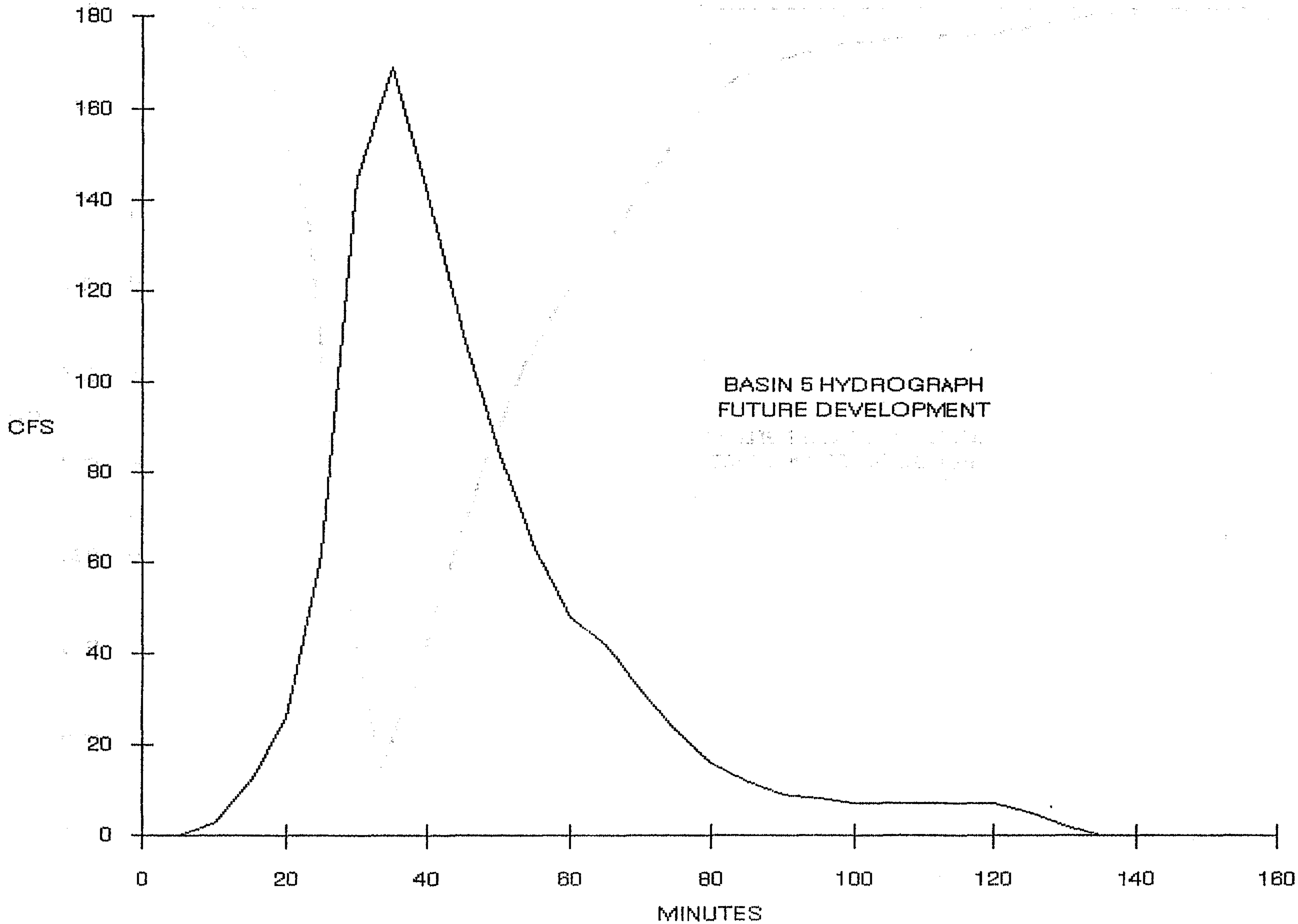


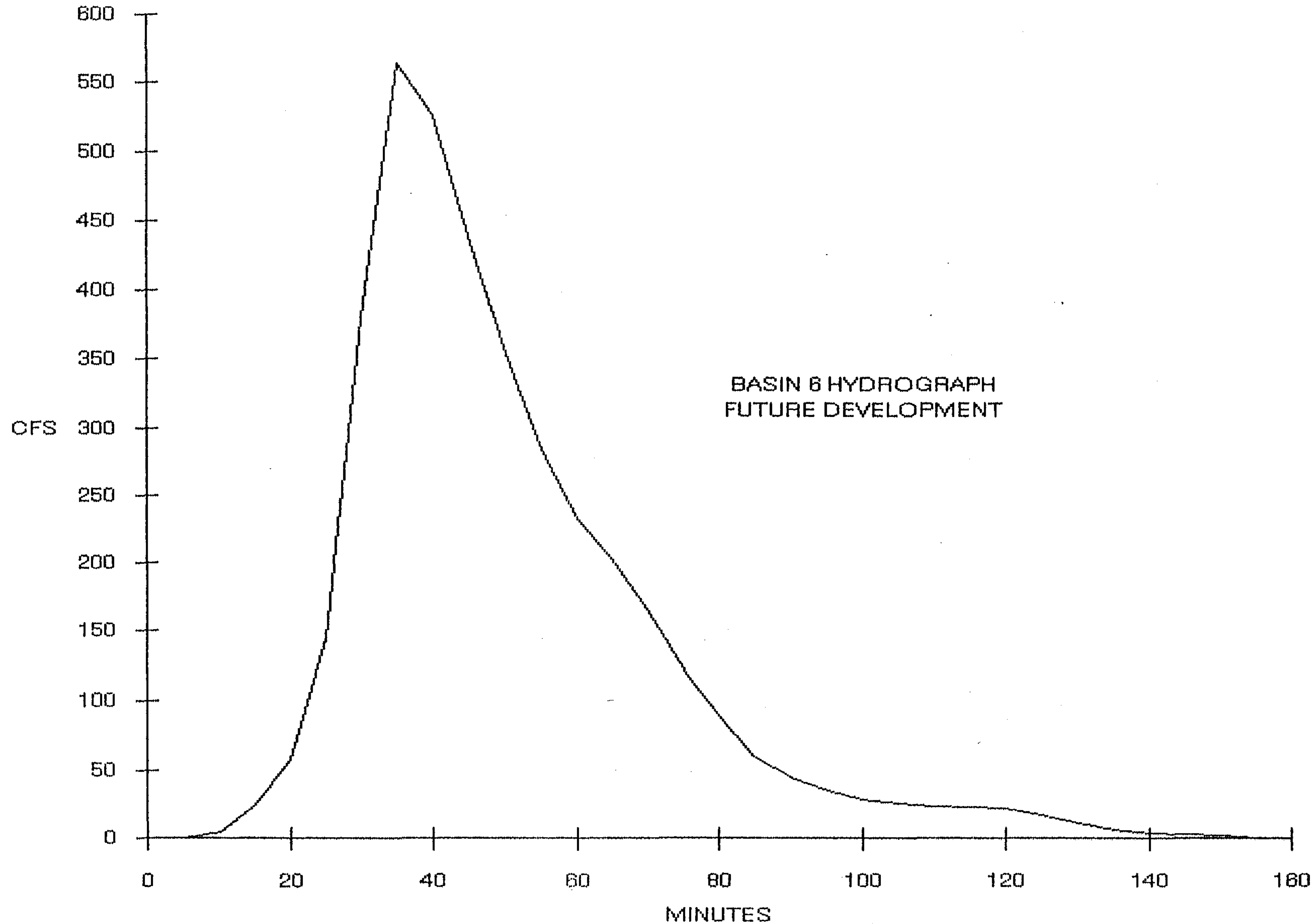
BASIN 2 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
120
140
160
MINUTES

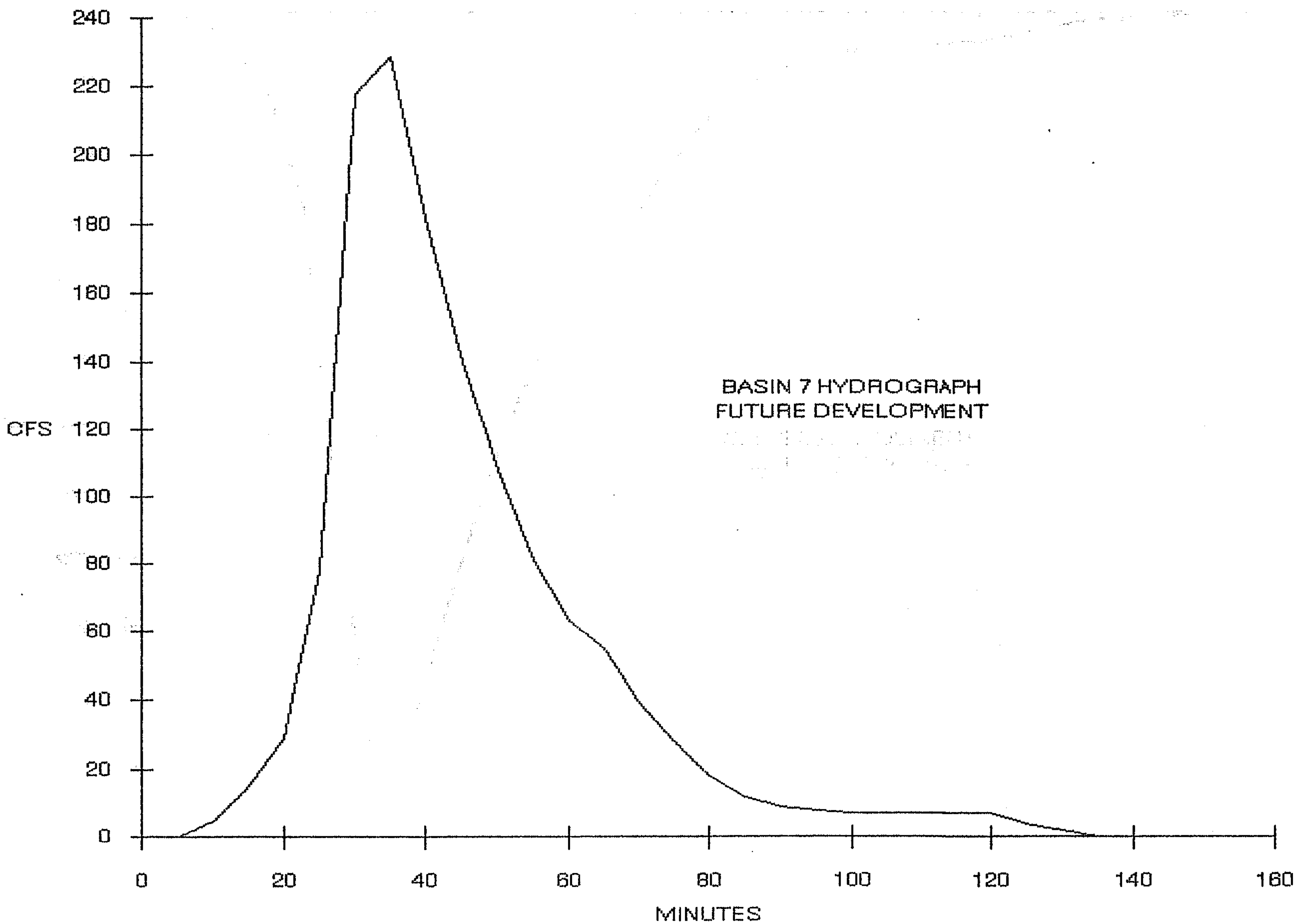


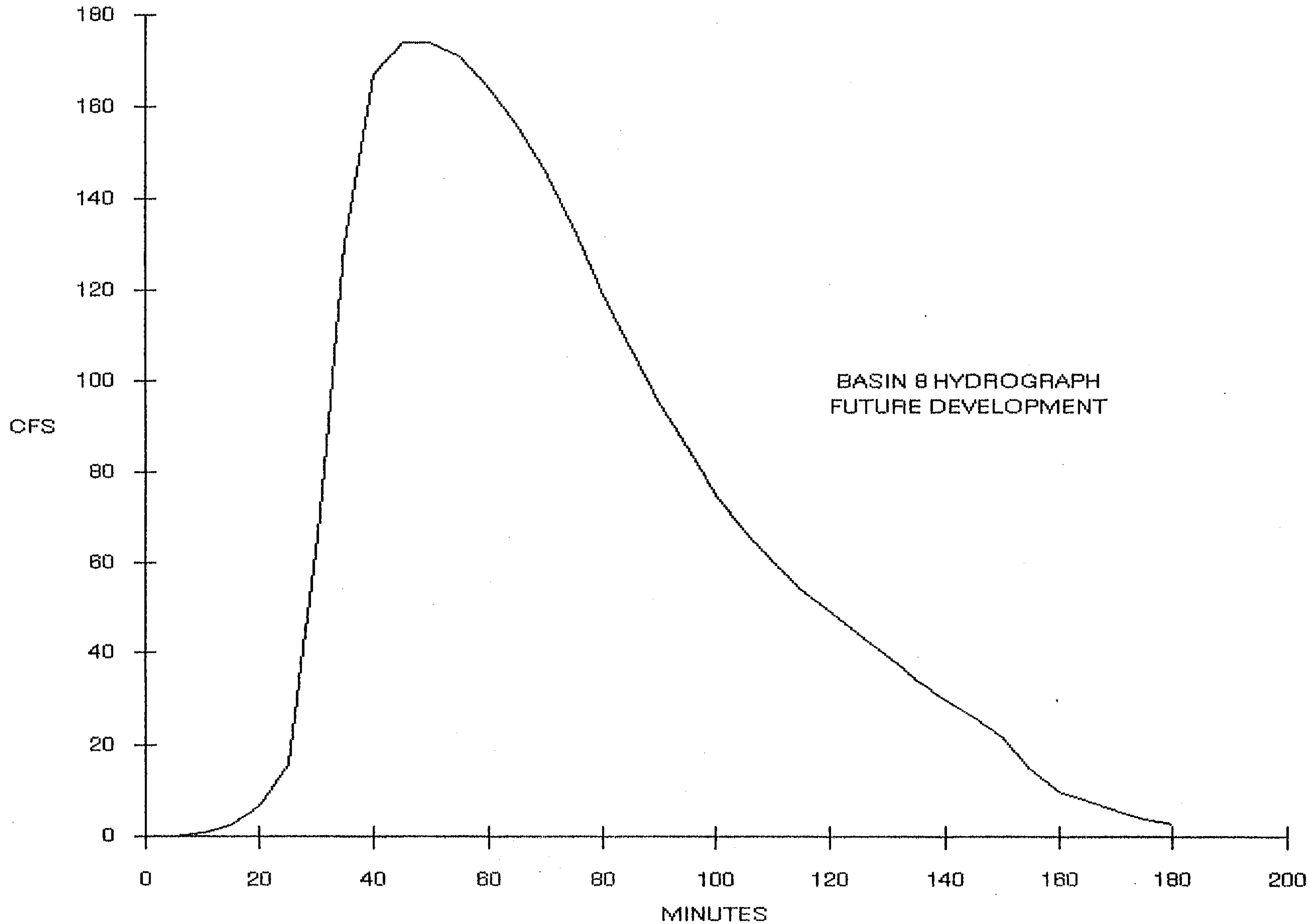
BASIN 3 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
MINUTES
0
20
40
60
80
100
120
140
160


BASIN 4 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
0
50
100
150
200
250
300
350
400
450
0
20
40
60
80
100
120
140
160
MINUTES

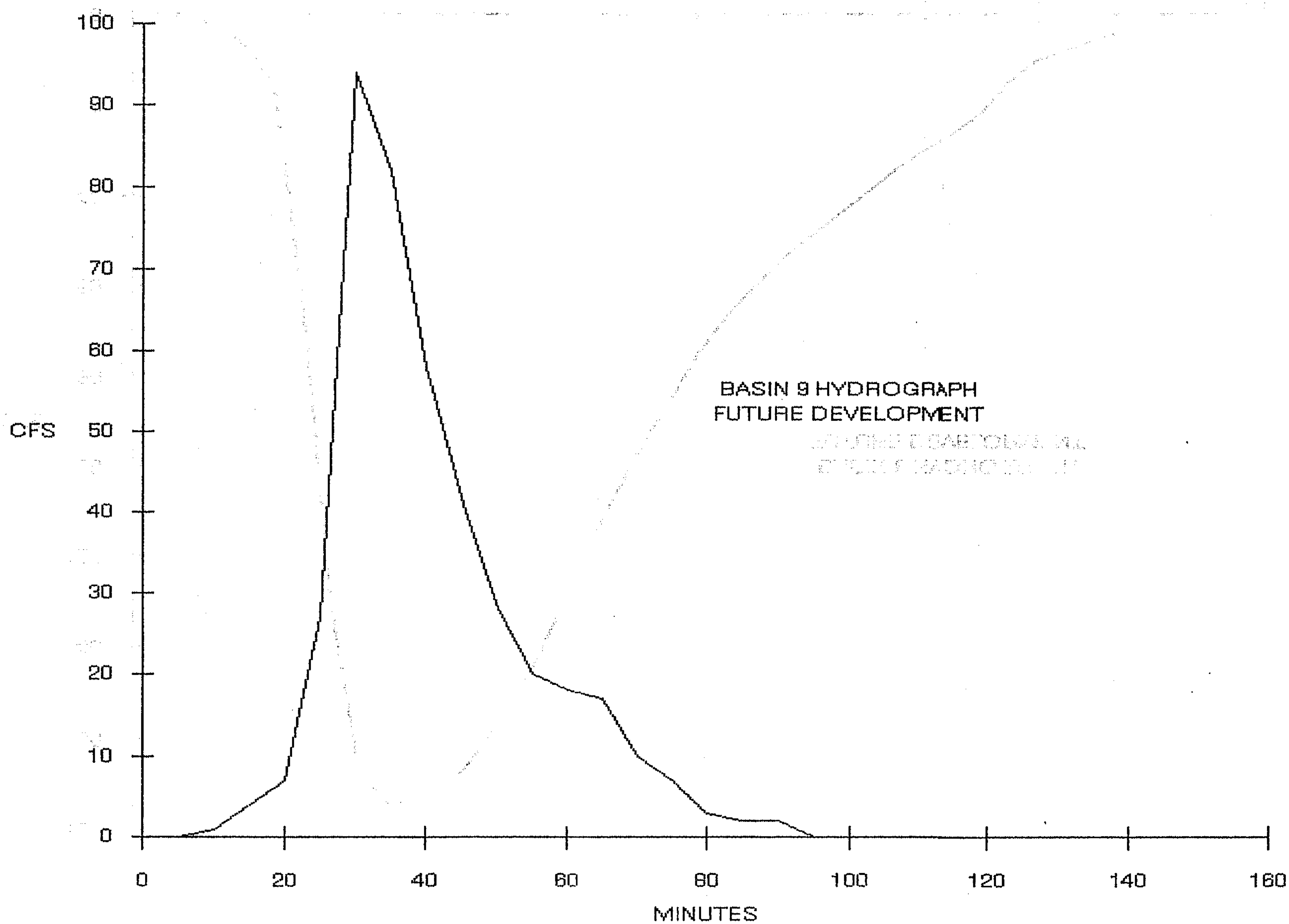

BASIN 5 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
180
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
MINUTES


BASIN 6 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
600
550
500
450
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
120
140
160
MINUTES

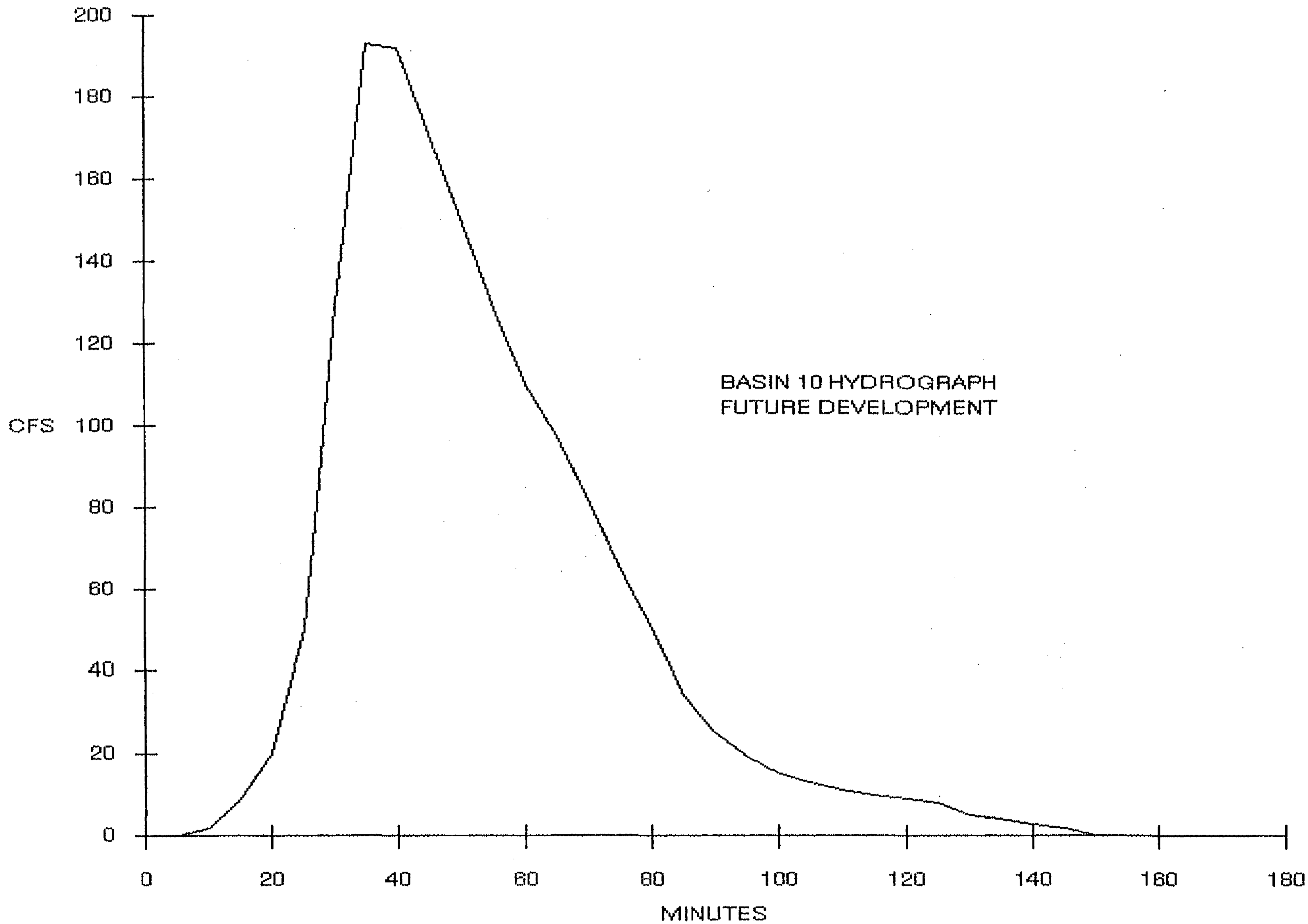

BASIN 7 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
240
220
200
180
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
MINUTES



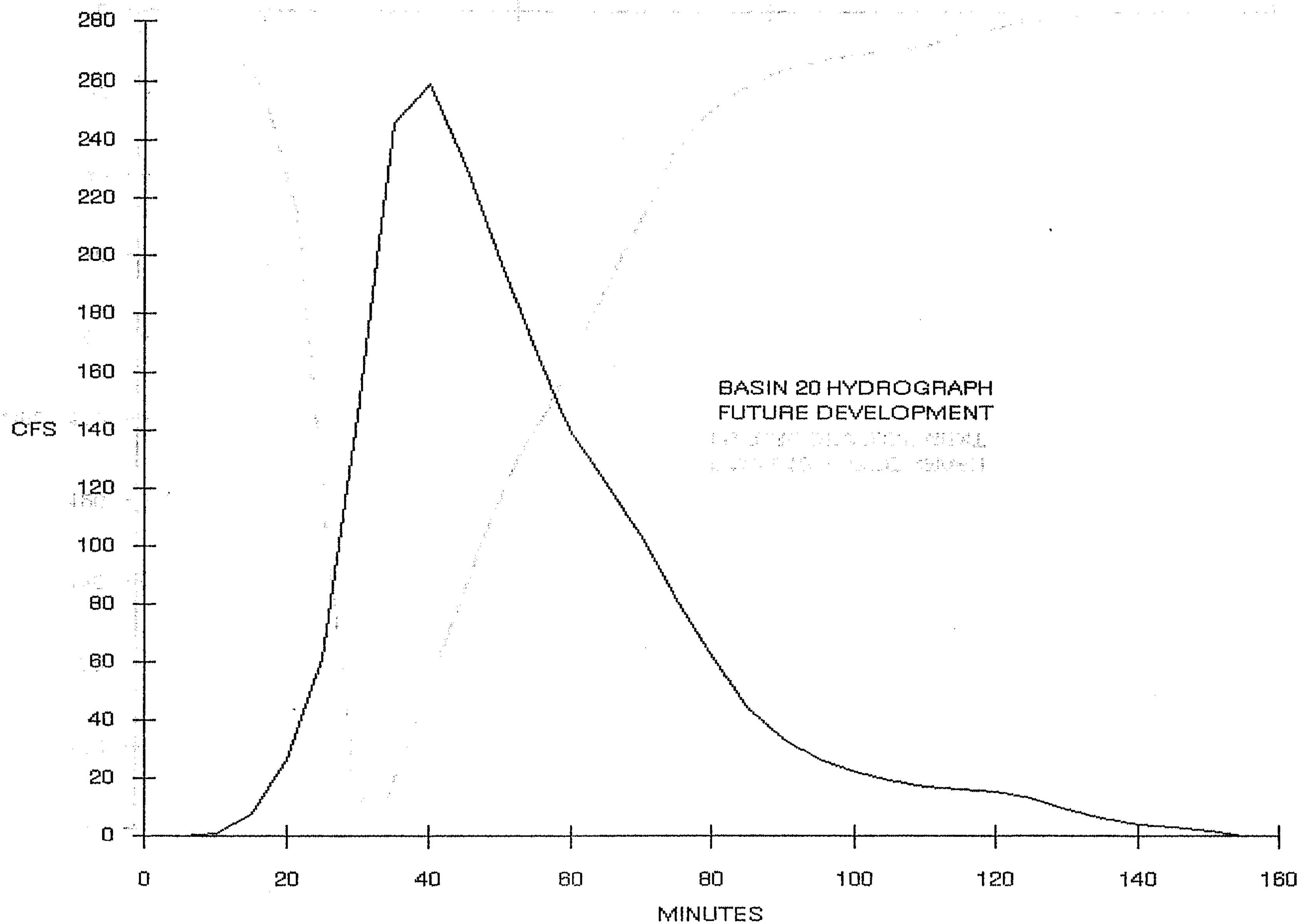
BASIN 8 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
180
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
180
200
MINUTES

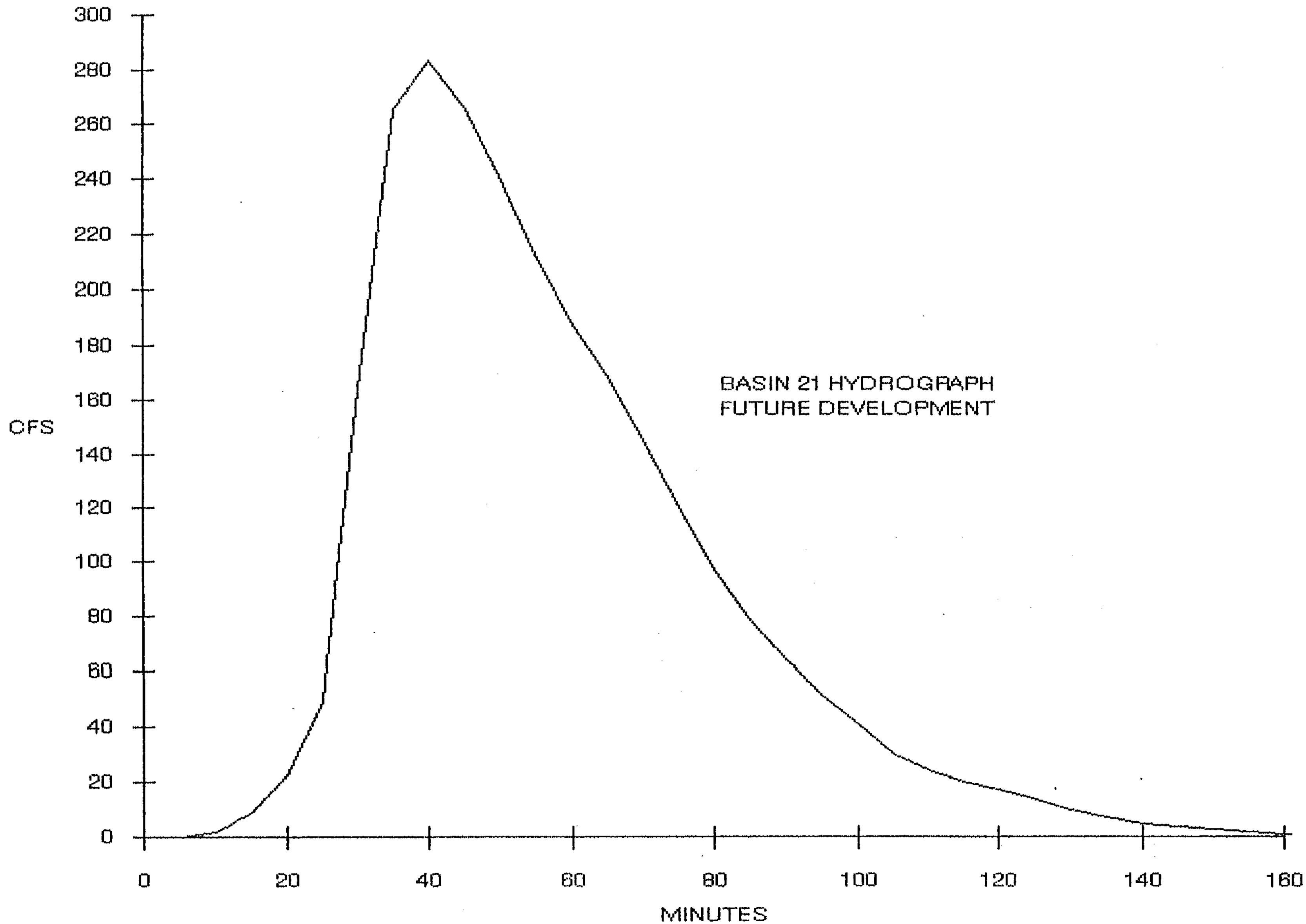


BASIN 9 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
MINUTES
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
160

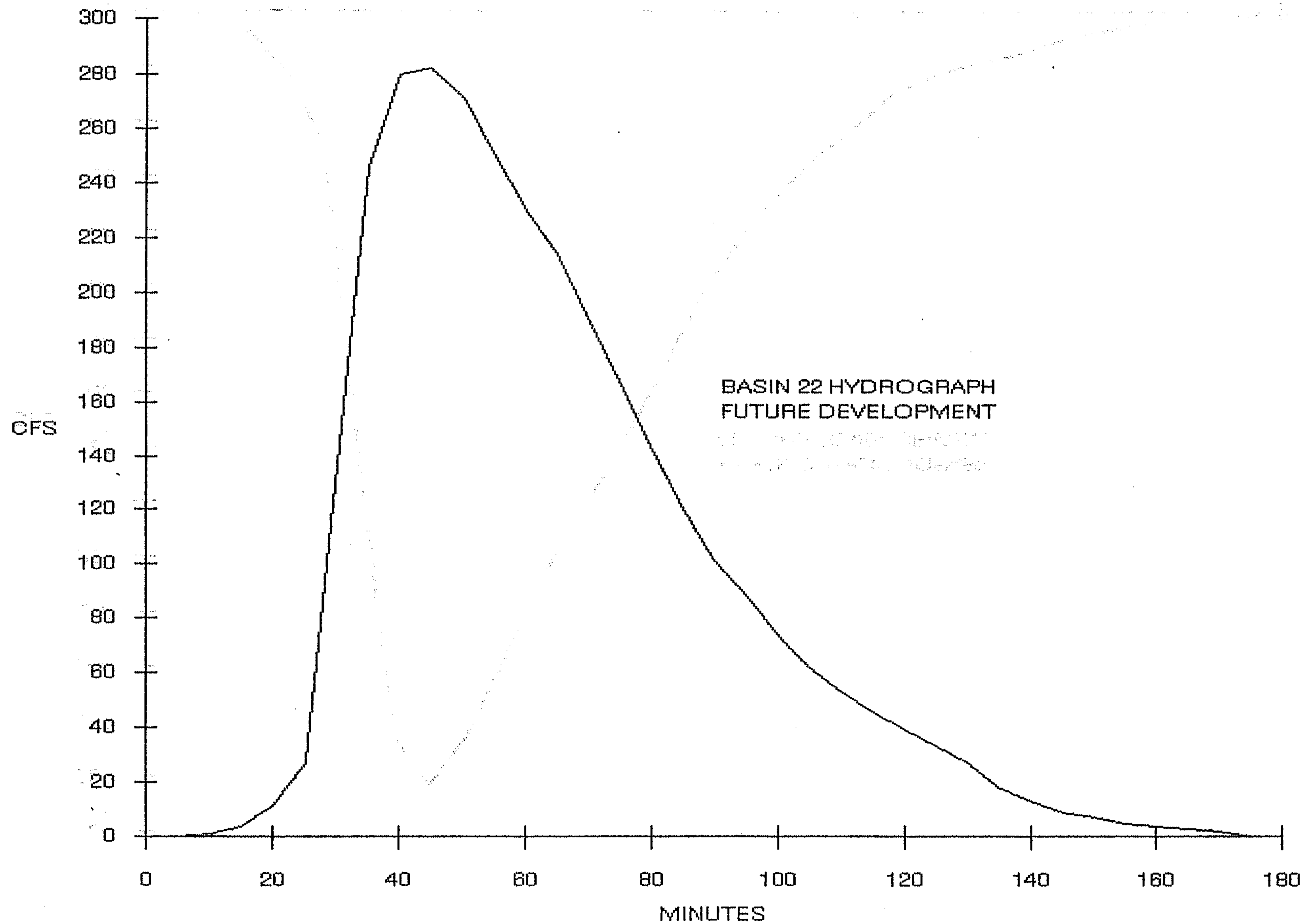


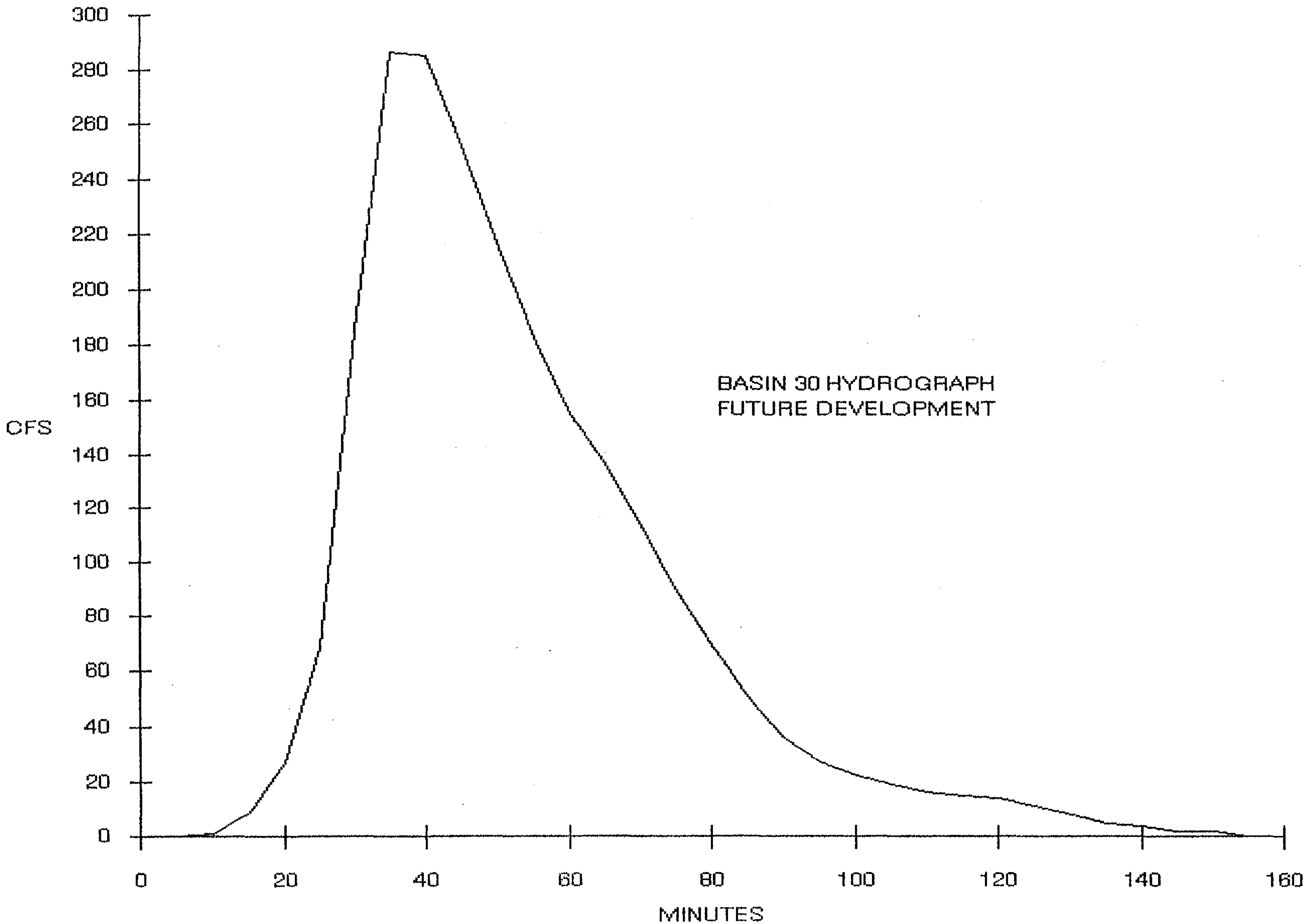
BASIN 10 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
200
180
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
180
MINUTES

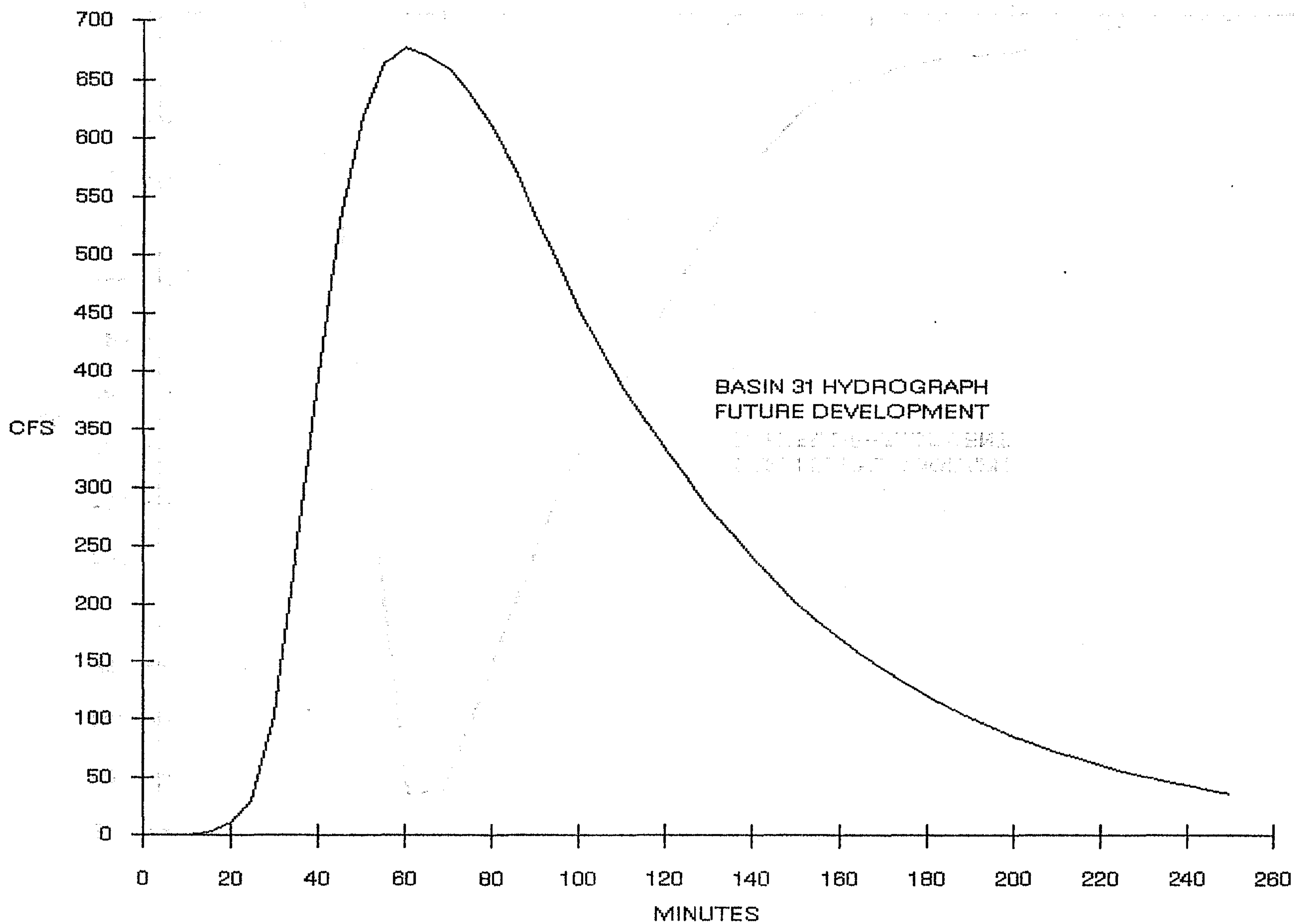

BASIN 20 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
MINUTES



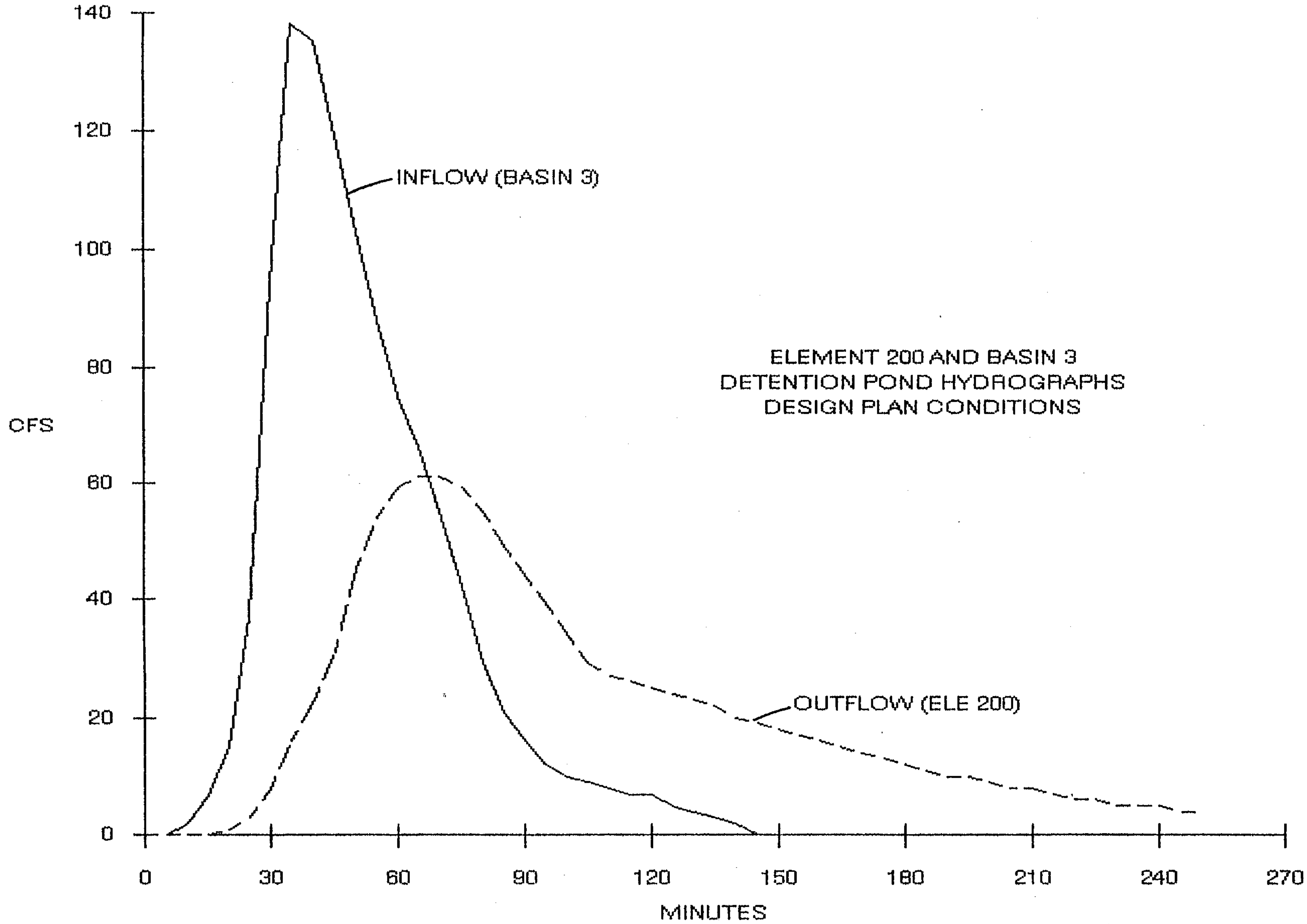
BASIN 21 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
MINUTES
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300


BASIN 22 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
MINUTES
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
180

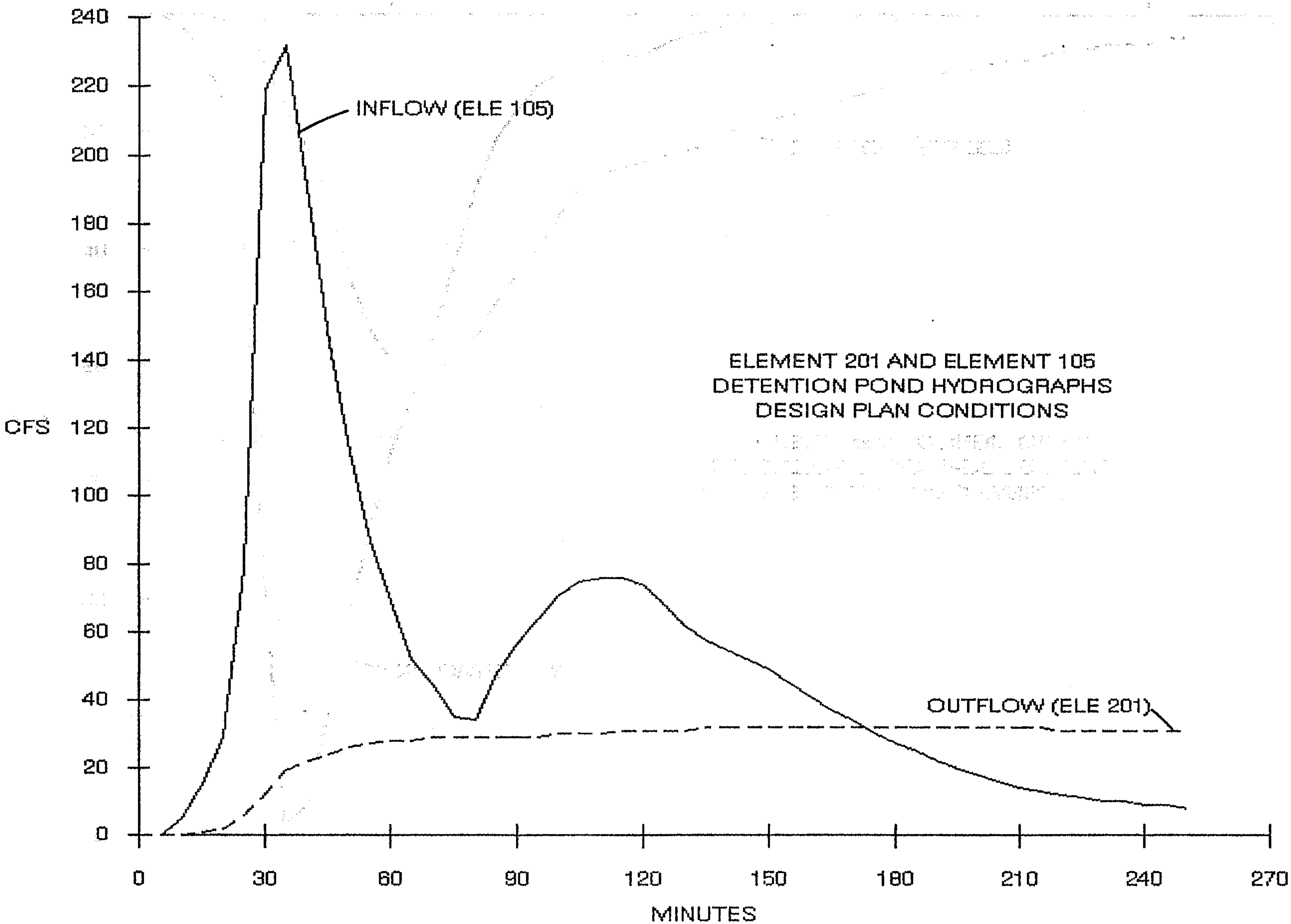

BASIN 30 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
MINUTES
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160



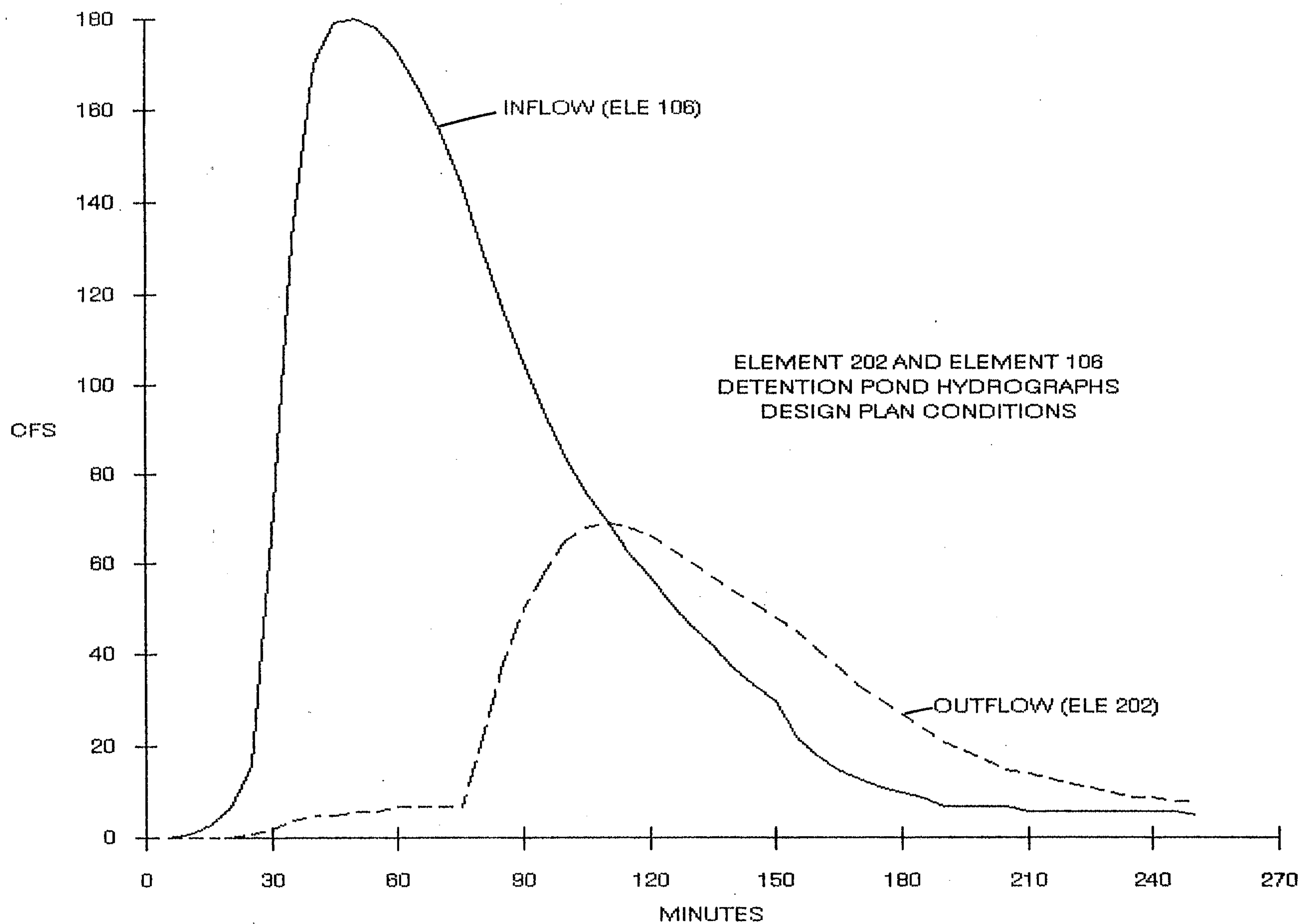
BASIN 31 HYDROGRAPH
FUTURE DEVELOPMENT
CFS
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
120
140
160
180
200
220
240
260
MINUTES

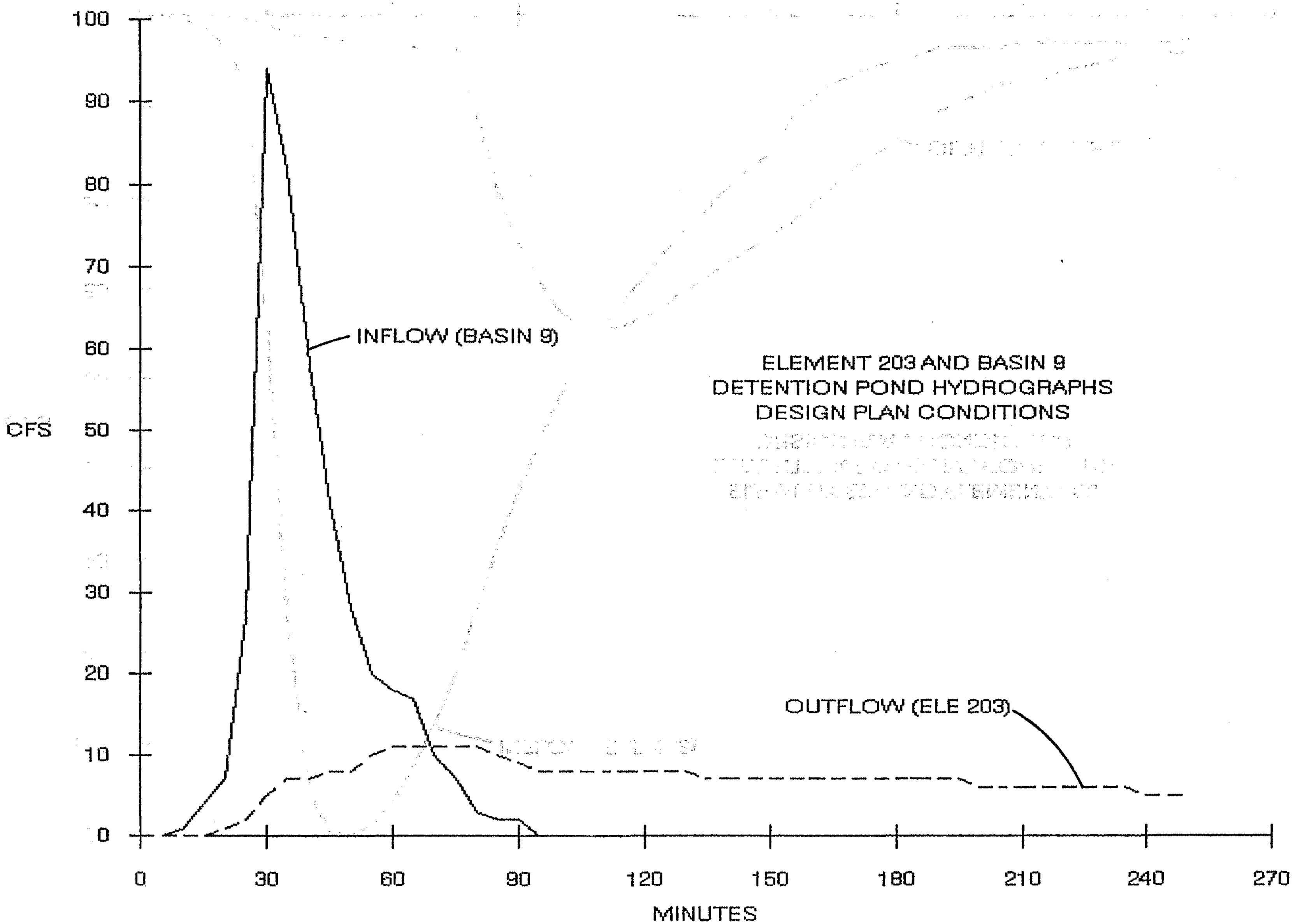


140
120
100
80
60
40
20
0
CFS
INFLOW (BASIN 3)
OUTFLOW (ELE 200)
ELEMENT 200 AND BASIN 3
DETENTION POND HYDROGRAPHS
DESIGN PLAN CONDITIONS
0
30
60
90
120
150
180
210
240
270
MINUTES

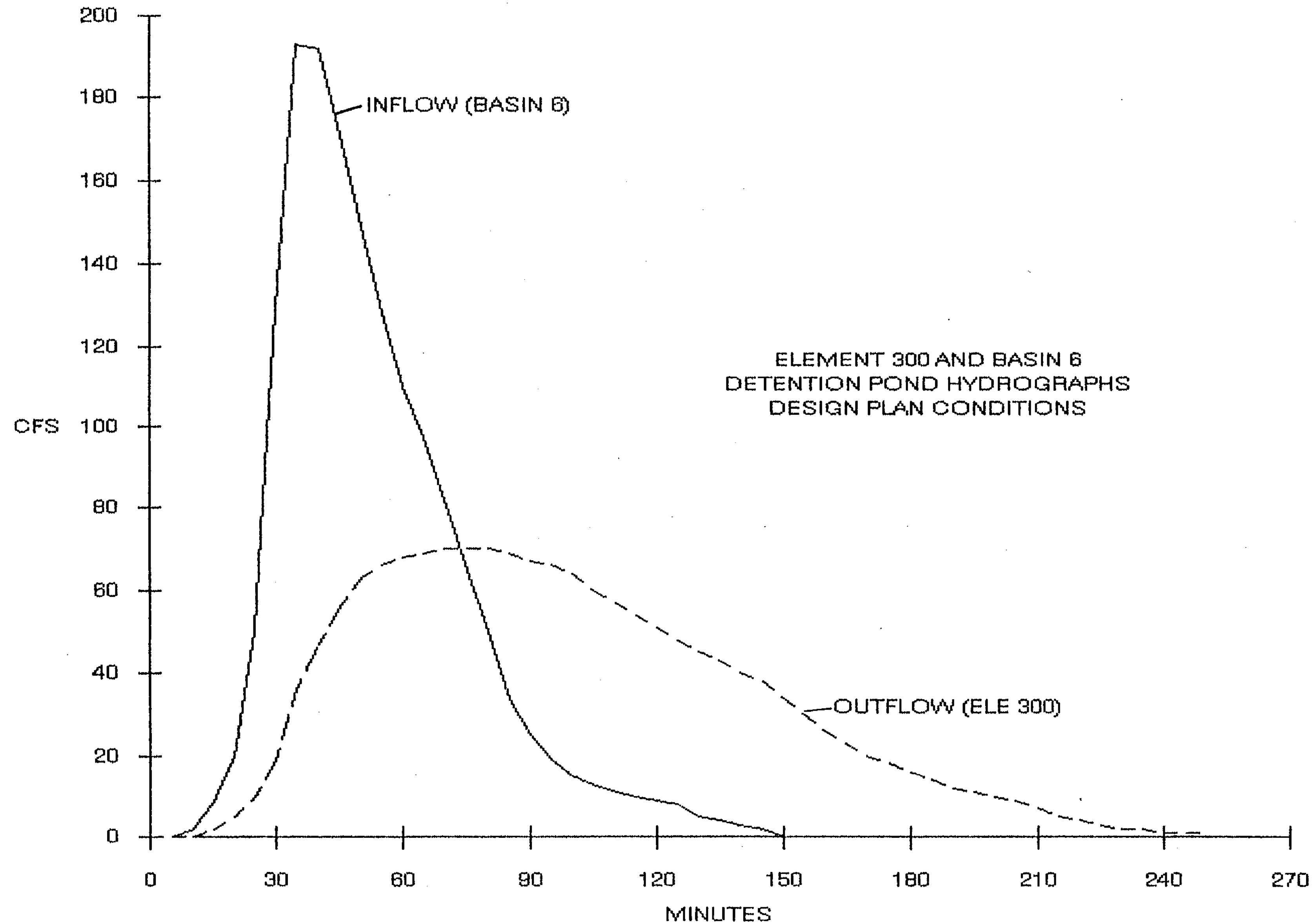


INFLOW (ELE 105)
ELEMENT 201 AND ELEMENT 105
DETENTION POND HYDROGRAPHS
DESIGN PLAN CONDITIONS
OUTFLOW (ELE 201)
CFS
240
220
200
180
160
140
120
100
80
60
40
20
0
0
30
60
90
120
150
180
210
240
270
MINUTES

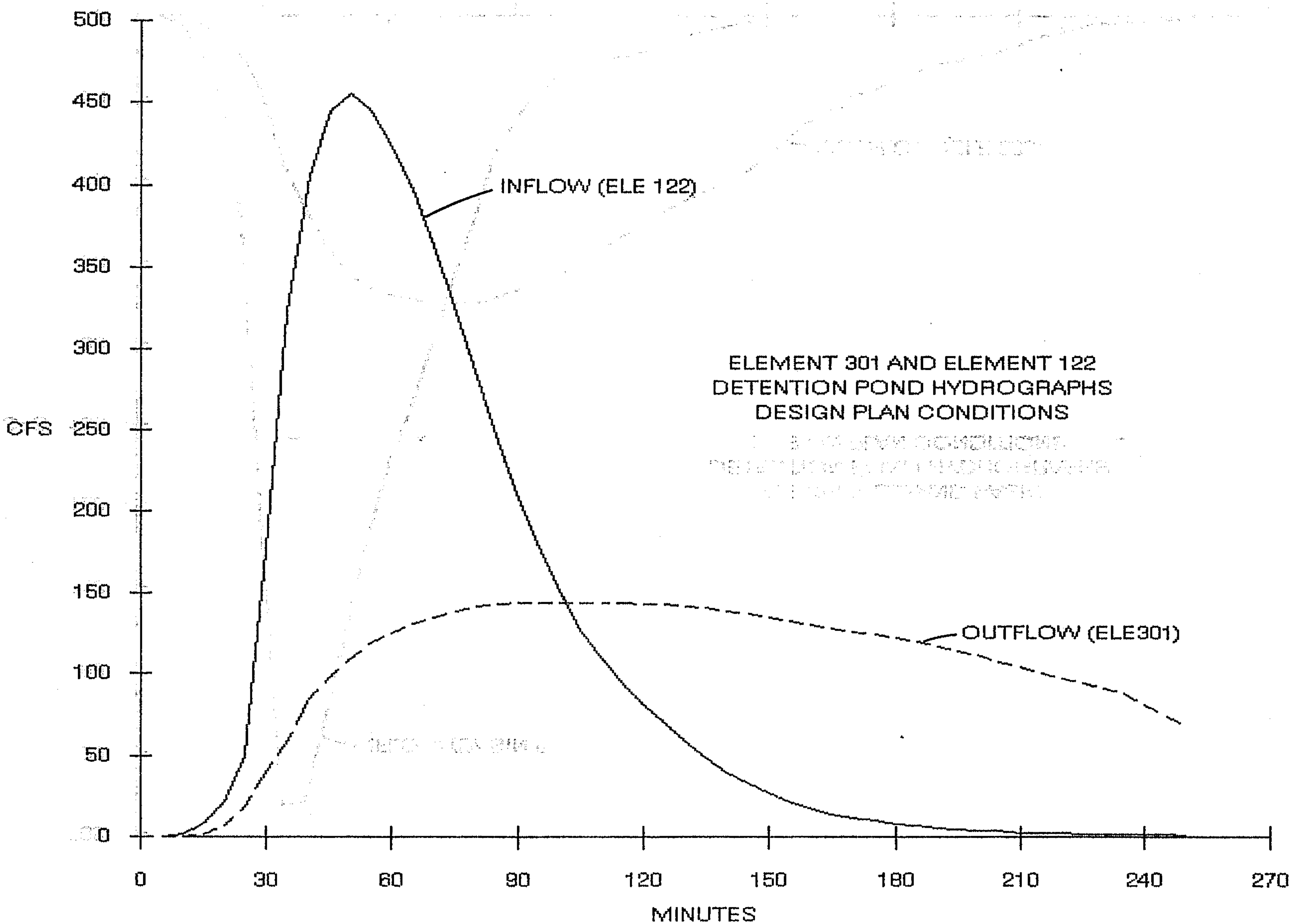

180
160
140
120
100
80
60
40
20
0
CFS
INFLOW (ELE 106)
ELEMENT 202 AND ELEMENT 106
DETENTION POND HYDROGRAPHS
DESIGN PLAN CONDITIONS
OUTFLOW (ELE 202)
0
30
60
90
120
150
180
210
240
270
MINUTES



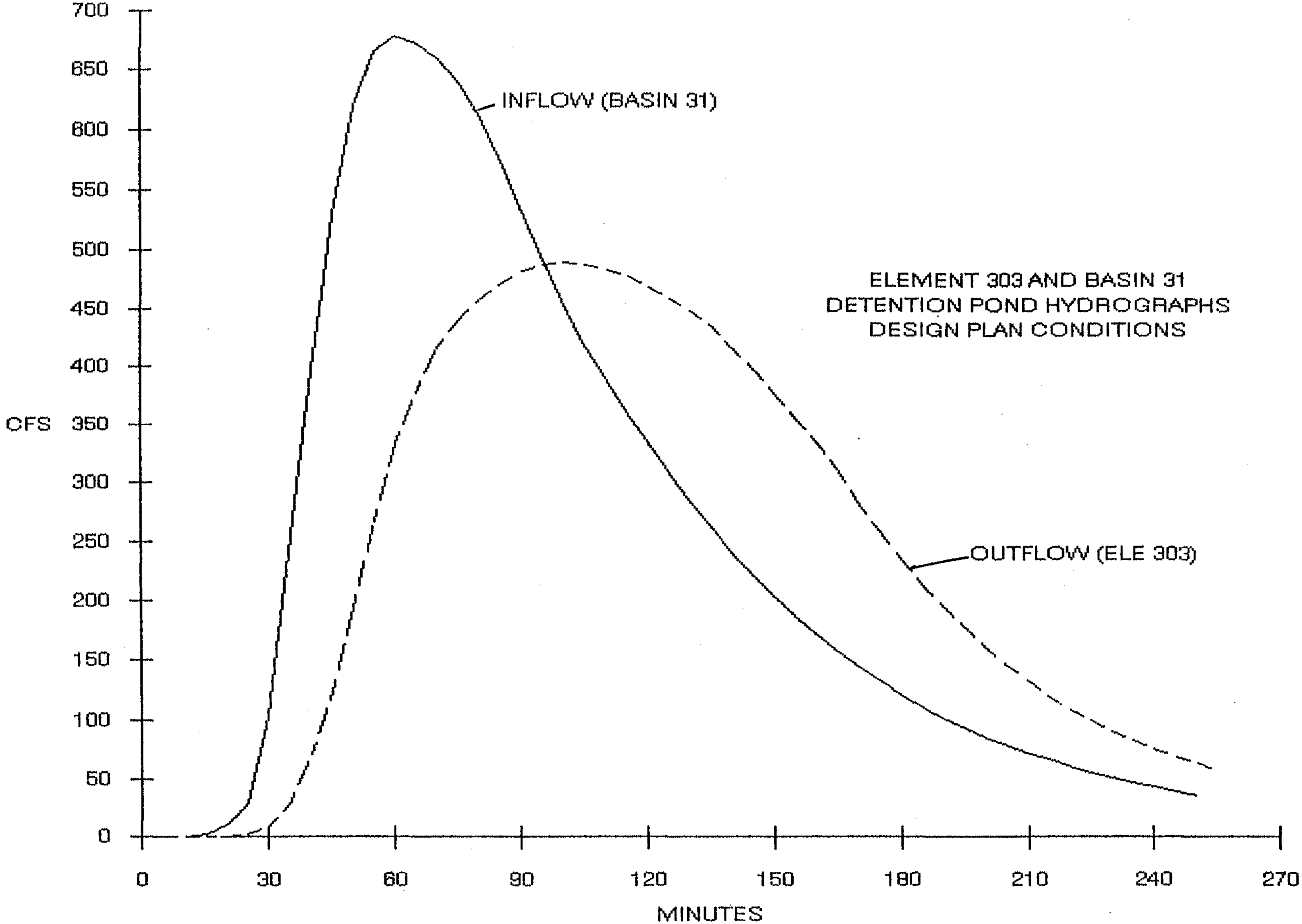
ELEMENT 203 AND BASIN 9
DETENTION POND HYDROGRAPHS
DESIGN PLAN CONDITIONS
INFLOW (BASIN 9)
OUTFLOW (ELE 203)
CFS
100
90
80
70
60
50
40
30
20
10
0
0
30
60
90
120
150
180
210
240
270
MINUTES



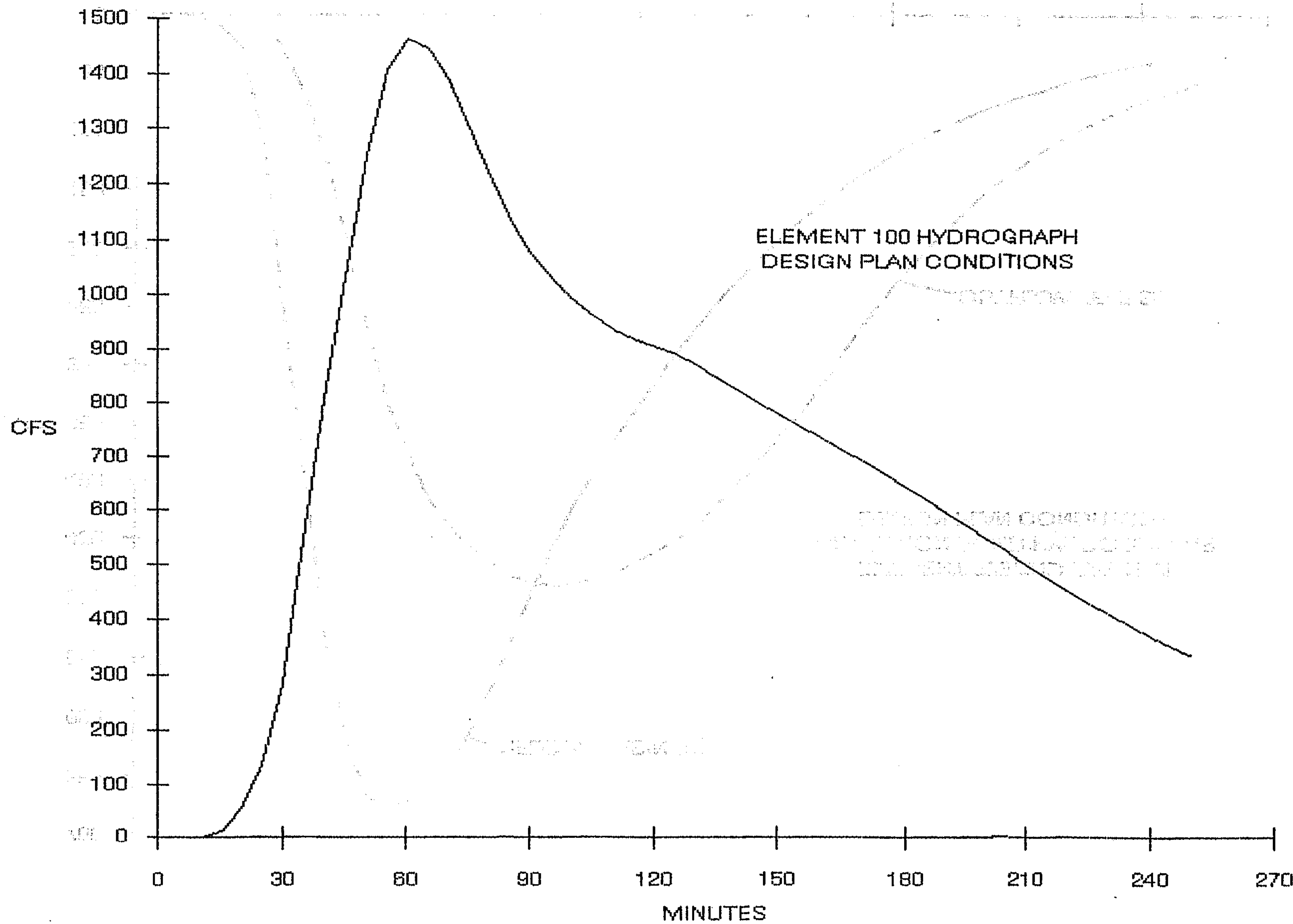
200
180
160
140
120
100
80
60
40
20
0
CFS
INFLOW (BASIN 6)
ELEMENT 300 AND BASIN 6
DETENTION POND HYDROGRAPHS
DESIGN PLAN CONDITIONS
OUTFLOW (ELE 300)
0
30
60
90
120
150
180
210
240
270
MINUTES

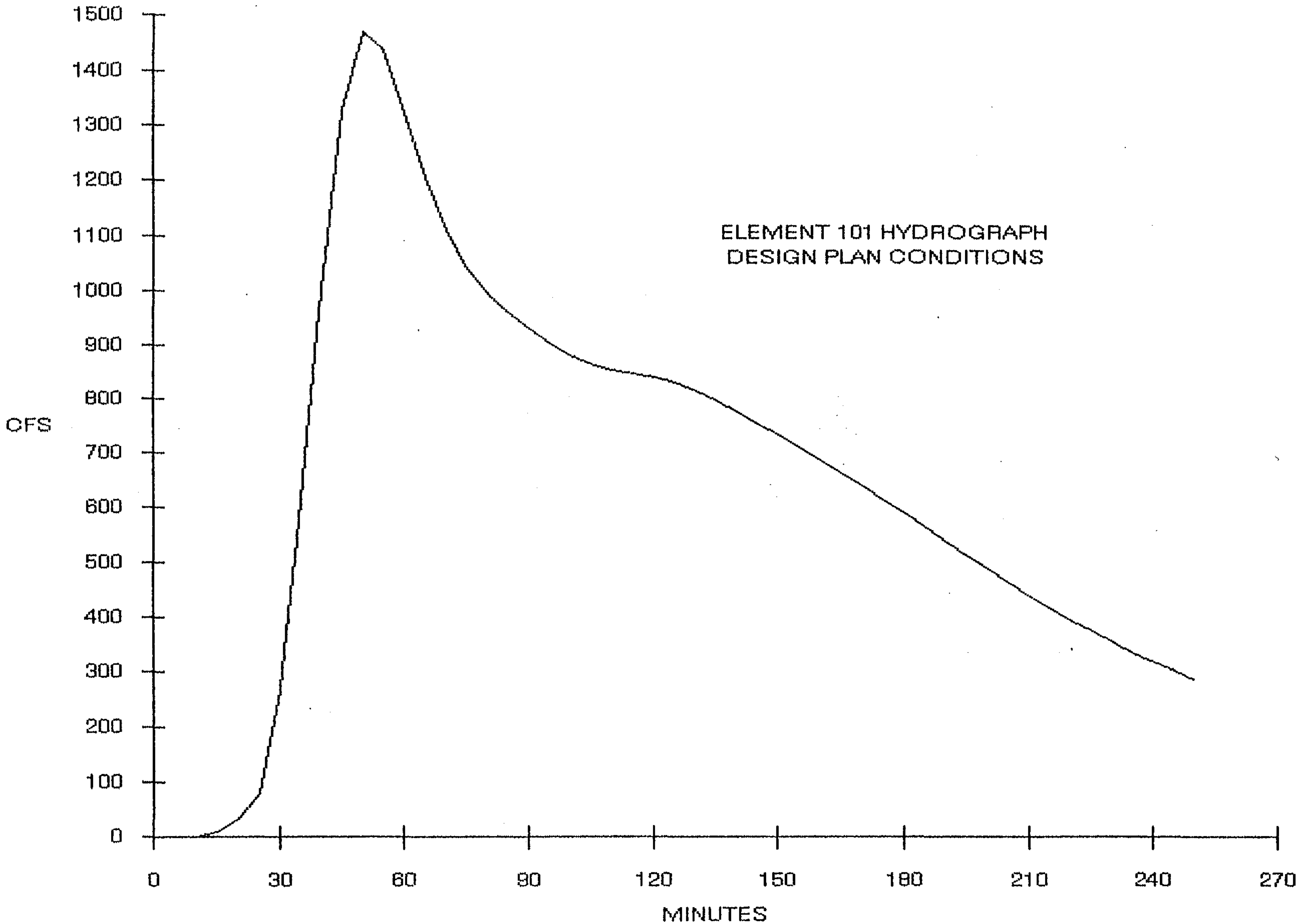


500
450
400
350
300
250
200
150
100
50
0
CFS
0
30
60
90
120
150
180
210
240
270
MINUTES
INFLOW (ELE 122)
OUTFLOW (ELE301)
ELEMENT 301 AND ELEMENT 122
DETENTION POND HYDROGRAPHS
DESIGN PLAN CONDITIONS

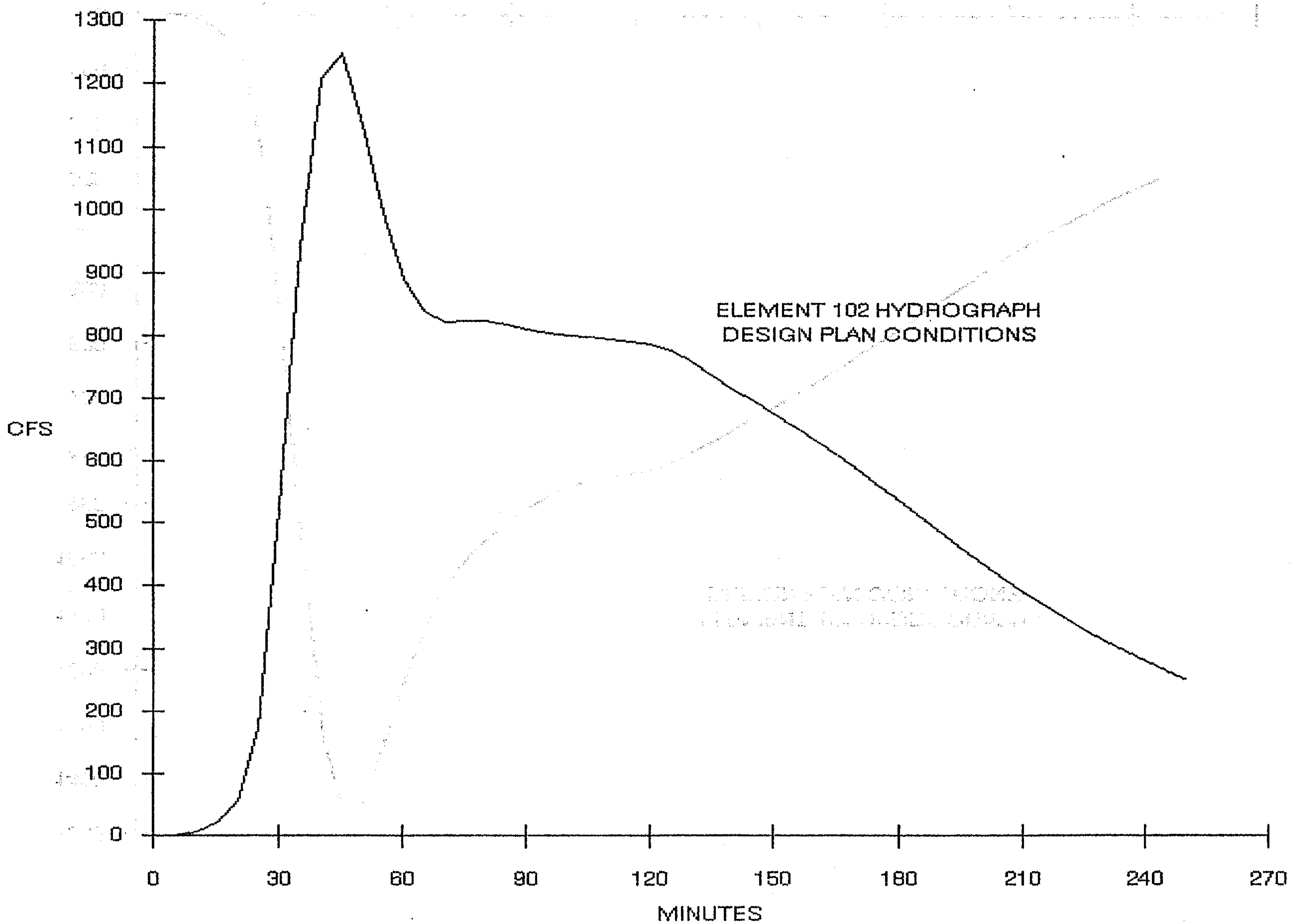


700
650
600
550
500
450
400
CFS
350
300
250
200
150
100
50
0
0
30
60
90
120
150
180
210
240
270
MINUTES
INFLOW (BASIN 31)
OUTFLOW (ELE 303)
ELEMENT 303 AND BASIN 31
DETENTION POND HYDROGRAPHS
DESIGN PLAN CONDITIONS

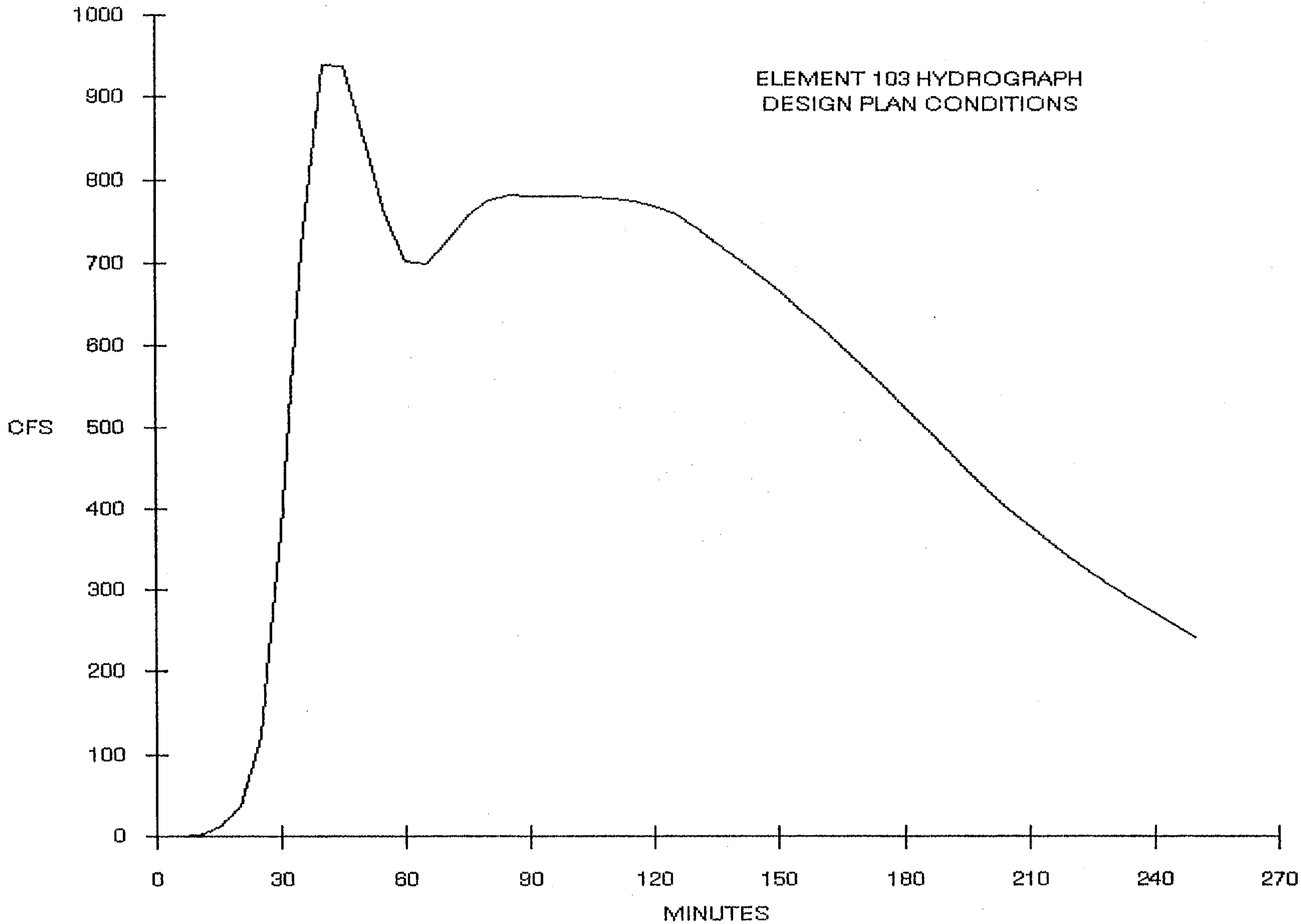

ELEMENT 100 HYDROGRAPH
DESIGN PLAN CONDITIONS
CFS
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
0
30
60
90
120
150
180
210
240
270
MINUTES

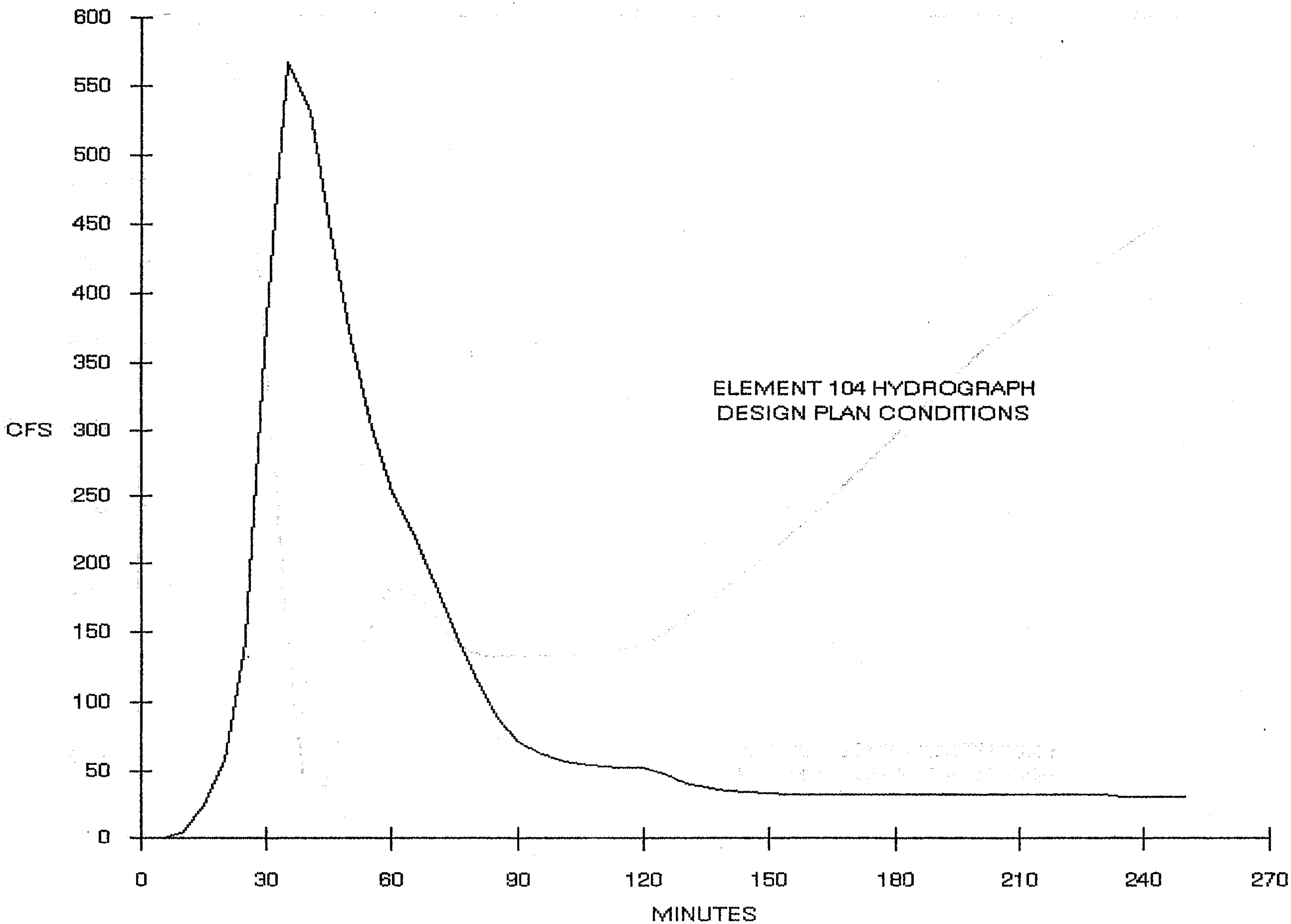


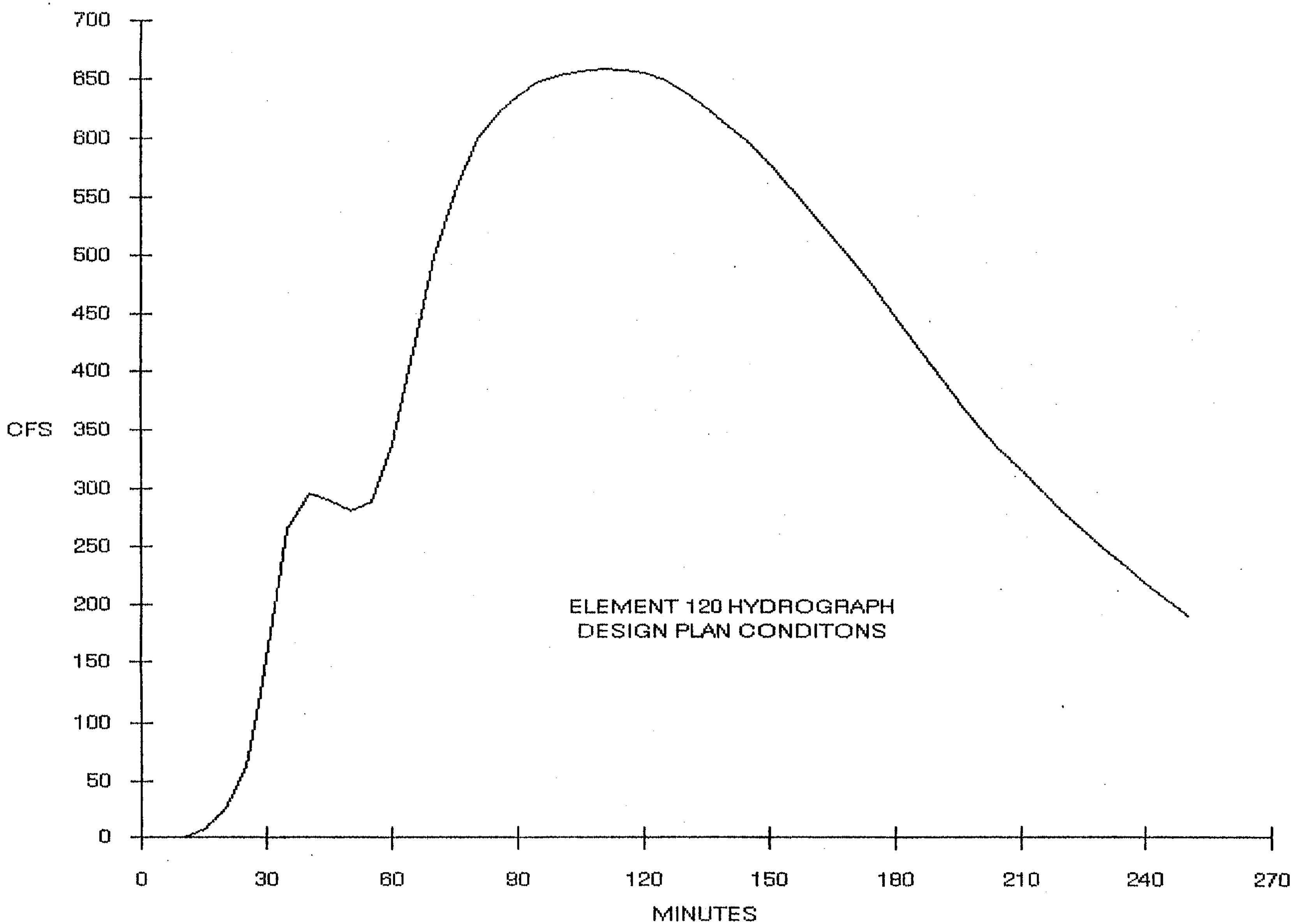
ELEMENT 101 HYDROGRAPH
DESIGN PLAN CONDITIONS
CFS
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
0
30
60
90
120
150
180
210
240
270
MINUTES



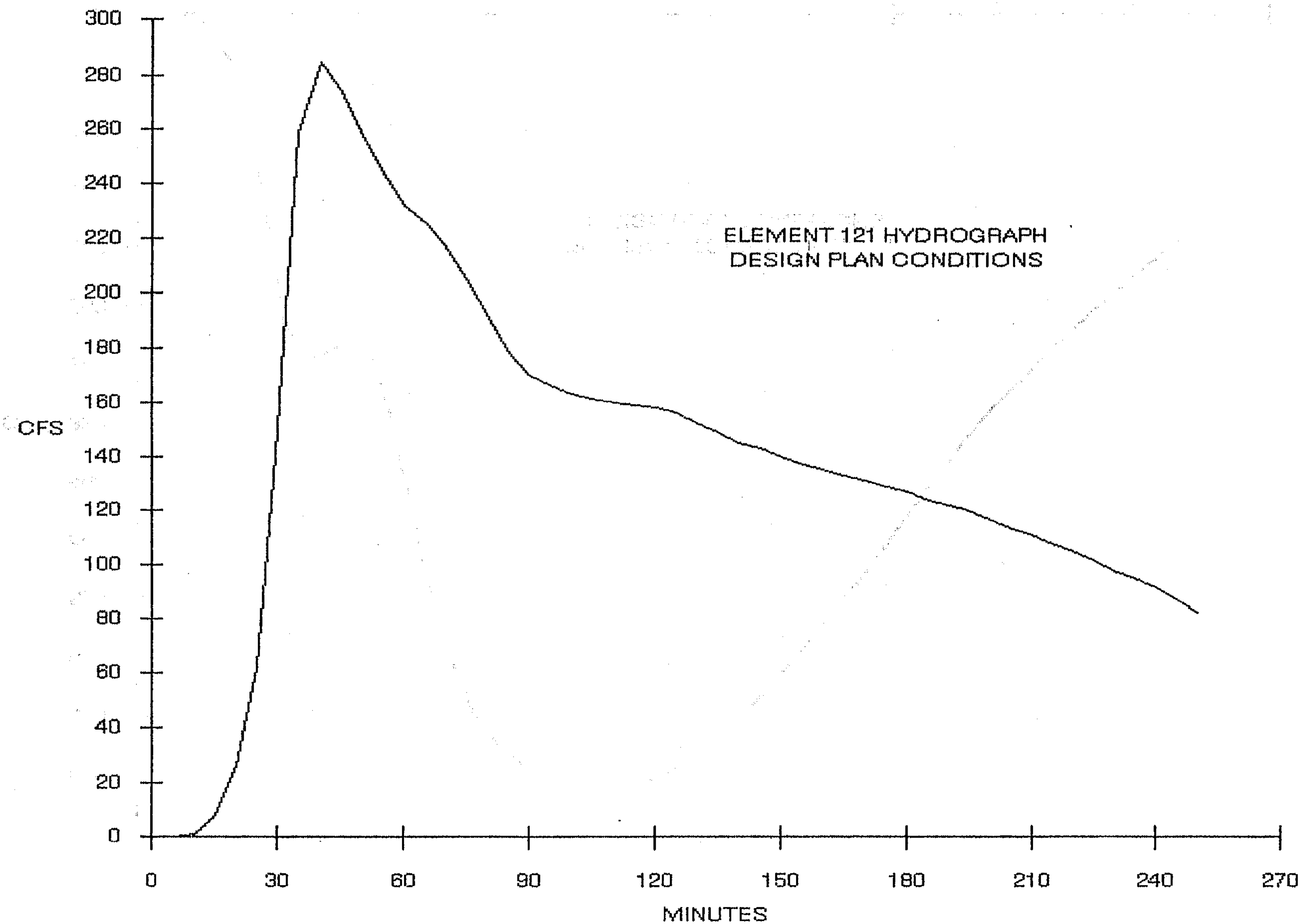
ELEMENT 102 HYDROGRAPH
DESIGN PLAN CONDITIONS
CFS
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
0
30
60
90
120
150
180
210
240
270
MINUTES


ELEMENT 103 HYDROGRAPH
DESIGN PLAN CONDITIONS
CFS
1000
900
800
700
600
500
400
300
200
100
0
0
30
60
90
120
150
180
210
240
270
MINUTES


ELEMENT 104 HYDROGRAPH
DESIGN PLAN CONDITIONS
CFS
600
550
500
450
400
350
300
250
200
150
100
50
0
0
30
60
90
120
150
180
210
240
270
MINUTES



700
650
600
550
500
450
400
CFS
350
300
250
200
150
100
50
0
ELEMENT 120 HYDROGRAPH
DESIGN PLAN CONDITONS
0
30
60
90
120
150
180
210
240
270
MINUTES


ELEMENT 121 HYDROGRAPH
DESIGN PLAN CONDITIONS
CFS
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
0
30
60
90
120
150
180
210
240
270
MINUTES

APPENDIX B

DESIGN PLAN COMPUTER PRINTOUTS

This appendix contains complete design plan computer printouts. Design plan printouts are for future land use and recommended design plan hydraulic conditions. Printouts for both the CUHPE/PC and UDSWM2 models are included. 10 year and 100 year runs are included.

Note: Computer printouts are dated Dec. 1993 rather than Dec. 1994 due to time lag between dates of final analysis (Dec. 1993) and City approval (Dec. 1994).

APPENDIX B - CUHPE/PC - 10 YR

FULLY DEVELOPED LAND USE CONDITIONS

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\2      ROBBINSDALE DRAINAGE BASIN DESIGN PLAN  FMG INC.     DEC 1993
01 10 YR      10 1.86                                            0.000.000.000.00

\70 1 15.0     01 01 BASIN #1 FUTURE CONDITIONS
 .172 1.06 0.59 88.0 .012        .40  .10  3.0.0018   .5     0
\70 1 15.0     02 02 BASIN #2 FUTURE CONDITIONS
 .177 0.76 0.34 38.0 .016        .50  .10  3.0.0018   .5     0
\71 1 15.0     03 03 BASIN #3 FUTURE CONDITIONS
 .058 0.44 0.22 43.0 .028 23.0  .35  .06  3.0.0018   .5     0
\70 1 15.0     04 04 BASIN #4 FUTURE CONDITIONS
 .148 0.55 0.21 38.0 .017        .35  .06  3.0.0018   .5     0
\71 1 15.0     05 05 BASIN #5 FUTURE CONDITIONS
 .053 0.42 0.24 52.0 .012 15.0  .35  .08  3.0.0018   .5     0
\70 1 15.0     06 06 BASIN #6 FUTURE CONDITIONS
 .206 0.68 0.28 40.0 .023        .37  .07  3.0.0018   .5     0
\71 1 15.0     07 07 BASIN #7 FUTURE CONDITIONS
 .074 0.46 0.17 36.0 .055 14.0  .37  .06  3.5.0018   .5     0
\70 1 15.0     08 08 BASIN #8 FUTURE CONDITIONS
 .156 1.12 0.52 18.0 .054        .50  .06  3.2.0018   .5     0
\71 1 15.0     09 09 BASIN #9 FUTURE CONDITIONS
 .032 0.28 0.12 20.0 .060  9.0  .40  .06  3.0.0018   .5     0
\71 1 15.0     10 10 BASIN #10 FUTURE CONDITIONS
 .085 0.51 0.21 40.0 .021 25.0  .35  .06  3.0.0018   .5     0
\71 1 15.0     20 20 BASIN #20 FUTURE CONDITIONS
 .105 0.59 0.30 53.0 .010 25.0  .40  .10  3.3.0018   .5     0
\70 1 15.0     21 21 BASIN #21 FUTURE CONDITIONS
 .152 0.80 0.37 30.0 .036        .50  .08  3.2.0018   .5     0
\70 1 15.0     22 22 BASIN #22 FUTURE CONDITIONS
 .204 0.79 0.38 15.0 .060        .50  .08  3.3.0018   .5     0
\71 1 15.0     30 30 BASIN #30 FUTURE CONDITIONS
 .125 0.51 0.24 39.0 .015 25.0  .40  .10  3.1.0018   .5     0
\70 1 15.0     31 31 BASIN #31 FUTURE CONDITIONS
 .813 2.10 1.18 20.0 .036        .50  .08  3.4.0018   .5     0
E
```

□□

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 01 -- BASIN COMMENT: BASIN #1 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.17	1.06	.59	88.00	.0120	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.075	.632

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
12.89	2333.71	401.40	9.17

WIDTH AT 50 = 13. MIN. WIDTH AT 75 = 7. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	25.	142.	*	50.	14.	*
5.	67.	*	30.	90.	*	55.	9.	*
10.	309.	*	35.	57.	*	60.	0.	*
15.	365.	*	40.	36.	*	0.	0.	*
20.	227.	*	45.	23.	*	0.	0.	*

1 BASIN ID: 01 -- BASIN COMMENT: BASIN #1 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	80.	.05	.039	71.	*
5.	.04	.000	0.	*	85.	.04	.030	65.	*
10.	.07	.005	0.	*	90.	.04	.030	57.	*
15.	.15	.128	10.	*	95.	.04	.030	50.	*
20.	.28	.233	57.	*	100.	.04	.030	46.	*
25.	.47	.421	148.	*	105.	.04	.030	44.	*
30.	.22	.207	259.	*	110.	.04	.030	42.	*
35.	.10	.094	295.	*	115.	.03	.026	41.	*
40.	.08	.071	250.	*	120.	.02	.020	39.	*
45.	.07	.062	196.	*	125.	.00	.000	34.	*
50.	.06	.052	155.	*	130.	.00	.000	24.	*
55.	.06	.052	126.	*	135.	.00	.000	15.	*
60.	.06	.052	105.	*	140.	.00	.000	9.	*
65.	.06	.052	92.	*	145.	.00	.000	6.	*
70.	.06	.052	83.	*	150.	.00	.000	3.	*
75.	.06	.052	77.	*	155.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = 1.795 INCHES
VOLUME OF EXCESS PRECIP = 16. ACRE-FEET
PEAK Q = 295. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 02 -- BASIN COMMENT: BASIN #2 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.18	.76	.34	38.00	.0160	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.094	.380

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
10.45	1836.31	325.03	9.44

WIDTH AT 50 = 16. MIN. WIDTH AT 75 = 8. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	' *	TIME	UNIT HYDROGRAPH	' *	TIME	UNIT HYDROGRAPH	' *
		*			*			
		*			*			
0.	0.	*	25.	127.	*	50.	26.	*
5.	175.	*	30.	92.	*	55.	19.	*
10.	324.	*	35.	67.	*	60.	14.	*
15.	248.	*	40.	49.	*	65.	10.	*
20.	177.	*	45.	36.	*	70.	0.	*

1 BASIN ID: 02 -- BASIN COMMENT: BASIN #2 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
				*					*
				*					*
0.	.00	.000	0.	*	80.	.05	.020	51.	*
5.	.04	.000	0.	*	85.	.04	.013	43.	*
10.	.07	.002	0.	*	90.	.04	.013	34.	*
15.	.15	.055	10.	*	95.	.04	.013	28.	*
20.	.28	.101	36.	*	100.	.04	.013	25.	*
25.	.47	.272	94.	*	105.	.04	.013	22.	*
30.	.22	.186	156.	*	110.	.04	.013	21.	*
35.	.10	.072	165.	*	115.	.03	.011	20.	*
40.	.08	.050	145.	*	120.	.02	.009	18.	*
45.	.07	.042	122.	*	125.	.00	.000	15.	*
50.	.06	.032	103.	*	130.	.00	.000	10.	*
55.	.06	.032	87.	*	135.	.00	.000	7.	*
60.	.06	.032	75.	*	140.	.00	.000	5.	*
65.	.06	.032	67.	*	145.	.00	.000	4.	*
70.	.06	.032	61.	*	150.	.00	.000	2.	*
75.	.06	.033	57.	*	155.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = 1.091 INCHES
VOLUME OF EXCESS PRECIP = 10. ACRE-FEET
PEAK Q = 165. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN. MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 03 -- BASIN COMMENT: BASIN #3 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.06	.44	.22	43.00	.0280	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.092	.362

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
9.48	23.00	1993.90	115.65	3.09

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 6.73)

WIDTH AT 50 = 15. MIN. WIDTH AT 75 = 8. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH
0.	0.	20.	55.	40.	16.
5.	72.	25.	40.	45.	11.
10.	115.	30.	29.	50.	8.
15.	80.	35.	21.	55.	0.

1 BASIN ID: 03 -- BASIN COMMENT: BASIN #3 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)
0.	.00	.000	0.	70.	.06	.034	21.
5.	.04	.000	0.	75.	.06	.034	18.
10.	.07	.019	1.	80.	.05	.022	15.
15.	.15	.062	7.	85.	.04	.014	13.
20.	.28	.114	17.	90.	.04	.014	11.
25.	.47	.371	46.	95.	.04	.014	9.
30.	.22	.189	70.	100.	.04	.014	8.
35.	.10	.075	66.	105.	.04	.014	8.
40.	.08	.052	55.	110.	.04	.014	7.
45.	.07	.044	45.	115.	.03	.013	7.
50.	.06	.034	38.	120.	.02	.010	6.
55.	.06	.034	32.	125.	.00	.000	5.
60.	.06	.034	27.	130.	.00	.000	3.
65.	.06	.034	24.	135.	.00	.000	2.

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = 1.262 INCHES
VOLUME OF EXCESS PRECIP = 4. ACRE-FEET

PEAK Q = 70. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN. MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .59
I = 3.4 INCHES/HOUR
A = 37.1 ACRES
Q = 74. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 04 -- BASIN COMMENT: BASIN #4 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.15	.55	.21	38.00	.0170	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.094	.370

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
7.83	2669.73	395.12	7.89

WIDTH AT 50 = 11. MIN. WIDTH AT 75 = 6. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	20.	125.	*	40.	19.	*
5.	281.	*	25.	78.	*	45.	12.	*
10.	346.	*	30.	49.	*	50.	8.	*
15.	201.	*	35.	31.	*	55.	0.	*

1 BASIN ID: 04 -- BASIN COMMENT: BASIN #4 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	70.	.06	.032	43.	*
5.	.04	.000	0.	*	75.	.06	.033	40.	*
10.	.07	.017	5.	*	80.	.05	.020	34.	*
15.	.15	.055	21.	*	85.	.04	.013	28.	*
20.	.28	.101	51.	*	90.	.04	.013	22.	*
25.	.47	.365	151.	*	95.	.04	.013	19.	*
30.	.22	.186	207.	*	100.	.04	.013	18.	*
35.	.10	.072	176.	*	105.	.04	.013	16.	*
40.	.08	.050	133.	*	110.	.04	.013	16.	*
45.	.07	.042	103.	*	115.	.03	.011	15.	*
50.	.06	.032	80.	*	120.	.02	.009	13.	*
55.	.06	.032	64.	*	125.	.00	.000	9.	*
60.	.06	.032	54.	*	130.	.00	.000	6.	*
65.	.06	.032	47.	*	135.	.00	.000	3.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = 1.199 INCHES
VOLUME OF EXCESS PRECIP = 9. ACRE-FEET
PEAK Q = 207. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN. MAX.IMP.RET.= .06 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 05 -- BASIN COMMENT: BASIN #5 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.05	.42	.24	52.00	.0120	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.087	.412

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
7.06	15.00	3468.44	183.83	2.83

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 7.53)

WIDTH AT 50 = 9. MIN. WIDTH AT 75 = 4. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .08 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	15.	69.	*	30.	11.	*
5.	136.	*	20.	38.	*	35.	0.	*
10.	131.	*	25.	21.	*	0.	0.	*

1 BASIN ID: 05 -- BASIN COMMENT: BASIN #5 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	65.	.06	.038	16.	*
5.	.04	.000	0.	*	70.	.06	.038	15.	*
10.	.07	.013	2.	*	75.	.06	.038	15.	*
15.	.15	.075	12.	*	80.	.05	.025	14.	*
20.	.28	.138	30.	*	85.	.04	.017	11.	*
25.	.47	.382	76.	*	90.	.04	.017	9.	*
30.	.22	.192	89.	*	95.	.04	.017	8.	*
35.	.10	.078	69.	*	100.	.04	.017	7.	*
40.	.08	.056	49.	*	105.	.04	.017	7.	*
45.	.07	.048	36.	*	110.	.04	.017	7.	*
50.	.06	.037	26.	*	115.	.03	.016	7.	*
55.	.06	.038	19.	*	120.	.02	.012	6.	*
60.	.06	.038	17.	*	125.	.00	.000	4.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXCESS PRECIP. = 1.367 INCHES
VOLUME OF EXCESS PRECIP = 4. ACRE-FEET
PEAK Q = 89. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN. MAX.IMP.RET.= .08 IN.

RATIONAL FORMULA C = .64
I = 4.2 INCHES/HOUR
A = 33.9 ACRES
Q = 91. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 06 -- BASIN COMMENT: BASIN #6 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.21	.68	.28	40.00	.0230	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.093	.412

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
8.74	2535.26	522.26	10.99

WIDTH AT 50 = 12. MIN. WIDTH AT 75 = 6. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .37 IN. MAX. IMPERVIOUS RET. = .07 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	25.	119.	*	50.	12.	*
5.	298.	*	30.	75.	*	55.	8.	*
10.	501.	*	35.	47.	*	60.	0.	*
15.	304.	*	40.	30.	*	0.	0.	*
20.	188.	*	45.	19.	*	0.	0.	*

1 BASIN ID: 06 -- BASIN COMMENT: BASIN #6 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	75.	.06	.033	59.	*
5.	.04	.000	0.	*	80.	.05	.021	52.	*
10.	.07	.014	4.	*	85.	.04	.013	42.	*
15.	.15	.058	24.	*	90.	.04	.013	34.	*
20.	.28	.106	65.	*	95.	.04	.013	29.	*
25.	.47	.355	179.	*	100.	.04	.013	26.	*
30.	.22	.187	279.	*	105.	.04	.013	24.	*
35.	.10	.073	252.	*	110.	.04	.013	23.	*
40.	.08	.051	193.	*	115.	.03	.012	22.	*
45.	.07	.043	149.	*	120.	.02	.009	20.	*
50.	.06	.033	117.	*	125.	.00	.000	15.	*
55.	.06	.033	93.	*	130.	.00	.000	9.	*

60.	.06	.033	78.	*	135.	.00	.000	6.	*
65.	.06	.033	69.	*	140.	.00	.000	4.	*
70.	.06	.033	63.	*	145.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXCESS PRECIP. = 1.208 INCHES
VOLUME OF EXCESS PRECIP = 13. ACRE-FEET
PEAK Q = 279. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .37 IN. MAX.IMP.RET.= .07 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN, FMG INC. DEC 1993

BASIN ID: 07 -- BASIN COMMENT: BASIN #7 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.07	.46	.17	36.00	.0550	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.095	.316

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
5.97	14.00	3496.13	258.71	3.95

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER,
REPLACING THE ONE COMPUTED BY CUHPD (TP= 5.87)

WIDTH AT 50 = 9. MIN. WIDTH AT 75 = 4. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .37 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.50 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	15.	85.	*	30.	13.	*
5.	245.	*	20.	46.	*	35.	0.	*
10.	161.	*	25.	25.	*	0.	0.	*

1 BASIN ID: 07 -- BASIN COMMENT: BASIN #7 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	65.	.06	.032	19.	*
5.	.04	.000	0.	*	70.	.06	.032	18.	*
10.	.07	.016	4.	*	75.	.06	.032	18.	*
15.	.15	.052	15.	*	80.	.05	.019	15.	*
20.	.28	.095	33.	*	85.	.04	.012	11.	*
25.	.47	.336	103.	*	90.	.04	.012	9.	*
30.	.22	.184	110.	*	95.	.04	.012	8.	*
35.	.10	.071	81.	*	100.	.04	.012	7.	*
40.	.08	.049	58.	*	105.	.04	.012	7.	*

45.	.07	.041	42.	*	110.	.04	.012	7.	*
50.	.06	.031	31.	*	115.	.03	.011	7.	*
55.	.06	.031	23.	*	120.	.02	.008	6.	*
60.	.06	.031	19.	*	125.	.00	.000	3.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXCESS PRECIP. = 1.144 INCHES
VOLUME OF EXCESS PRECIP = 5. ACRE-FEET
PEAK Q = 110. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.50 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .37 IN. MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .53
I = 4.4 INCHES/HOUR
A = 47.4 ACRES
Q = 110. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 08 -- BASIN COMMENT: BASIN #8 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.16	1.12	.52	18.00	.0540	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.113	.234

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
13.05	853.14	133.09	8.32

WIDTH AT 50 = 35. MIN. WIDTH AT 75 = 18. MIN. K50 = .22 K75 = .30

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.20 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	45.	59.	*	90.	19.	*
5.	63.	*	50.	52.	*	95.	17.	*
10.	124.	*	55.	46.	*	100.	15.	*
15.	130.	*	60.	41.	*	105.	13.	*
20.	110.	*	65.	36.	*	110.	12.	*
25.	98.	*	70.	32.	*	115.	10.	*
30.	90.	*	75.	28.	*	120.	9.	*
35.	79.	*	80.	25.	*	125.	8.	*
40.	67.	*	85.	22.	*	130.	0.	*

1 BASIN ID: 08 -- BASIN COMMENT: BASIN #8 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	95.	.04	.006	33.	*
5.	.04	.000	0.	*	100.	.04	.006	30.	*
10.	.07	.008	0.	*	105.	.04	.006	28.	*

15.	.15	.026	3.	*	110.	.04	.006	25.	*
20.	.28	.048	7.	*	115.	.03	.005	23.	*
25.	.47	.210	23.	*	120.	.02	.004	21.	*
30.	.22	.178	47.	*	125.	.00	.000	19.	*
35.	.10	.064	62.	*	130.	.00	.000	17.	*
40.	.08	.042	64.	*	135.	.00	.000	15.	*
45.	.07	.034	63.	*	140.	.00	.000	13.	*
50.	.06	.024	61.	*	145.	.00	.000	11.	*
55.	.06	.024	58.	*	150.	.00	.000	8.	*
60.	.06	.024	54.	*	155.	.00	.000	6.	*
65.	.06	.025	51.	*	160.	.00	.000	5.	*
70.	.06	.025	49.	*	165.	.00	.000	4.	*
75.	.06	.025	46.	*	170.	.00	.000	3.	*
80.	.05	.012	44.	*	175.	.00	.000	3.	*
85.	.04	.006	40.	*	180.	.00	.000	2.	*
90.	.04	.006	37.	*	185.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = .813 INCHES
VOLUME OF EXCESS PRECIP = 7. ACRE-FEET
PEAK Q = 64. CFS TIME OF PEAK = 40. MIN.
INFILT.= 3.20 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN. MAX.IMP.RET.= .06 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 09 -- BASIN COMMENT: BASIN #9 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.03	.28	.12	20.00	.0600	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.110	.191

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
3.91	9.00	5204.05	166.53	1.71

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 5.05)

WIDTH AT 50 = 6. MIN. WIDTH AT 75 = 3. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	10.	56.	*	20.	10.	*
5.	147.	*	15.	24.	*	25.	0.	*

1 BASIN ID: 09 -- BASIN COMMENT: BASIN #9 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME	INCREMENT RAINFALL	TOTAL EXCESS	STORM HYDROGRAPH	*	TIME	INCREMENT RAINFALL	TOTAL EXCESS	STORM HYDROGRAPH	*

(MIN.)	(IN)	PRECIP	(CFS)	*	(MIN.)	(IN)	PRECIP	(CFS)	*
				*					*
				*					*
0.	.00	.000	0.	*	60.	.06	.025	6.	*
5.	.04	.000	0.	*	65.	.06	.025	6.	*
10.	.07	.009	1.	*	70.	.06	.025	6.	*
15.	.15	.029	5.	*	75.	.06	.026	6.	*
20.	.28	.053	10.	*	80.	.05	.013	4.	*
25.	.47	.303	48.	*	85.	.04	.007	3.	*
30.	.22	.179	45.	*	90.	.04	.007	2.	*
35.	.10	.065	27.	*	95.	.04	.007	2.	*
40.	.08	.043	17.	*	100.	.04	.007	2.	*
45.	.07	.035	11.	*	105.	.04	.007	2.	*
50.	.06	.025	7.	*	110.	.04	.007	2.	*
55.	.06	.025	6.	*	115.	.03	.006	1.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = .930 INCHES
VOLUME OF EXCESS PRECIP = 2. ACRE-FEET
PEAK Q = 48. CFS TIME OF PEAK = 25. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .43
I = 5.2 INCHES/HOUR
A = 20.5 ACRES
Q = 46. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 10 -- BASIN COMMENT: BASIN #10 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.09	.51	.21	40.00	.0210	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.093	.361

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
9.79	25.00	1899.81	161.48	4.53

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 7.34)

WIDTH AT 50 = 16. MIN. WIDTH AT 75 = 8. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
		*			*			
		*			*			
0.	0.	*	25.	60.	*	50.	13.	*
5.	99.	*	30.	44.	*	55.	9.	*
10.	161.	*	35.	32.	*	60.	0.	*
15.	116.	*	40.	24.	*	0.	0.	*
20.	81.	*	45.	17.	*	0.	0.	*

1 BASIN ID: 10 -- BASIN COMMENT: BASIN #10 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	75.	.06	.033	28.	*
5.	.04	.000	0.	*	80.	.05	.021	23.	*
10.	.07	.017	2.	*	85.	.04	.013	19.	*
15.	.15	.058	9.	*	90.	.04	.013	15.	*
20.	.28	.106	22.	*	95.	.04	.013	13.	*
25.	.47	.367	61.	*	100.	.04	.013	12.	*
30.	.22	.187	96.	*	105.	.04	.013	11.	*
35.	.10	.073	93.	*	110.	.04	.013	10.	*
40.	.08	.051	78.	*	115.	.03	.012	10.	*
45.	.07	.043	65.	*	120.	.02	.009	9.	*
50.	.06	.033	54.	*	125.	.00	.000	7.	*
55.	.06	.033	46.	*	130.	.00	.000	5.	*
60.	.06	.033	40.	*	135.	.00	.000	3.	*
65.	.06	.033	35.	*	140.	.00	.000	2.	*
70.	.06	.033	31.	*	145.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = 1.224 INCHES
VOLUME OF EXCESS PRECIP = 6. ACRE-FEET
PEAK Q = 96. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN. MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .57
I = 3.2 INCHES/HOUR
A = 54.4 ACRES
Q = 100. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 20 -- BASIN COMMENT: BASIN #20 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.10	.59	.30	53.00	.0100	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.087	.462

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
10.95	25.00	2100.68	220.57	5.60

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 9.35)

WIDTH AT 50 = 14. MIN. WIDTH AT 75 = 7. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.30 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	25.	78.	*	50.	12.	*
5.	83.	*	30.	54.	*	55.	9.	*
10.	217.	*	35.	37.	*	60.	0.	*
15.	166.	*	40.	26.	*	0.	0.	*
20.	113.	*	45.	18.	*	0.	0.	*

1 BASIN ID: 20 -- BASIN COMMENT: BASIN #20 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	75.	.06	.038	37.	*
5.	.04	.000	0.	*	80.	.05	.026	32.	*
10.	.07	.003	0.	*	85.	.04	.018	27.	*
15.	.15	.077	7.	*	90.	.04	.018	23.	*
20.	.28	.140	29.	*	95.	.04	.018	20.	*
25.	.47	.354	73.	*	100.	.04	.018	18.	*
30.	.22	.192	125.	*	105.	.04	.018	17.	*
35.	.10	.079	129.	*	110.	.04	.018	16.	*
40.	.08	.056	109.	*	115.	.03	.016	15.	*
45.	.07	.048	89.	*	120.	.02	.012	14.	*
50.	.06	.038	73.	*	125.	.00	.000	12.	*
55.	.06	.038	60.	*	130.	.00	.000	8.	*
60.	.06	.038	52.	*	135.	.00	.000	5.	*
65.	.06	.038	45.	*	140.	.00	.000	4.	*
70.	.06	.038	41.	*	145.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = 1.339 INCHES
VOLUME OF EXCESS PRECIP = 7. ACRE-FEET
PEAK Q = 129. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.30 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .10 IN.

RATIONAL FORMULA C = .62
I = 3.2 INCHES/HOUR
A = 67.2 ACRES
Q = 135. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 21 -- BASIN COMMENT: BASIN #21 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.15	.80	.37	30.00	.0360	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.099	.300

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
9.89	1560.82	237.24	8.11

WIDTH AT 50 = 19. MIN. WIDTH AT 75 = 10. MIN. K50 = .31 K75 = .42

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .08 IN.
INFILTRATION = 3.20 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	30.	84.	*	60.	18.	*
5.	157.	*	35.	65.	*	65.	14.	*
10.	237.	*	40.	50.	*	70.	11.	*
15.	188.	*	45.	39.	*	75.	8.	*
20.	144.	*	50.	30.	*	80.	0.	*
25.	108.	*	55.	23.	*	0.	0.	*

1 BASIN ID: 21 -- BASIN COMMENT: BASIN #21 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	80.	.05	.017	43.	*
5.	.04	.000	0.	*	85.	.04	.010	37.	*
10.	.07	.007	1.	*	90.	.04	.010	31.	*
15.	.15	.043	9.	*	95.	.04	.010	26.	*
20.	.28	.080	24.	*	100.	.04	.010	21.	*
25.	.47	.244	66.	*	105.	.04	.010	18.	*
30.	.22	.183	109.	*	110.	.04	.010	16.	*
35.	.10	.069	117.	*	115.	.03	.009	15.	*
40.	.08	.047	106.	*	120.	.02	.007	13.	*
45.	.07	.039	93.	*	125.	.00	.000	11.	*
50.	.06	.029	80.	*	130.	.00	.000	8.	*
55.	.06	.029	70.	*	135.	.00	.000	6.	*
60.	.06	.029	62.	*	140.	.00	.000	5.	*
65.	.06	.029	56.	*	145.	.00	.000	3.	*
70.	.06	.029	51.	*	150.	.00	.000	2.	*
75.	.06	.029	48.	*	155.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = .979 INCHES
VOLUME OF EXCESS PRECIP = 8. ACRE-FEET
PEAK Q = 117. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.20 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN. MAX.IMP.RET.= .08 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 22 -- BASIN COMMENT: BASIN #22 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.20	.79	.38	15.00	.0600	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.118	.234

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
10.28	1157.60	236.15	10.88

WIDTH AT 50 = 26. MIN. WIDTH AT 75 = 13. MIN. K50 = .24 K75 = .32

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .08 IN.

INFILTRATION = 3.30 IN./HR.   DECAY = .00180/SECOND   FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	40.	82.	*	80.	19.	*
5.	150.	*	45.	69.	*	85.	16.	*
10.	236.	*	50.	57.	*	90.	13.	*
15.	203.	*	55.	48.	*	95.	11.	*
20.	174.	*	60.	40.	*	100.	9.	*
25.	146.	*	65.	33.	*	105.	8.	*
30.	118.	*	70.	28.	*	110.	0.	*
35.	99.	*	75.	23.	*	0.	0.	*

1 BASIN ID: 22 -- BASIN COMMENT: BASIN #22 FUTURE CONDITIONS

**** STORM NO. = 1 ****   DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	85.	.04	.005	45.	*
5.	.04	.000	0.	*	90.	.04	.005	39.	*
10.	.07	.004	1.	*	95.	.04	.005	34.	*
15.	.15	.022	4.	*	100.	.04	.005	30.	*
20.	.28	.040	12.	*	105.	.04	.005	26.	*
25.	.47	.198	44.	*	110.	.04	.005	23.	*
30.	.22	.176	86.	*	115.	.03	.005	21.	*
35.	.10	.062	102.	*	120.	.02	.003	18.	*
40.	.08	.041	100.	*	125.	.00	.000	15.	*
45.	.07	.033	94.	*	130.	.00	.000	11.	*
50.	.06	.022	85.	*	135.	.00	.000	8.	*
55.	.06	.023	77.	*	140.	.00	.000	7.	*
60.	.06	.023	70.	*	145.	.00	.000	5.	*
65.	.06	.023	65.	*	150.	.00	.000	4.	*
70.	.06	.024	60.	*	155.	.00	.000	3.	*
75.	.06	.024	57.	*	160.	.00	.000	3.	*
80.	.05	.011	52.	*	165.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86)   EXECESS PRECIP. = .763 INCHES
VOLUME OF EXCESS PRECIP = 8. ACRE-FEET
PEAK Q = 102. CFS   TIME OF PEAK = 35. MIN.
INFILT.= 3.30 IN/HR   DECAY = .00180   FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN.   MAX.IMP.RET.= .08 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS   EXECUTED ON DATE   AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 30 -- BASIN COMMENT: BASIN #30 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.13	.51	.24	39.00	.0150	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.094	.371

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
9.65	25.00	1994.80	249.35	6.67

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER,
REPLACING THE ONE COMPUTED BY CUHPD (TP= 8.12)

WIDTH AT 50 = 15. MIN. WIDTH AT 75 = 8. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.10 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	25.	85.	*	50.	15.	*
5.	148.	*	30.	61.	*	55.	11.	*
10.	249.	*	35.	43.	*	60.	8.	*
15.	175.	*	40.	31.	*	65.	0.	*
20.	120.	*	45.	22.	*	0.	0.	*

1 BASIN ID: 30 -- BASIN COMMENT: BASIN #30 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	75.	.06	.033	40.	*
5.	.04	.000	0.	*	80.	.05	.020	35.	*
10.	.07	.002	0.	*	85.	.04	.013	28.	*
15.	.15	.057	9.	*	90.	.04	.013	22.	*
20.	.28	.103	30.	*	95.	.04	.013	19.	*
25.	.47	.333	85.	*	100.	.04	.013	17.	*
30.	.22	.187	136.	*	105.	.04	.013	16.	*
35.	.10	.073	133.	*	110.	.04	.013	15.	*
40.	.08	.051	111.	*	115.	.03	.012	14.	*
45.	.07	.043	91.	*	120.	.02	.009	13.	*
50.	.06	.032	75.	*	125.	.00	.000	10.	*
55.	.06	.032	63.	*	130.	.00	.000	7.	*
60.	.06	.033	54.	*	135.	.00	.000	5.	*
65.	.06	.033	48.	*	140.	.00	.000	3.	*
70.	.06	.033	43.	*	145.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = 1.163 INCHES
VOLUME OF EXCESS PRECIP = 8. ACRE-FEET
PEAK Q = 136. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.10 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .10 IN.

RATIONAL FORMULA C = .54
I = 3.2 INCHES/HOUR
A = 80.0 ACRES
Q = 140. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 31 -- BASIN COMMENT: BASIN #31 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.81	2.10	1.18	20.00	.0360	5.00

COEFFICIENT (REFLECTING TIME TO PEAK) COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)

.110 .310

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
25.24	524.13	426.11	43.36

WIDTH AT 50 = 57. MIN. WIDTH AT 75 = 30. MIN. K50 = .26 K75 = .36

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .08 IN.
INFILTRATION = 3.40 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH
0.	0.	90.	144.	180.	30.
5.	75.	95.	132.	185.	28.
10.	210.	100.	121.	190.	26.
15.	330.	105.	111.	195.	23.
20.	404.	110.	102.	200.	21.
25.	426.	115.	93.	205.	20.
30.	413.	120.	86.	210.	18.
35.	379.	125.	79.	215.	17.
40.	342.	130.	72.	220.	15.
45.	316.	135.	66.	225.	14.
50.	293.	140.	61.	230.	13.
55.	270.	145.	56.	235.	12.
60.	247.	150.	51.	240.	11.
65.	224.	155.	47.	245.	10.
70.	203.	160.	43.	250.	9.
75.	187.	165.	39.	255.	8.
80.	171.	170.	36.	260.	8.
85.	157.	175.	33.	265.	0.

1 BASIN ID: 31 -- BASIN COMMENT: BASIN #31 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)
0.	.00	.000	0.	160.	.00	.000	72.
5.	.04	.000	0.	165.	.00	.000	66.
10.	.07	.005	0.	170.	.00	.000	60.
15.	.15	.029	3.	175.	.00	.000	55.
20.	.28	.053	12.	180.	.00	.000	51.
25.	.47	.209	38.	185.	.00	.000	46.
30.	.22	.178	89.	190.	.00	.000	43.
35.	.10	.064	147.	195.	.00	.000	39.
40.	.08	.042	196.	200.	.00	.000	36.
45.	.07	.035	228.	205.	.00	.000	33.
50.	.06	.024	243.	210.	.00	.000	30.
55.	.06	.025	244.	215.	.00	.000	28.
60.	.06	.025	239.	220.	.00	.000	25.
65.	.06	.025	233.	225.	.00	.000	23.
70.	.06	.025	228.	230.	.00	.000	21.
75.	.06	.026	224.	235.	.00	.000	20.
80.	.05	.013	218.	240.	.00	.000	18.
85.	.04	.007	209.	245.	.00	.000	16.
90.	.04	.007	199.	250.	.00	.000	15.
95.	.04	.007	188.	255.	.00	.000	14.
100.	.04	.007	176.	260.	.00	.000	13.
105.	.04	.007	165.	265.	.00	.000	12.
110.	.04	.007	155.	270.	.00	.000	11.
115.	.03	.006	146.	275.	.00	.000	10.
120.	.02	.005	137.	280.	.00	.000	8.
125.	.00	.000	128.	285.	.00	.000	6.
130.	.00	.000	119.	290.	.00	.000	4.
135.	.00	.000	110.	295.	.00	.000	4.
140.	.00	.000	101.	300.	.00	.000	3.

145.	.00	.000	93.	*	305.	.00	.000	3.	*
150.	.00	.000	85.	*	310.	.00	.000	2.	*
155.	.00	.000	78.	*	315.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = .829 INCHES
VOLUME OF EXCESS PRECIP = 36. ACRE-FEET
PEAK Q = 244. CFS TIME OF PEAK = 55. MIN.
INFILT.= 3.40 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN. MAX.IMP.RET.= .08 IN.

1 U.D.F.C.D. CUHPD RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985 TO WRITE OUTPUT FILE OF STORM HYDROGRAPHS FOR SUBSEQUENT USE WITH MULTI-PLAN RIVER ROUTING ROUTINES OF HEC-1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

NO HYDROGRAPH VALUES WERE WRITTEN TO AN OUTPUTFILE FOR THIS RUN OF CUHPD.

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\2      ROBBINSDALE DRAINAGE BASIN DESIGN PLAN  FMG INC.     DEC 1993
01100 YR    100 2.95                                             0.000.000.000.00

\70 1 15.0     01 01 BASIN #1 FUTURE CONDITIONS
 .172 1.06 0.59 88.0 .012        .40  .10  3.0.0018   .5     0
\70 1 15.0     02 02 BASIN #2 FUTURE CONDITIONS
 .177 0.76 0.34 38.0 .016        .50  .10  3.0.0018   .5     0
\71 1 15.0     03 03 BASIN #3 FUTURE CONDITIONS
 .058 0.44 0.22 43.0 .028 23.0  .35  .06  3.0.0018   .5     0
\70 1 15.0     04 04 BASIN #4 FUTURE CONDITIONS
 .148 0.55 0.21 38.0 .017        .35  .06  3.0.0018   .5     0
\71 1 15.0     05 05 BASIN #5 FUTURE CONDITIONS
 .053 0.42 0.24 52.0 .012 15.0  .35  .08  3.0.0018   .5     0
\70 1 15.0     06 06 BASIN #6 FUTURE CONDITIONS
 .206 0.68 0.28 40.0 .023        .37  .07  3.0.0018   .5     0
\71 1 15.0     07 07 BASIN #7 FUTURE CONDITIONS
 .074 0.46 0.17 36.0 .055 14.0  .37  .06  3.5.0018   .5     0
\70 1 15.0     08 08 BASIN #8 FUTURE CONDITIONS
 .156 1.12 0.52 18.0 .054        .50  .06  3.2.0018   .5     0
\71 1 15.0     09 09 BASIN #9 FUTURE CONDITIONS
 .032 0.28 0.12 20.0 .060  9.0  .40  .06  3.0.0018   .5     0
\71 1 15.0     10 10 BASIN #10 FUTURE CONDITIONS
 .085 0.51 0.21 40.0 .021 25.0  .35  .06  3.0.0018   .5     0
\71 1 15.0     20 20 BASIN #20 FUTURE CONDITIONS
 .105 0.59 0.30 53.0 .010 25.0  .40  .10  3.3.0018   .5     0
\70 1 15.0     21 21 BASIN #21 FUTURE CONDITIONS
 .152 0.80 0.37 30.0 .036        .50  .08  3.2.0018   .5     0
\70 1 15.0     22 22 BASIN #22 FUTURE CONDITIONS
 .204 0.79 0.38 15.0 .060        .50  .08  3.3.0018   .5     0
\71 1 15.0     30 30 BASIN #30 FUTURE CONDITIONS
 .125 0.51 0.24 39.0 .015 25.0  .40  .10  3.1.0018   .5     0
\70 1 15.0     31 31 BASIN #31 FUTURE CONDITIONS
 .813 2.10 1.18 20.0 .036        .50  .08  3.4.0018   .5     0
E
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1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 01 -- BASIN COMMENT: BASIN #1 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.17	1.06	.59	88.00	.0120	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.075	.632

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
12.89	2333.71	401.40	9.17

WIDTH AT 50 = 13. MIN. WIDTH AT 75 = 7. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	25.	142.	*	50.	14.	*
5.	67.	*	30.	90.	*	55.	9.	*
10.	309.	*	35.	57.	*	60.	0.	*
15.	365.	*	40.	36.	*	0.	0.	*
20.	227.	*	45.	23.	*	0.	0.	*

1 BASIN ID: 01 -- BASIN COMMENT: BASIN #1 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	80.	.04	.030	117.	*
5.	.03	.000	0.	*	85.	.04	.030	88.	*
10.	.09	.015	1.	*	90.	.04	.030	68.	*
15.	.14	.113	12.	*	95.	.04	.030	56.	*
20.	.24	.197	54.	*	100.	.04	.030	49.	*
25.	.41	.364	130.	*	105.	.04	.030	45.	*
30.	.74	.699	259.	*	110.	.04	.030	43.	*
35.	.41	.389	437.	*	115.	.04	.030	41.	*
40.	.24	.220	512.	*	120.	.04	.030	40.	*
45.	.18	.170	457.	*	125.	.00	.000	38.	*
50.	.15	.136	378.	*	130.	.00	.000	28.	*
55.	.12	.108	310.	*	135.	.00	.000	18.	*
60.	.12	.108	254.	*	140.	.00	.000	11.	*
65.	.12	.108	214.	*	145.	.00	.000	7.	*
70.	.06	.051	184.	*	150.	.00	.000	4.	*
75.	.06	.051	150.	*	155.	.00	.000	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.996 INCHES
VOLUME OF EXCESS PRECIP = 27. ACRE-FEET
PEAK Q = 512. CFS TIME OF PEAK = 40. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .10 IN.

APPENDIX B - CUHPE/PC - 100 YR

FULLY DEVELOPED LAND USE CONDITIONS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 02 -- BASIN COMMENT: BASIN #2 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.18	.76	.34	38.00	.0160	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.094	.380

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
10.45	1836.31	325.03	9.44

WIDTH AT 50 = 16. MIN. WIDTH AT 75 = 8. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH
0.	0.	25.	127.	50.	26.
5.	175.	30.	92.	55.	19.
10.	324.	35.	67.	60.	14.
15.	248.	40.	49.	65.	10.
20.	177.	45.	36.	70.	0.

1 BASIN ID: 02 -- BASIN COMMENT: BASIN #2 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)
0.	.00	.000	0.	80.	.04	.013	105.
5.	.03	.000	0.	85.	.04	.013	81.
10.	.09	.006	1.	90.	.04	.013	62.
15.	.14	.049	11.	95.	.04	.013	45.
20.	.24	.085	32.	100.	.04	.013	35.
25.	.41	.184	73.	105.	.04	.013	29.
30.	.74	.691	211.	110.	.04	.013	25.
35.	.41	.375	357.	115.	.04	.013	22.
40.	.24	.203	377.	120.	.04	.013	20.
45.	.18	.152	343.	125.	.00	.000	17.
50.	.15	.118	300.	130.	.00	.000	12.
55.	.12	.089	257.	135.	.00	.000	8.
60.	.12	.090	221.	140.	.00	.000	6.
65.	.12	.090	195.	145.	.00	.000	4.
70.	.06	.032	166.	150.	.00	.000	3.
75.	.06	.032	133.	155.	.00	.000	2.

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.313 INCHES
VOLUME OF EXCESS PRECIP = 22. ACRE-FEET
PEAK Q = 377. CFS TIME OF PEAK = 40. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN. MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 03 -- BASIN COMMENT: BASIN #3 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.06	.44	.22	43.00	.0280	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.092	.362

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
9.48	23.00	1993.90	115.65	3.09

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 6.73)

WIDTH AT 50 = 15. MIN. WIDTH AT 75 = 8. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH
0.	0.	20.	55.	40.	16.
5.	72.	25.	40.	45.	11.
10.	115.	30.	29.	50.	8.
15.	80.	35.	21.	55.	0.

1 BASIN ID: 03 -- BASIN COMMENT: BASIN #3 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)
0.	.00	.000	0.	70.	.06	.034	55.
5.	.03	.000	0.	75.	.06	.034	42.
10.	.09	.024	2.	80.	.04	.014	29.
15.	.14	.055	7.	85.	.04	.014	21.
20.	.24	.096	15.	90.	.04	.014	16.
25.	.41	.286	37.	95.	.04	.014	12.
30.	.74	.692	94.	100.	.04	.014	10.
35.	.41	.377	138.	105.	.04	.014	9.
40.	.24	.205	135.	110.	.04	.014	8.
45.	.18	.154	119.	115.	.04	.014	7.
50.	.15	.120	103.	120.	.04	.014	7.
55.	.12	.091	88.	125.	.00	.000	5.
60.	.12	.091	75.	130.	.00	.000	4.
65.	.12	.092	66.	135.	.00	.000	3.

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.482 INCHES
VOLUME OF EXCESS PRECIP = 8. ACRE-FEET

PEAK Q = 138. CFS   TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR   DECAY = .00180   FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN.   MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .73
I = 5.4 INCHES/HOUR
A = 37.1 ACRES
Q = 145. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS   EXECUTED ON DATE   AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC.   DEC 1993

BASIN ID: 04 -- BASIN COMMENT: BASIN #4 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.15	.55	.21	38.00	.0170	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.094	.370

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
7.83	2669.73	395.12	7.89

WIDTH AT 50 = 11. MIN.   WIDTH AT 75 = 6. MIN.   K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN.   MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR.   DECAY = .00180/SECOND   FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	20.	125.	*	40.	19.	*
5.	281.	*	25.	78.	*	45.	12.	*
10.	346.	*	30.	49.	*	50.	8.	*
15.	201.	*	35.	31.	*	55.	0.	*

1 BASIN ID: 04 -- BASIN COMMENT: BASIN #4 FUTURE CONDITIONS

**** STORM NO. = 1 ****   DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	75.	.06	.032	80.	*
5.	.03	.000	0.	*	80.	.04	.013	56.	*
10.	.09	.021	6.	*	85.	.04	.013	38.	*
15.	.14	.049	21.	*	90.	.04	.013	29.	*
20.	.24	.085	45.	*	95.	.04	.013	23.	*
25.	.41	.277	120.	*	100.	.04	.013	19.	*
30.	.74	.691	315.	*	105.	.04	.013	17.	*
35.	.41	.375	416.	*	110.	.04	.013	16.	*
40.	.24	.203	370.	*	115.	.04	.013	15.	*
45.	.18	.152	303.	*	120.	.04	.013	15.	*
50.	.15	.118	245.	*	125.	.00	.000	11.	*
55.	.12	.089	196.	*	130.	.00	.000	7.	*
60.	.12	.090	161.	*	135.	.00	.000	4.	*
65.	.12	.090	140.	*	140.	.00	.000	3.	*
70.	.06	.032	110.	*	145.	.00	.000	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.420 INCHES
VOLUME OF EXCESS PRECIP = 19. ACRE-FEET
PEAK Q = 416. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN. MAX.IMP.RET.= .06 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 05 -- BASIN COMMENT: BASIN #5 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.05	.42	.24	52.00	.0120	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.087	.412

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
7.06	15.00	3468.44	183.83	2.83

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER,
REPLACING THE ONE COMPUTED BY CUHPD (TP= 7.53)

WIDTH AT 50 = 9. MIN. WIDTH AT 75 = 4. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .08 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	15.	69.	*	30.	11.	*
5.	136.	*	20.	38.	*	35.	0.	*
10.	131.	*	25.	21.	*	0.	0.	*

1 BASIN ID: 05 -- BASIN COMMENT: BASIN #5 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	65.	.12	.095	42.	*
5.	.03	.000	0.	*	70.	.06	.037	32.	*
10.	.09	.019	3.	*	75.	.06	.037	23.	*
15.	.14	.067	12.	*	80.	.04	.017	16.	*
20.	.24	.117	26.	*	85.	.04	.017	12.	*
25.	.41	.303	62.	*	90.	.04	.017	9.	*
30.	.74	.693	145.	*	95.	.04	.017	8.	*
35.	.41	.379	169.	*	100.	.04	.017	7.	*
40.	.24	.208	141.	*	105.	.04	.017	7.	*
45.	.18	.157	109.	*	110.	.04	.017	7.	*
50.	.15	.123	84.	*	115.	.04	.017	7.	*
55.	.12	.095	63.	*	120.	.04	.017	7.	*
60.	.12	.095	48.	*	125.	.00	.000	5.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.582 INCHES
VOLUME OF EXCESS PRECIP = 7. ACRE-FEET
PEAK Q = 169. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN. MAX.IMP.RET.= .08 IN.

RATIONAL FORMULA C = .76
I = 6.7 INCHES/HOUR
A = 33.9 ACRES
Q = 172. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 06 -- BASIN COMMENT: BASIN #6 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.21	.68	.28	40.00	.0230	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.093	.412

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
8.74	2535.26	522.26	10.99

WIDTH AT 50 = 12. MIN. WIDTH AT 75 = 6. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .37 IN. MAX. IMPERVIOUS RET. = .07 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	25.	119.	*	50.	12.	*
5.	298.	*	30.	75.	*	55.	8.	*
10.	501.	*	35.	47.	*	60.	0.	*
15.	304.	*	40.	30.	*	0.	0.	*
20.	188.	*	45.	19.	*	0.	0.	*

1 BASIN ID: 06 -- BASIN COMMENT: BASIN #6 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	75.	.06	.033	121.	*
5.	.03	.000	0.	*	80.	.04	.013	89.	*
10.	.09	.018	5.	*	85.	.04	.013	60.	*
15.	.14	.052	24.	*	90.	.04	.013	44.	*
20.	.24	.090	58.	*	95.	.04	.013	35.	*
25.	.41	.268	144.	*	100.	.04	.013	29.	*
30.	.74	.691	380.	*	105.	.04	.013	26.	*
35.	.41	.376	564.	*	110.	.04	.013	24.	*
40.	.24	.204	526.	*	115.	.04	.013	23.	*
45.	.18	.153	434.	*	120.	.04	.013	22.	*
50.	.15	.119	353.	*	125.	.00	.000	18.	*

55.	.12	.090	284.	*	130.	.00	.000	11.	*
60.	.12	.090	233.	*	135.	.00	.000	7.	*
65.	.12	.090	201.	*	140.	.00	.000	4.	*
70.	.06	.033	163.	*	145.	.00	.000	3.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.429 INCHES
VOLUME OF EXCESS PRECIP = 27. ACRE-FEET
PEAK Q = 564. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .37 IN. MAX.IMP.RET.= .07 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 07 -- BASIN COMMENT: BASIN #7 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.07	.46	.17	36.00	.0550	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.095	.316

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
5.97	14.00	3496.13	258.71	3.95

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 5.87)

WIDTH AT 50 = 9. MIN. WIDTH AT 75 = 4. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .37 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.50 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	15.	85.	*	30.	13.	*
5.	245.	*	20.	46.	*	35.	0.	*
10.	161.	*	25.	25.	*	0.	0.	*

1 BASIN ID: 07 -- BASIN COMMENT: BASIN #7 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	65.	.12	.089	55.	*
5.	.03	.000	0.	*	70.	.06	.031	39.	*
10.	.09	.020	5.	*	75.	.06	.031	28.	*
15.	.14	.046	15.	*	80.	.04	.012	18.	*
20.	.24	.081	29.	*	85.	.04	.012	12.	*
25.	.41	.247	78.	*	90.	.04	.012	9.	*
30.	.74	.689	218.	*	95.	.04	.012	8.	*
35.	.41	.374	229.	*	100.	.04	.012	7.	*

40.	.24	.202	182.	*	105.	.04	.012	7.	*
45.	.18	.151	140.	*	110.	.04	.012	7.	*
50.	.15	.117	108.	*	115.	.04	.012	7.	*
55.	.12	.089	81.	*	120.	.04	.012	7.	*
60.	.12	.089	63.	*	125.	.00	.000	4.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.366 INCHES
VOLUME OF EXCESS PRECIP = 9. ACRE-FEET
PEAK Q = 229. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.50 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .37 IN. MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .69
I = 6.9 INCHES/HOUR
A = 47.4 ACRES
Q = 227. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 08 -- BASIN COMMENT: BASIN #8 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.16	1.12	.52	18.00	.0540	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.113	.234

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
13.05	853.14	133.09	8.32

WIDTH AT 50 = 35. MIN. WIDTH AT 75 = 18. MIN. K50 = .22 K75 = .30

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.20 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	45.	59.	*	90.	19.	*
5.	63.	*	50.	52.	*	95.	17.	*
10.	124.	*	55.	46.	*	100.	15.	*
15.	130.	*	60.	41.	*	105.	13.	*
20.	110.	*	65.	36.	*	110.	12.	*
25.	98.	*	70.	32.	*	115.	10.	*
30.	90.	*	75.	28.	*	120.	9.	*
35.	79.	*	80.	25.	*	125.	8.	*
40.	67.	*	85.	22.	*	130.	0.	*

1 BASIN ID: 08 -- BASIN COMMENT: BASIN #8 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	95.	.04	.006	85.	*
5.	.03	.000	0.	*	100.	.04	.006	75.	*

10.	.09	.010	1.	*	105.	.04	.006	67.	*
15.	.14	.023	3.	*	110.	.04	.006	60.	*
20.	.24	.040	7.	*	115.	.04	.006	54.	*
25.	.41	.110	16.	*	120.	.04	.006	49.	*
30.	.74	.687	66.	*	125.	.00	.000	44.	*
35.	.41	.370	130.	*	130.	.00	.000	39.	*
40.	.24	.196	167.	*	135.	.00	.000	34.	*
45.	.18	.145	174.	*	140.	.00	.000	30.	*
50.	.15	.111	174.	*	145.	.00	.000	26.	*
55.	.12	.082	171.	*	150.	.00	.000	22.	*
60.	.12	.082	164.	*	155.	.00	.000	15.	*
65.	.12	.083	156.	*	160.	.00	.000	10.	*
70.	.06	.024	146.	*	165.	.00	.000	8.	*
75.	.06	.024	133.	*	170.	.00	.000	6.	*
80.	.04	.006	119.	*	175.	.00	.000	4.	*
85.	.04	.006	107.	*	180.	.00	.000	3.	*
90.	.04	.006	95.	*	185.	.00	.000	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXCESS PRECIP. = 2.043 INCHES
VOLUME OF EXCESS PRECIP = 17. ACRE-FEET
PEAK Q = 174. CFS TIME OF PEAK = 45. MIN.
INFILT.= 3.20 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN. MAX.IMP.RET.= .06 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 09 -- BASIN COMMENT: BASIN #9 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.03	.28	.12	20.00	.0600	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.110	.191

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
3.91	9.00	5204.05	166.53	1.71

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 5.05)

WIDTH AT 50 = 6. MIN. WIDTH AT 75 = 3. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	10.	56.	*	20.	10.	*
5.	147.	*	15.	24.	*	25.	0.	*

1 BASIN ID: 09 -- BASIN COMMENT: BASIN #9 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

INCREMENT TOTAL STORM * INCREMENT TOTAL STORM *

TIME (MIN.)	RAINFALL (IN)	EXCESS PRECIP	HYDROGRAPH (CFS)	*	TIME (MIN.)	RAINFALL (IN)	EXCESS PRECIP	HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	60.	.12	.083	21.	*
5.	.03	.000	0.	*	65.	.12	.083	20.	*
10.	.09	.011	2.	*	70.	.06	.025	11.	*
15.	.14	.026	4.	*	75.	.06	.025	8.	*
20.	.24	.045	8.	*	80.	.04	.007	4.	*
25.	.41	.203	33.	*	85.	.04	.007	2.	*
30.	.74	.688	114.	*	90.	.04	.007	2.	*
35.	.41	.371	98.	*	95.	.04	.007	2.	*
40.	.24	.197	68.	*	100.	.04	.007	2.	*
45.	.18	.146	49.	*	105.	.04	.007	2.	*
50.	.15	.112	33.	*	110.	.04	.007	2.	*
55.	.12	.083	24.	*	115.	.04	.007	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXCESS PRECIP. = 2.159 INCHES
VOLUME OF EXCESS PRECIP = 4. ACRE-FEET
PEAK Q = 114. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .63
I = 8.3 INCHES/HOUR
A = 20.5 ACRES
Q = 108. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 10 -- BASIN COMMENT: BASIN #10 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.09	.51	.21	40.00	.0210	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.093	.361

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
9.79	25.00	1899.81	161.48	4.53

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 7.34)

WIDTH AT 50 = 16. MIN. WIDTH AT 75 = 8. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	25.	60.	*	50.	13.	*
5.	99.	*	30.	44.	*	55.	9.	*
10.	161.	*	35.	32.	*	60.	0.	*
15.	116.	*	40.	24.	*	0.	0.	*
20.	81.	*	45.	17.	*	0.	0.	*

1 BASIN ID: 10 -- BASIN COMMENT: BASIN #10 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	75.	.06	.033	65.	*
5.	.03	.000	0.	*	80.	.04	.013	50.	*
10.	.09	.022	2.	*	85.	.04	.013	34.	*
15.	.14	.052	9.	*	90.	.04	.013	25.	*
20.	.24	.090	20.	*	95.	.04	.013	19.	*
25.	.41	.280	50.	*	100.	.04	.013	15.	*
30.	.74	.691	129.	*	105.	.04	.013	13.	*
35.	.41	.376	193.	*	110.	.04	.013	11.	*
40.	.24	.204	192.	*	115.	.04	.013	10.	*
45.	.18	.153	171.	*	120.	.04	.013	9.	*
50.	.15	.119	149.	*	125.	.00	.000	8.	*
55.	.12	.090	128.	*	130.	.00	.000	5.	*
60.	.12	.090	110.	*	135.	.00	.000	4.	*
65.	.12	.090	97.	*	140.	.00	.000	3.	*
70.	.06	.033	82.	*	145.	.00	.000	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.445 INCHES
VOLUME OF EXCESS PRECIP = 11. ACRE-FEET
PEAK Q = 193. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN. MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .72
I = 5.1 INCHES/HOUR
A = 54.4 ACRES
Q = 200. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 20 -- BASIN COMMENT: BASIN #20 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.10	.59	.30	53.00	.0100	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.087	.462

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
10.95	25.00	2100.68	220.57	5.60

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 9.35)

WIDTH AT 50 = 14. MIN. WIDTH AT 75 = 7. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.30 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	25.	78.	*	50.	12.	*
5.	83.	*	30.	54.	*	55.	9.	*
10.	217.	*	35.	37.	*	60.	0.	*
15.	166.	*	40.	26.	*	0.	0.	*
20.	113.	*	45.	18.	*	0.	0.	*

1 BASIN ID: 20 -- BASIN COMMENT: BASIN #20 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	75.	.06	.038	81.	*
5.	.03	.000	0.	*	80.	.04	.018	62.	*
10.	.09	.009	1.	*	85.	.04	.018	44.	*
15.	.14	.068	8.	*	90.	.04	.018	33.	*
20.	.24	.119	26.	*	95.	.04	.018	26.	*
25.	.41	.275	61.	*	100.	.04	.018	22.	*
30.	.74	.693	145.	*	105.	.04	.018	19.	*
35.	.41	.379	246.	*	110.	.04	.018	17.	*
40.	.24	.208	259.	*	115.	.04	.018	16.	*
45.	.18	.157	230.	*	120.	.04	.018	15.	*
50.	.15	.123	197.	*	125.	.00	.000	13.	*
55.	.12	.095	166.	*	130.	.00	.000	9.	*
60.	.12	.095	139.	*	135.	.00	.000	6.	*
65.	.12	.095	121.	*	140.	.00	.000	4.	*
70.	.06	.038	103.	*	145.	.00	.000	3.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.554 INCHES
VOLUME OF EXCESS PRECIP = 14. ACRE-FEET
PEAK Q = 259. CFS TIME OF PEAK = 40. MIN.
INFILT.= 3.30 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .10 IN.

RATIONAL FORMULA C = .75
I = 5.1 INCHES/HOUR
A = 67.2 ACRES
Q = 258. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 21 -- BASIN COMMENT: BASIN #21 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.15	.80	.37	30.00	.0360	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.099	.300

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
9.89	1560.82	237.24	8.11

WIDTH AT 50 = 19. MIN. WIDTH AT 75 = 10. MIN. K50 = .31 K75 = .42

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .08 IN.

INFILTRATION = 3.20 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH
0.	0.	30.	84.	60.	18.
5.	157.	35.	65.	65.	14.
10.	237.	40.	50.	70.	11.
15.	188.	45.	39.	75.	8.
20.	144.	50.	30.	80.	0.
25.	108.	55.	23.	0.	0.

1 BASIN ID: 21 -- BASIN COMMENT: BASIN #21 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)
0.	.00	.000	0.	80.	.04	.010	97.
5.	.03	.000	0.	85.	.04	.010	78.
10.	.09	.011	2.	90.	.04	.010	63.
15.	.14	.039	9.	95.	.04	.010	51.
20.	.24	.067	22.	100.	.04	.010	41.
25.	.41	.151	49.	105.	.04	.010	30.
30.	.74	.689	164.	110.	.04	.010	24.
35.	.41	.373	265.	115.	.04	.010	20.
40.	.24	.201	283.	120.	.04	.010	17.
45.	.18	.149	265.	125.	.00	.000	14.
50.	.15	.115	239.	130.	.00	.000	10.
55.	.12	.087	211.	135.	.00	.000	7.
60.	.12	.087	187.	140.	.00	.000	5.
65.	.12	.087	168.	145.	.00	.000	4.
70.	.06	.029	145.	150.	.00	.000	3.
75.	.06	.029	120.	155.	.00	.000	2.

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.204 INCHES
VOLUME OF EXCESS PRECIP = 18. ACRE-FEET
PEAK Q = 283. CFS TIME OF PEAK = 40. MIN.
INFILT.= 3.20 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN. MAX.IMP.RET.= .08 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 22 -- BASIN COMMENT: BASIN #22 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.20	.79	.38	15.00	.0600	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.118	.234

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
10.28	1157.60	236.15	10.88

WIDTH AT 50 = 26. MIN. WIDTH AT 75 = 13. MIN. K50 = .24 K75 = .32

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN.   MAX. IMPERVIOUS RET. = .08 IN.
INFILTRATION = 3.30 IN./HR.   DECAY = .00180/SECOND   FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH
0.	0.	40.	82.	80.	19.
5.	150.	45.	69.	85.	16.
10.	236.	50.	57.	90.	13.
15.	203.	55.	48.	95.	11.
20.	174.	60.	40.	100.	9.
25.	146.	65.	33.	105.	8.
30.	118.	70.	28.	110.	0.
35.	99.	75.	23.	0.	0.

1 BASIN ID: 22 -- BASIN COMMENT: BASIN #22 FUTURE CONDITIONS

**** STORM NO. = 1 ****   DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)
0.	.00	.000	0.	85.	.04	.005	120.
5.	.03	.000	0.	90.	.04	.005	101.
10.	.09	.005	1.	95.	.04	.005	86.
15.	.14	.019	4.	100.	.04	.005	73.
20.	.24	.034	11.	105.	.04	.005	62.
25.	.41	.096	27.	110.	.04	.005	53.
30.	.74	.686	137.	115.	.04	.005	46.
35.	.41	.369	246.	120.	.04	.005	39.
40.	.24	.195	280.	125.	.00	.000	33.
45.	.18	.144	282.	130.	.00	.000	27.
50.	.15	.110	271.	135.	.00	.000	18.
55.	.12	.081	250.	140.	.00	.000	13.
60.	.12	.081	230.	145.	.00	.000	9.
65.	.12	.081	214.	150.	.00	.000	7.
70.	.06	.023	191.	155.	.00	.000	5.
75.	.06	.023	166.	160.	.00	.000	4.
80.	.04	.005	142.	165.	.00	.000	3.

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95)   EXCESS PRECIP. = 1.994 INCHES
VOLUME OF EXCESS PRECIP = 22. ACRE-FEET
PEAK Q = 282. CFS   TIME OF PEAK = 45. MIN.
INFILT.= 3.30 IN/HR   DECAY = .00180   FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN.   MAX.IMP.RET.= .08 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS   EXECUTED ON DATE   AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 30 -- BASIN COMMENT: BASIN #30 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.13	.51	.24	39.00	.0150	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.094	.371

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
9.65	25.00	1994.80	249.35	6.67

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER,
REPLACING THE ONE COMPUTED BY CUHPD (TP= 8.12)

WIDTH AT 50 = 15. MIN. WIDTH AT 75 = 8. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.10 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH
0.	0.	25.	85.	50.	15.
5.	148.	30.	61.	55.	11.
10.	249.	35.	43.	60.	8.
15.	175.	40.	31.	65.	0.
20.	120.	45.	22.	0.	0.

1 BASIN ID: 30 -- BASIN COMMENT: BASIN #30 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)
0.	.00	.000	0.	75.	.06	.032	89.
5.	.03	.000	0.	80.	.04	.013	69.
10.	.09	.007	1.	85.	.04	.013	51.
15.	.14	.050	9.	90.	.04	.013	36.
20.	.24	.087	27.	95.	.04	.013	27.
25.	.41	.246	68.	100.	.04	.013	22.
30.	.74	.691	185.	105.	.04	.013	19.
35.	.41	.376	286.	110.	.04	.013	16.
40.	.24	.204	285.	115.	.04	.013	15.
45.	.18	.153	250.	120.	.04	.013	14.
50.	.15	.118	215.	125.	.00	.000	11.
55.	.12	.090	182.	130.	.00	.000	8.
60.	.12	.090	155.	135.	.00	.000	5.
65.	.12	.090	136.	140.	.00	.000	4.
70.	.06	.032	113.	145.	.00	.000	2.

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.384 INCHES
VOLUME OF EXCESS PRECIP = 16. ACRE-FEET
PEAK Q = 286. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.10 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .10 IN.

RATIONAL FORMULA C = .70
I = 5.1 INCHES/HOUR
A = 80.0 ACRES
Q = 287. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 31 -- BASIN COMMENT: BASIN #31 FUTURE CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.81	2.10	1.18	20.00	.0360	5.00

COEFFICIENT (REFLECTING TIME TO PEAK) COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)

.110 .310

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
25.24	524.13	426.11	43.36

WIDTH AT 50 = 57. MIN. WIDTH AT 75 = 30. MIN. K50 = .26 K75 = .36

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .08 IN.
INFILTRATION = 3.40 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	90.	144.	*	180.	30.	*
5.	75.	*	95.	132.	*	185.	28.	*
10.	210.	*	100.	121.	*	190.	26.	*
15.	330.	*	105.	111.	*	195.	23.	*
20.	404.	*	110.	102.	*	200.	21.	*
25.	426.	*	115.	93.	*	205.	20.	*
30.	413.	*	120.	86.	*	210.	18.	*
35.	379.	*	125.	79.	*	215.	17.	*
40.	342.	*	130.	72.	*	220.	15.	*
45.	316.	*	135.	66.	*	225.	14.	*
50.	293.	*	140.	61.	*	230.	13.	*
55.	270.	*	145.	56.	*	235.	12.	*
60.	247.	*	150.	51.	*	240.	11.	*
65.	224.	*	155.	47.	*	245.	10.	*
70.	203.	*	160.	43.	*	250.	9.	*
75.	187.	*	165.	39.	*	255.	8.	*
80.	171.	*	170.	36.	*	260.	8.	*
85.	157.	*	175.	33.	*	265.	0.	*

1 BASIN ID: 31 -- BASIN COMMENT: BASIN #31 FUTURE CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	160.	.00	.000	170.	*
5.	.03	.000	0.	*	165.	.00	.000	156.	*
10.	.09	.007	1.	*	170.	.00	.000	143.	*
15.	.14	.026	3.	*	175.	.00	.000	131.	*
20.	.24	.045	11.	*	180.	.00	.000	120.	*
25.	.41	.110	29.	*	185.	.00	.000	110.	*
30.	.74	.687	103.	*	190.	.00	.000	101.	*
35.	.41	.370	240.	*	195.	.00	.000	93.	*
40.	.24	.197	396.	*	200.	.00	.000	85.	*
45.	.18	.146	529.	*	205.	.00	.000	78.	*
50.	.15	.112	619.	*	210.	.00	.000	71.	*
55.	.12	.083	665.	*	215.	.00	.000	66.	*
60.	.12	.083	677.	*	220.	.00	.000	60.	*
65.	.12	.083	671.	*	225.	.00	.000	55.	*
70.	.06	.025	659.	*	230.	.00	.000	51.	*
75.	.06	.025	638.	*	235.	.00	.000	46.	*
80.	.04	.007	609.	*	240.	.00	.000	43.	*
85.	.04	.007	573.	*	245.	.00	.000	39.	*
90.	.04	.007	532.	*	250.	.00	.000	36.	*
95.	.04	.007	491.	*	255.	.00	.000	33.	*
100.	.04	.007	453.	*	260.	.00	.000	30.	*
105.	.04	.007	418.	*	265.	.00	.000	28.	*
110.	.04	.007	387.	*	270.	.00	.000	25.	*
115.	.04	.007	358.	*	275.	.00	.000	23.	*
120.	.04	.007	332.	*	280.	.00	.000	21.	*
125.	.00	.000	307.	*	285.	.00	.000	18.	*
130.	.00	.000	283.	*	290.	.00	.000	12.	*
135.	.00	.000	261.	*	295.	.00	.000	8.	*

140.	.00	.000	240.	*	300.	.00	.000	6.	*
145.	.00	.000	220.	*	305.	.00	.000	5.	*
150.	.00	.000	202.	*	310.	.00	.000	4.	*
155.	.00	.000	185.	*	315.	.00	.000	3.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.058 INCHES
VOLUME OF EXCESS PRECIP = 89. ACRE-FEET
PEAK Q = 677. CFS TIME OF PEAK = 60. MIN.
INFILT.= 3.40 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN. MAX.IMP.RET.= .08 IN.

1 U.D.F.C.D. CUHPD RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985 TO WRITE OUTPUT FILE OF STORM HYDROGRAPHS FOR SUBSEQUENT USE WITH MULTI-PLAN RIVER ROUTING ROUTINES OF HEC-1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

NO HYDROGRAPH VALUES WERE WRITTEN TO AN OUTPUTFILE FOR THIS RUN OF CUHPD.

APPENDIX B - UDSWM2 - 10 YR

DESIGN PLAN CONDITIONS

CAUTION STATEMENT

The user is advised to use caution when using flow conveyance element (channels and pipes) peak flows and hydrographs given in this report. The UDSWM2-PC model assumes that all adjacent sub-basin flow enters the flow conveyance element at the sub-basin design point or the downstream end of the element. The flow conveyance element is simply routing the upstream incoming flow and ignoring the possibility that additional flow may be entering from the adjacent sub-basin. Due to this model limitation flow used for channel or pipe design should be increased appropriately using engineering judgment to reflect incoming sub-basin flow.

```
   2   1   1   2
   3   4
WATERSHED    1
ROBBINSDALE DRAINAGE BASIN DESIGN PLAN     FMG INC.  DECEMBER 1993
FUTURE HYDROLOGIC AND DESIGN PLAN HYDRAULIC CONDITIONS   10 YR STORM
        50  0 0  5.0                                                          1
        01  100
        02  101
        03  200
        04  102
        05  103
        06  104
        07  105
        08  106
        09  203
        10  300
        20  121
        21  122
        22   22
        30  130
        31  303

    0  203    11  9 2     0.1      1.     .01                       .016      .1
         0         0        .1       2.        .4         3.          .7        6.
       1.3         7         2        8       2.8         11         3.7        12
       4.8        12
    0   11   106   1     20.0     1100    .024      10.       10.      .075     10.0
    0  106   202   3               1.
    0  202    10  9 2     0.1      1.     .01                       .016      .1
         0         0        .2      1.0      1.1        4.0        2.8       5.0
       5.2       6.0       8.3      7.0     10.2        7.0       12.3       60.
      14.5     150.0
    0   10     9   2      3.5      300    .019       0.        0.     .016      3.5
    0    9   105   2      3.5      700    .030                          .016      3.5
    0  105   201   3               1.
    0  201     8  7 2     0.1      1.      .1                       .016      .1
         0         0       0.8       8.       2.8         19         5.1        24
       7.5        29      10.5       32      14.0         35
    0    8   104   1     20.0     2800    .017       5.        5.     .050     10.0
    0  104     7   3               1.
    0    7     6   1     25.0      200   .0100       3.        3.     .050     10.0
    0    6   103   1     30.0     1350   .0085       3.        3.     .050     10.0
    0  300    12  5 2     0.1      1.
         0         0        .2       8.       1.8        37.        4.5       64
       7.5        80
    0   12   103   1      4.0     1300     .01       4.        4.     .025      5.0
    0  103     5   3               1.
    0    5   102   1     20.0     1000    .008       4.        4.     .050     10.0
    0  102     4   3               1.
    0    4     2   1     25.0     2300   .0085       4.        4.     .050     10.0
    0  200     3  4 2     0.1      1.
         0         0       1.2       14       2.8         28         4.8        85
    0    3     2   1      3.0      350    .020       3.        3.     .050      5.0
    0    2   101   1     35.0      800    .005       5.        5.     .063     10.0
    0  101     1   3               1.
    0    1   100   1     35.0     3200    .005       5.        5.     .063     10.0
    0  100    99   3               1.
    0   22   122   1     20.0     3750    .031       5.        5.     .075     10.0
    0  122   301   3               1.
    0  301    21  6 2     0.1      1.
        0.        0.        .5       35       4.5         88        10.5       117
      19.5      142.      24.5      148
    0   21   121   1     15.0     2600    .005       4.        4.     .050      5.0
    0  121   120   3               1.
    0  120    20   3               1.
    0   20     6   1     30.0      700    .005       4.        4.     .050      5.0
    0  303    31  7 2     0.1      1.
         0         0         1       60       4.5        180         9.0       320
      14.5       430      21.0      510      28.0        580
    0   31   130   1     20.0     2800    .005       4.        4.     .050     10.0
    0  130   302   3               1.
    0  302    30  6 2     0.1      1.
         0         0        1.      13.       4.0         25         9.0        34
      12.0       220       16.     550.
    0   30   120   1      20.     1500    .005       4.        4.     .050     10.0

    0
   36
    1    2    3    4    5    6    7    8    9   10   11   12   20   21   22   30
   31  100  101  102  103  104  105  106  120  121  122  130  200  201  202  203
  300  301  302  303
```

1

ENVIRONMENTAL PROTECTION AGENCY - STORM WATER MANAGEMENT MODEL - VERSION PC.1

DEVELOPED BY METCALF + EDDY, INC.
UNIVERSITY OF FLORIDA
WATER RESOURCES ENGINEEERS, INC. (SEPTEMBER 1970)

UPDATED BY UNIVERSITY OF FLORIDA (JUNE 1973)
HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS
MISSOURI RIVER DIVISION, CORPS OF ENGINEERS (SEPTEMBER 1974)
BOYLE ENGINEERING CORPORATION (MARCH 1985, JULY 1985)

OTAPE OR DISK ASSIGNMENTS

JIN(1)	JIN(2)	JIN(3)	JIN(4)	JIN(5)	JIN(6)	JIN(7)	JIN(8)	JIN(9)	JIN(10)
2	1	0	0	0	0	0	0	0	0

JOUT(1)	JOUT(2)	JOUT(3)	JOUT(4)	JOUT(5)	JOUT(6)	JOUT(7)	JOUT(8)	JOUT(9)	JOUT(10)
1	2	0	0	0	0	0	0	0	0

NSCRAT(1)	NSCRAT(2)	NSCRAT(3)	NSCRAT(4)	NSCRAT(5)
3	4	0	0	0

1

WATERSHED PROGRAM CALLED

*** ENTRY MADE TO RUNOFF MODEL ***

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
FUTURE HYDROLOGIC AND DESIGN PLAN HYDRAULIC CONDITIONS 10 YR STORM

ONUMBER OF TIME STEPS 50
OINTEGRATION TIME INTERVAL (MINUTES), 5.00

25.0 PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DEPTH
1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
FUTURE HYDROLOGIC AND DESIGN PLAN HYDRAULIC CONDITIONS 10 YR STORM

HYDROGRAPHS FROM CUHPE/PC ARE LISTED FOR THE FOLLOWING 15 SUBCATCHMENTS

TIME(HR/MIN)		1 20	2 21	3 22	4 30	5 31	6	7	8	9	10
0	0.	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.	0.	0.	0.	0.	0.
0	5.	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.	0.	0.	0.	0.	0.
0	10.	0. 0.	0. 1.	1. 1.	5. 0.	2. 0.	4.	4.	0.	1.	2.
0	15.	10. 7.	10. 9.	7. 4.	21. 9.	12. 3.	24.	15.	3.	5.	9.
0	20.	57. 29.	36. 24.	17. 12.	51. 30.	30. 12.	65.	33.	7.	10.	22.
0	25.	148. 73.	94. 66.	46. 44.	151. 85.	76. 38.	179.	103.	23.	48.	61.
0	30.	259. 125.	156. 109.	70. 86.	207. 136.	89. 89.	279.	110.	47.	45.	96.
0	35.	295. 129.	165. 117.	66. 102.	176. 133.	69. 147.	252.	81.	62.	27.	93.
0	40.	250. 109.	145. 106.	55. 100.	133. 111.	49. 196.	193.	58.	64.	17.	78.
0	45.	196.	122.	45.	103.	36.	149.	42.	63.	11.	65.

		89.	93.	94.	91.	228.					
0	50.	155.	103.	38.	80.	26.	117.	31.	61.	7.	54.
		73.	80.	85.	75.	243.					
0	55.	126.	87.	32.	64.	19.	93.	23.	58.	6.	46.
		60.	70.	77.	63.	244.					
1	0.	105.	75.	27.	54.	17.	78.	19.	54.	6.	40.
		52.	62.	70.	54.	239.					
1	5.	92.	67.	24.	47.	16.	69.	19.	51.	6.	35.
		45.	56.	65.	48.	233.					
1	10.	83.	61.	21.	43.	15.	63.	18.	49.	6.	31.
		41.	51.	60.	43.	228.					
1	15.	77.	57.	18.	40.	15.	59.	18.	46.	6.	28.
		37.	48.	57.	40.	224.					
1	20.	71.	51.	15.	34.	14.	52.	15.	44.	4.	23.
		32.	43.	52.	35.	218.					
1	25.	65.	43.	13.	28.	11.	42.	11.	40.	3.	19.
		27.	37.	45.	28.	209.					
1	30.	57.	34.	11.	22.	9.	34.	9.	37.	2.	15.
		23.	31.	39.	22.	199.					
1	35.	50.	28.	9.	19.	8.	29.	8.	33.	2.	13.
		20.	26.	34.	19.	188.					
1	40.	46.	25.	8.	18.	7.	26.	7.	30.	2.	12.
		18.	21.	30.	17.	176.					
1	45.	44.	22.	8.	16.	7.	24.	7.	28.	2.	11.
		17.	18.	26.	16.	165.					
1	50.	42.	21.	7.	16.	7.	23.	7.	25.	2.	10.
		16.	16.	23.	15.	155.					
1	55.	41.	20.	7.	15.	7.	22.	7.	23.	1.	10.
		15.	15.	21.	14.	146.					
2	0.	39.	18.	6.	13.	6.	20.	6.	21.	0.	9.
		14.	13.	18.	13.	137.					
2	5.	34.	15.	5.	9.	4.	15.	3.	19.	0.	7.
		12.	11.	15.	10.	128.					
2	10.	24.	10.	3.	6.	2.	9.	2.	17.	0.	5.
		8.	8.	11.	7.	119.					
2	15.	15.	7.	2.	3.	0.	6.	0.	15.	0.	3.
		5.	6.	8.	5.	110.					
2	20.	9.	5.	2.	2.	0.	4.	0.	13.	0.	2.
		4.	5.	7.	3.	101.					
2	25.	6.	4.	0.	0.	0.	2.	0.	11.	0.	2.
		2.	3.	5.	2.	93.					
2	30.	3.	2.	0.	0.	0.	0.	0.	8.	0.	0.
		2.	2.	4.	1.	85.					
2	35.	2.	2.	0.	0.	0.	0.	0.	6.	0.	0.
		0.	2.	3.	0.	78.					
2	40.	0.	0.	0.	0.	0.	0.	0.	5.	0.	0.
		0.	0.	3.	0.	72.					
2	45.	0.	0.	0.	0.	0.	0.	0.	4.	0.	0.
		0.	0.	2.	0.	66.					
2	50.	0.	0.	0.	0.	0.	0.	0.	3.	0.	0.
		0.	0.	2.	0.	60.					
2	55.	0.	0.	0.	0.	0.	0.	0.	3.	0.	0.
		0.	0.	0.	0.	55.					
3	0.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.
		0.	0.	0.	0.	51.					
3	5.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.
		0.	0.	0.	0.	46.					
3	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	43.					
3	15.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	39.					
3	20.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	36.					

3	25.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	33.					
3	30.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	30.					
3	35.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	28.					
3	40.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	25.					
3	45.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	23.					
3	50.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	21.					
3	55.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	20.					
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	18.					
4	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	16.					
4	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	15.					

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ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
FUTURE HYDROLOGIC AND DESIGN PLAN HYDRAULIC CONDITIONS 10 YR STORM

GUTTER NUMBER	GUTTER CONNECTION	NDP	NP		WIDTH OR DIAM (FT)	LENGTH (FT)	INVERT SLOPE (FT/FT)	SIDE SLOPES HORIZ TO VERT L	R	MANNING N	OVERBANK/SURCHARGE DEPTH (FT)	JK
203	11	9	2	PIPE	.1	1.	.0100	.0	.0	.016	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0 .0 .1 2.0 .4 3.0 .7 6.0 1.3 7.0 2.0 8.0										
		2.8 11.0 3.7 12.0 4.8 12.0										
11	106	0	1	CHANNEL	20.0	1100.	.0240	10.0	10.0	.075	10.00	0
106	202	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
202	10	9	2	PIPE	.1	1.	.0100	.0	.0	.016	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0 .0 .2 1.0 1.1 4.0 2.8 5.0 5.2 6.0 8.3 7.0										
		10.2 7.0 12.3 60.0 14.5 150.0										
10	9	0	2	PIPE	3.5	300.	.0190	.0	.0	.016	3.50	0
9	105	0	2	PIPE	3.5	700.	.0300	.0	.0	.016	3.50	0
105	201	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
201	8	7	2	PIPE	.1	1.	.1000	.0	.0	.016	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0 .0 .8 8.0 2.8 19.0 5.1 24.0 7.5 29.0 10.5 32.0										
		14.0 35.0										
8	104	0	1	CHANNEL	20.0	2800.	.0170	5.0	5.0	.050	10.00	0
104	7	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
7	6	0	1	CHANNEL	25.0	200.	.0100	3.0	3.0	.050	10.00	0
6	103	0	1	CHANNEL	30.0	1350.	.0085	3.0	3.0	.050	10.00	0
300	12	5	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0 .0 .2 8.0 1.8 37.0 4.5 64.0 7.5 80.0										
12	103	0	1	CHANNEL	4.0	1300.	.0100	4.0	4.0	.025	5.00	0
103	5	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
5	102	0	1	CHANNEL	20.0	1000.	.0080	4.0	4.0	.050	10.00	0
102	4	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
4	2	0	1	CHANNEL	25.0	2300.	.0085	4.0	4.0	.050	10.00	0
200	3	4	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0 .0 1.2 14.0 2.8 28.0 4.8 85.0										
3	2	0	1	CHANNEL	3.0	350.	.0200	3.0	3.0	.050	5.00	0
2	101	0	1	CHANNEL	35.0	800.	.0050	5.0	5.0	.063	10.00	0
101	1	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
1	100	0	1	CHANNEL	35.0	3200.	.0050	5.0	5.0	.063	10.00	0
100	99	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
22	122	0	1	CHANNEL	20.0	3750.	.0310	5.0	5.0	.075	10.00	0
122	301	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
301	21	6	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0 .0 .5 35.0 4.5 88.0 10.5 117.0 19.5 142.0 24.5 148.0										
21	121	0	1	CHANNEL	15.0	2600.	.0050	4.0	4.0	.050	5.00	0
121	120	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
120	20	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
20	6	0	1	CHANNEL	30.0	700.	.0050	4.0	4.0	.050	5.00	0
303	31	7	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0 .0 1.0 60.0 4.5 180.0 9.0 320.0 14.5 430.0 21.0 510.0										
		28.0 580.0										
31	130	0	1	CHANNEL	20.0	2800.	.0050	4.0	4.0	.050	10.00	0
130	302	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
302	30	6	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0

RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW
.0 .0 1.0 13.0 4.0 25.0 9.0 34.0 12.0 220.0 16.0 550.0
30 120 0 1 CHANNEL 20.0 1500. .0050 4.0 4.0 .050 10.00 0
OTOTAL NUMBER OF CUTTERS/PIPES, 36
1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
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ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES

GUTTER	TRIBUTARY GUTTER/PIPE										TRIBUTARY SUBAREA										D.A. (AC)
1	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1528.3
2	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1415.0
3	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37.1
4	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1377.9
5	103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1283.2
6	7	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1194.9
7	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	299.5
8	201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167.7
9	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
10	202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
11	203	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20.5
12	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54.4
20	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	895.4
21	301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	227.8
22	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0	130.6
30	302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600.3
31	303	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	520.3
100	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1638.4
101	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1528.3
102	5	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1377.9
103	6	12	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	1283.2
104	8	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	299.5
105	9	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	167.7
106	11	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	120.3
120	121	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	895.4
121	21	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	295.0
122	22	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	227.8
130	31	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	600.3
200	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	37.1
201	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167.7
202	106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
203	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	20.5
300	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	54.4
301	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	227.8
302	130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600.3
303	0	0	0	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	0	520.3

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ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
FUTURE HYDROLOGIC AND DESIGN PLAN HYDRAULIC CONDITIONS 10 YR STORM

HYDROGRAPHS ARE LISTED FOR THE FOLLOWING 36 CONVEYANCE ELEMENTS

THE UPPER NUMBER IS DISCHARGE IN CFS
THE LOWER NUMBER IS ONE OF THE FOLLOWING CASES:
( ) DENOTES DEPTH ABOVE INVERT IN FEET
(S) DENOTES STORAGE IN AC-FT FOR DETENSION DAM. DISCHARGE INCLUDES SPILLWAY OUTFLOW.
(I) DENOTES GUTTER INFLOW IN CFS FROM SPECIFIED INFLOW HYDROGRAPH
(D) DENOTES DISCHARGE IN CFS DIVERTED FROM THIS GUTTER
(O) DENOTES STORAGE IN AC-FT FOR SURCHARGED GUTTER

TIME(HR/MIN)	1 11 103 202	2 12 104 203	3 20 105 300	4 21 106 301	5 22 120 302	6 30 121 303	7 31 122	8 100 130	9 101 200	10 102 201
0 5.	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )
	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )
	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0(S)	0. .0(S)
	0. .0(S)	0. .0(S)	0. .0(S)	0. .0(S)	0. .0(S)	0. .0(S)				
0 10.	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	1. .1( )	0. .0( )	0. .0( )	0. .0( )
	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	5. .0( )
	2. .0( )	4. .0( )	4. .0( )	0. .0( )	0. .0( )	0. .0( )	1. .0( )	0. .0( )	0. .0(S)	0. .0(S)
	0. .0(S)	0. .0(S)	0. .0(S)	0. .0(S)	0. .0(S)	0. .0(S)				
0 15.	0. .0( )	0. .0( )	0. .1( )	1. .1( )	1. .1( )	1. .1( )	16. .4( )	0. .0( )	0. .0( )	0. .0( )
	0. .0( )	0. .0( )	0. .1( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	10. .0( )	10. .0( )	23. .0( )
	13. .0( )	24. .0( )	15. .0( )	3. .0( )	7. .0( )	7. .0( )	9. .0( )	9. .0( )	0. .0(S)	1. .1(S)
	0. .0(S)	0. .0(S)	1. .0(S)	2. .0(S)	0. .0(S)	1. .0(S)				
0 20.	1. .1( )	0. .1( )	1. .2( )	8. .3( )	12. .4( )	11. .3( )	56. .8( )	0. .0( )	0. .1( )	0. .1( )
	0. .0( )	1. .2( )	6. .3( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	58. .0( )	36. .0( )	62. .0( )
	42. .0( )	65. .0( )	33. .0( )	7. .0( )	29. .0( )	29. .0( )	25. .0( )	30. .0( )	1. .1(S)	2. .2(S)
	0. .0(S)	1. .1(S)	5. .1(S)	8. .1(S)	2. .2(S)	3. .0(S)				
0 25.	6. .2( )	8. .3( )	2. .3( )	46. .8( )	64. 1.1( )	68. .9( )	159. 1.5( )	0. .0( )	0. .1( )	1. .2( )
	0. .0( )	5. .3( )	33. .7( )	1. .2( )	3. .1( )	0. .1( )	0. .0( )	154. .0( )	102. .0( )	215. .0( )
	149. .0( )	179. .0( )	103. .0( )	24. .0( )	75. .0( )	74. .0( )	69. .0( )	85. .0( )	4. .3(S)	7. .7(S)
	1. .1(S)	3. .3(S)	11. .4(S)	23. .3(S)	7. .5(S)	11. .2(S)				
0 30.	25. .6( )	58. 1.0( )	6. .6( )	157. 1.6( )	196. 2.0( )	209. 1.7( )	274. 2.1( )	1. .1( )	1. .2( )	1. .3( )
	1. .1( )	11. .6( )	86. 1.2( )	5. .3( )	12. .3( )	2. .1( )	2. .1( )	283. .0( )	213. .0( )	403. .0( )
	309. .0( )	280. .0( )	111. .0( )	48. .0( )	132. .0( )	130. .0( )	121. .0( )	137. .0( )	8. .7(S)	11. 1.3(S)
	2. .4(S)	4. .5(S)	19. .8(S)	39. .8(S)	14. 1.2(S)	29. .5(S)				
0 35.	72. 1.1( )	188. 1.9( )	11. .8( )	316. 2.3( )	352. 2.7( )	340. 2.2( )	263. 2.0( )	3. .1( )	2. .3( )	3. .4( )
	2. .1( )	20. .7( )	131. 1.5( )	12. .5( )	30. .6( )	5. .3( )	7. .3( )	367. .0( )	354. .0( )	528. .0( )
	429.	254.	84.	64.	146.	141.	147.	140.	12.	14.

		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	1.1(S)	1.9(S)
		3. .8(S)	6. .8(S)	28. 1.3(S)	47. 1.4(S)	17. 2.1(S)	59. 1.0(S)				
0	40.	154. 1.7( )	355. 2.7( )	15. .9( )	447. 2.8( )	431. 3.0( )	364. 2.3( )	203. 1.8( )	5. .2( )	4. .4( )	4. .4( )
		3. .2( )	29. .9( )	141. 1.5( )	21. .7( )	48. .8( )	8. .4( )	19. .6( )	404. .0( )	500. .0( )	565. .0( )
		442. .0( )	198. .0( )	61. .0( )	68. .0( )	138. .0( )	130. .0( )	154. .0( )	129. .0( )	16. 1.4(S)	16. 2.3(S)
		4. 1.2(S)	6. .9(S)	34. 1.7(S)	56. 2.1(S)	20. 2.9(S)	83. 1.7(S)				
0	45.	262. 2.3( )	474. 3.1( )	17. 1.0( )	505. 3.0( )	421. 3.0( )	329. 2.2( )	162. 1.5( )	7. .2( )	4. .4( )	4. .5( )
		4. .2( )	35. 1.0( )	136. 1.5( )	31. .9( )	62. .9( )	12. .5( )	37. .9( )	457. .0( )	596. .0( )	524. .0( )
		399. .0( )	157. .0( )	46. .0( )	67. .0( )	132. .0( )	120. .0( )	155. .0( )	128. .0( )	18. 1.6(S)	18. 2.6(S)
		4. 1.6(S)	6. .9(S)	38. 1.9(S)	65. 2.7(S)	23. 3.6(S)	110. 2.5(S)				
0	50.	365. 2.7( )	514. 3.3( )	19. 1.0( )	496. 2.9( )	379. 2.8( )	289. 2.0( )	130. 1.4( )	10. .3( )	4. .4( )	4. .5( )
		5. .2( )	38. 1.0( )	132. 1.5( )	41. 1.1( )	70. .9( )	16. .6( )	60. 1.2( )	520. .0( )	616. .0( )	458. .0( )
		354. .0( )	126. .0( )	35. .0( )	66. .0( )	130. .0( )	114. .0( )	150. .0( )	135. .0( )	19. 1.8(S)	19. 2.7(S)
		5. 2.0(S)	6. .9(S)	39. 2.0(S)	72. 3.3(S)	26. 4.3(S)	137. 3.2(S)				
0	55.	440. 3.0( )	498. 3.2( )	20. 1.0( )	457. 2.8( )	338. 2.7( )	259. 1.9( )	108. 1.2( )	12. .3( )	5. .4( )	5. .5( )
		6. .2( )	40. 1.0( )	131. 1.5( )	51. 1.2( )	73. 1.0( )	20. .6( )	86. 1.4( )	566. .0( )	585. .0( )	402. .0( )
		317. .0( )	105. .0( )	27. .0( )	63. .0( )	131. .0( )	111. .0( )	143. .0( )	148. .0( )	20. 1.9(S)	19. 2.8(S)
		5. 2.5(S)	6. .9(S)	40. 2.1(S)	79. 3.8(S)	27. 5.1(S)	159. 3.9(S)				
1	0.	480. 3.2( )	460. 3.1( )	20. 1.0( )	413. 2.7( )	309. 2.5( )	238. 1.8( )	94. 1.1( )	14. .4( )	5. .4( )	5. .5( )
		6. .2( )	40. 1.1( )	133. 1.5( )	60. 1.4( )	73. 1.0( )	23. .7( )	112. 1.7( )	585. .0( )	535. .0( )	362. .0( )
		295. .0( )	92. .0( )	24. .0( )	60. .0( )	134. .0( )	112. .0( )	135. .0( )	166. .0( )	21. 1.9(S)	19. 2.9(S)
		5. 2.8(S)	6. .9(S)	40. 2.1(S)	84. 4.2(S)	29. 6.0(S)	177. 4.4(S)				
1	5.	490. 3.2( )	421. 3.0( )	21. 1.0( )	377. 2.5( )	291. 2.5( )	227. 1.8( )	85. 1.1( )	15. .4( )	5. .5( )	5. .5( )
		6. .2( )	40. 1.1( )	136. 1.5( )	68. 1.4( )	72. 1.0( )	25. .7( )	136. 1.8( )	583. .0( )	488. .0( )	338. .0( )
		283. .0( )	84. .0( )	24. .0( )	57. .0( )	139. .0( )	114. .0( )	128. .0( )	183. .0( )	21. 2.0(S)	19. 2.9(S)
		5. 3.2(S)	6. .9(S)	40. 2.1(S)	88. 4.5(S)	30. 7.0(S)	189. 4.8(S)				
1	10.	484. 3.2( )	390. 2.8( )	21. 1.1( )	351. 2.4( )	282. 2.4( )	223. 1.8( )	80. 1.0( )	16. .4( )	5. .5( )	5. .5( )
		6. .2( )	40. 1.1( )	141. 1.5( )	75. 1.5( )	69. .9( )	28. .8( )	155. 2.0( )	567. .0( )	451. .0( )	325. .0( )
		278. .0( )	80. .0( )	24. .0( )	55. .0( )	143. .0( )	115. .0( )	120. .0( )	199. .0( )	21. 2.0(S)	19. 2.9(S)
		5. 3.6(S)	6. .9(S)	40. 2.1(S)	89. 4.7(S)	32. 8.1(S)	197. 5.0(S)				
1	15.	468. 3.1( )	368. 2.7( )	21. 1.1( )	334. 2.4( )	278. 2.4( )	222. 1.8( )	77. 1.0( )	17. .4( )	5. .5( )	5. .5( )
		6. .2( )	39. 1.0( )	146. 1.6( )	80. 1.6( )	66. .9( )	33. .8( )	171. 2.1( )	546. .0( )	424. .0( )	317. .0( )

		277. .0( )	76. .0( )	24. .0( )	53. .0( )	150. .0( )	117. .0( )	114. .0( )	211. .0( )	21. 2.0(S)	19. 3.0(S)
		5. 3.9(S)	6. .9(S)	39. 2.0(S)	90. 4.9(S)	49. 9.2(S)	202. 5.2(S)				
1	20.	450. 3.1( )	352. 2.7( )	21. 1.0( )	323. 2.3( )	277. 2.4( )	225. 1.8( )	71. 1.0( )	18. .4( )	6. .5( )	6. .5( )
		6. .2( )	39. 1.0( )	158. 1.6( )	83. 1.6( )	62. .9( )	53. 1.1( )	183. 2.2( )	522. .0( )	403. .0( )	311. .0( )
		277. .0( )	69. .0( )	21. .0( )	50. .0( )	168. .0( )	116. .0( )	105. .0( )	218. .0( )	21. 1.9(S)	19. 3.0(S)
		6. 4.2(S)	6. .9(S)	38. 1.9(S)	91. 5.1(S)	107. 10.2(S)	206. 5.3(S)				
1	25.	432. 3.0( )	342. 2.6( )	20. 1.0( )	316. 2.3( )	279. 2.4( )	234. 1.8( )	62. .9( )	18. .4( )	6. .5( )	6. .5( )
		6. .2( )	38. 1.0( )	183. 1.8( )	86. 1.6( )	58. .9( )	89. 1.5( )	192. 2.2( )	497. .0( )	385. .0( )	307. .0( )
		282. .0( )	60. .0( )	17. .0( )	47. .0( )	202. .0( )	113. .0( )	95. .0( )	220. .0( )	20. 1.9(S)	19. 3.0(S)
		6. 4.5(S)	6. .9(S)	37. 1.8(S)	91. 5.1(S)	147. 10.8(S)	207. 5.4(S)				
1	30.	414. 2.9( )	335. 2.6( )	20. 1.0( )	312. 2.3( )	289. 2.4( )	252. 1.9( )	53. .8( )	19. .4( )	6. .5( )	6. .5( )
		6. .2( )	36. 1.0( )	217. 2.0( )	88. 1.7( )	54. .8( )	126. 1.8( )	197. 2.3( )	471. .0( )	369. .0( )	311. .0( )
		297. .0( )	52. .0( )	15. .0( )	43. .0( )	237. .0( )	111. .0( )	85. .0( )	220. .0( )	20. 1.8(S)	19. 2.9(S)
		6. 4.8(S)	6. .9(S)	35. 1.7(S)	91. 5.1(S)	172. 11.2(S)	207. 5.4(S)				
1	35.	399. 2.9( )	334. 2.6( )	19. 1.0( )	316. 2.3( )	307. 2.5( )	277. 2.0( )	48. .8( )	19. .4( )	6. .5( )	6. .5( )
		6. .2( )	34. 1.0( )	250. 2.1( )	89. 1.7( )	49. .8( )	157. 2.0( )	200. 2.3( )	449. .0( )	362. .0( )	326. .0( )
		319. .0( )	48. .0( )	14. .0( )	39. .0( )	266. .0( )	109. .0( )	75. .0( )	220. .0( )	19. 1.8(S)	19. 2.9(S)
		6. 5.0(S)	6. .8(S)	32. 1.5(S)	91. 5.0(S)	189. 11.5(S)	204. 5.3(S)				
1	40.	387. 2.8( )	339. 2.6( )	19. 1.0( )	327. 2.3( )	329. 2.6( )	303. 2.1( )	45. .7( )	19. .4( )	6. .5( )	6. .5( )
		6. .2( )	32. .9( )	275. 2.3( )	89. 1.7( )	44. .7( )	178. 2.1( )	201. 2.3( )	433. .0( )	364. .0( )	346. .0( )
		342. .0( )	45. .0( )	13. .0( )	36. .0( )	286. .0( )	107. .0( )	66. .0( )	218. .0( )	19. 1.7(S)	19. 2.9(S)
		6. 5.2(S)	6. .8(S)	30. 1.4(S)	90. 4.9(S)	200. 11.7(S)	200. 5.1(S)				
1	45.	381. 2.8( )	351. 2.7( )	18. 1.0( )	343. 2.4( )	349. 2.7( )	323. 2.2( )	44. .7( )	19. .4( )	6. .5( )	6. .6( )
		6. .2( )	29. .9( )	292. 2.3( )	89. 1.7( )	40. .7( )	193. 2.2( )	200. 2.3( )	425. .0( )	374. .0( )	366. .0( )
		360. .0( )	43. .0( )	13. .0( )	34. .0( )	299. .0( )	106. .0( )	58. .0( )	215. .0( )	18. 1.6(S)	19. 2.8(S)
		6. 5.4(S)	6. .8(S)	28. 1.3(S)	89. 4.7(S)	206. 11.8(S)	194. 5.0(S)				
1	50.	381. 2.8( )	367. 2.7( )	18. 1.0( )	360. 2.5( )	365. 2.8( )	337. 2.2( )	42. .7( )	19. .4( )	6. .5( )	6. .6( )
		6. .2( )	27. .9( )	303. 2.4( )	89. 1.7( )	36. .6( )	201. 2.3( )	196. 2.3( )	423. .0( )	387. .0( )	380. .0( )
		372. .0( )	42. .0( )	13. .0( )	31. .0( )	306. .0( )	105. .0( )	52. .0( )	211. .0( )	17. 1.6(S)	19. 2.8(S)
		6. 5.6(S)	6. .8(S)	26. 1.2(S)	88. 4.5(S)	208. 11.8(S)	188. 4.7(S)				
1	55.	385. 2.8( )	381. 2.8( )	17. .9( )	374. 2.5( )	374. 2.8( )	345. 2.3( )	41. .7( )	19. .4( )	6. .5( )	6. .6( )
		6. .2( )	25. .8( )	308. 2.4( )	88. 1.7( )	32. .6( )	205. 2.3( )	192. 2.2( )	426. .0( )	401. .0( )	389. .0( )

		377. .0( )	41. .0( )	13. .0( )	29. .0( )	309. .0( )	103. .0( )	47. .0( )	206. .0( )	17. 1.5(S)	19. 2.8(S)
		6. 5.8(S)	6. .7(S)	24. 1.1(S)	85. 4.2(S)	208. 11.8(S)	180. 4.5(S)				
2	0.	392. 2.8( )	393. 2.8( )	16. .9( )	383. 2.5( )	377. 2.8( )	347. 2.3( )	39. .7( )	19. .4( )	6. .5( )	6. .6( )
		6. .2( )	24. .8( )	308. 2.4( )	86. 1.6( )	29. .6( )	206. 2.3( )	186. 2.2( )	431. .0( )	411. .0( )	390. .0( )
		377. .0( )	39. .0( )	12. .0( )	27. .0( )	307. .0( )	100. .0( )	43. .0( )	199. .0( )	16. 1.4(S)	19. 2.7(S)
		6. 5.9(S)	6. .7(S)	22. 1.0(S)	81. 4.0(S)	206. 11.8(S)	172. 4.3(S)				
2	5.	398. 2.9( )	399. 2.9( )	16. .9( )	385. 2.6( )	374. 2.8( )	344. 2.3( )	35. .6( )	19. .4( )	6. .5( )	6. .6( )
		6. .2( )	22. .8( )	304. 2.4( )	84. 1.6( )	26. .5( )	205. 2.3( )	179. 2.2( )	432. .0( )	413. .0( )	383. .0( )
		370. .0( )	34. .0( )	10. .0( )	25. .0( )	301. .0( )	96. .0( )	37. .0( )	189. .0( )	16. 1.4(S)	18. 2.7(S)
		6. 6.1(S)	5. .6(S)	21. .9(S)	78. 3.7(S)	202. 11.7(S)	164. 4.0(S)				
2	10.	402. 2.9( )	398. 2.9( )	15. .9( )	380. 2.5( )	364. 2.8( )	334. 2.2( )	29. .6( )	19. .4( )	6. .5( )	6. .6( )
		6. .2( )	20. .8( )	296. 2.3( )	81. 1.6( )	23. .5( )	201. 2.3( )	172. 2.1( )	427. .0( )	408. .0( )	369. .0( )
		356. .0( )	28. .0( )	8. .0( )	23. .0( )	290. .0( )	89. .0( )	32. .0( )	179. .0( )	15. 1.3(S)	18. 2.6(S)
		6. 6.2(S)	5. .6(S)	19. .8(S)	74. 3.4(S)	196. 11.6(S)	155. 3.8(S)				
2	15.	403. 2.9( )	390. 2.8( )	14. .9( )	369. 2.5( )	348. 2.7( )	320. 2.2( )	25. .5( )	18. .4( )	6. .5( )	6. .6( )
		5. .2( )	18. .7( )	285. 2.3( )	78. 1.6( )	20. .5( )	196. 2.3( )	165. 2.1( )	418. .0( )	398. .0( )	352. .0( )
		339. .0( )	24. .0( )	6. .0( )	20. .0( )	279. .0( )	84. .0( )	27. .0( )	169. .0( )	14. 1.2(S)	17. 2.5(S)
		6. 6.3(S)	5. .6(S)	17. .7(S)	70. 3.1(S)	188. 11.5(S)	147. 3.5(S)				
2	20.	399. 2.9( )	378. 2.8( )	14. .8( )	354. 2.4( )	332. 2.6( )	306. 2.1( )	22. .5( )	18. .4( )	6. .5( )	6. .6( )
		5. .2( )	17. .7( )	273. 2.2( )	75. 1.5( )	18. .4( )	189. 2.2( )	157. 2.0( )	408. .0( )	383. .0( )	334. .0( )
		323. .0( )	22. .0( )	6. .0( )	18. .0( )	267. .0( )	78. .0( )	22. .0( )	160. .0( )	13. 1.1(S)	17. 2.4(S)
		6. 6.4(S)	4. .5(S)	15. .6(S)	66. 2.8(S)	180. 11.4(S)	138. 3.3(S)				
2	25.	391. 2.8( )	362. 2.7( )	13. .8( )	338. 2.4( )	316. 2.6( )	292. 2.0( )	20. .5( )	18. .4( )	6. .5( )	6. .6( )
		5. .2( )	15. .7( )	261. 2.2( )	71. 1.5( )	15. .4( )	181. 2.2( )	149. 1.9( )	397. .0( )	365. .0( )	316. .0( )
		307. .0( )	20. .0( )	6. .0( )	16. .0( )	255. .0( )	74. .0( )	19. .0( )	151. .0( )	12. 1.0(S)	17. 2.4(S)
		6. 6.5(S)	4. .5(S)	14. .5(S)	62. 2.5(S)	171. 11.2(S)	129. 3.0(S)				
2	30.	380. 2.8( )	345. 2.6( )	12. .8( )	322. 2.3( )	301. 2.5( )	278. 2.0( )	18. .4( )	17. .4( )	6. .5( )	6. .6( )
		5. .2( )	14. .6( )	249. 2.1( )	68. 1.4( )	13. .4( )	173. 2.1( )	140. 1.9( )	383. .0( )	347. .0( )	301. .0( )
		291. .0( )	17. .0( )	6. .0( )	13. .0( )	242. .0( )	69. .0( )	16. .0( )	142. .0( )	11. 1.0(S)	16. 2.3(S)
		6. 6.5(S)	4. .5(S)	12. .4(S)	58. 2.2(S)	162. 11.1(S)	121. 2.8(S)				
2	35.	367. 2.7( )	328. 2.6( )	11. .8( )	306. 2.3( )	285. 2.4( )	263. 1.9( )	17. .4( )	17. .4( )	6. .5( )	6. .6( )
		4.	12.	235.	64.	11.	164.	132.	369.	330.	285.

		.2( )	.6( )	2.1( )	1.4( )	.3( )	2.1( )	1.8( )	.0( )	.0( )	.0( )
		276. .0( )	17. .0( )	6. .0( )	10. .0( )	228. .0( )	64. .0( )	13. .0( )	132. .0( )	10. .9(S)	16. 2.2(S)
		6. 6.5(S)	4. .5(S)	11. .4(S)	54. 1.9(S)	154. 10.9(S)	113. 2.5(S)				
2	40.	353. 2.7( )	312. 2.5( )	10. .7( )	290. 2.2( )	270. 2.4( )	250. 1.9( )	17. .4( )	17. .4( )	6. .5( )	6. .6( )
		4. .2( )	11. .5( )	223. 2.0( )	60. 1.4( )	10. .3( )	156. 2.0( )	124. 1.8( )	353. .0( )	312. .0( )	270. .0( )
		261. .0( )	17. .0( )	6. .0( )	9. .0( )	216. .0( )	60. .0( )	10. .0( )	124. .0( )	10. .8(S)	16. 2.2(S)
		6. 6.6(S)	3. .4(S)	10. .3(S)	50. 1.7(S)	145. 10.8(S)	105. 2.3(S)				
2	45.	338. 2.6( )	296. 2.4( )	9. .7( )	275. 2.1( )	255. 2.3( )	237. 1.8( )	16. .4( )	16. .4( )	6. .5( )	6. .6( )
		4. .2( )	10. .5( )	210. 1.9( )	57. 1.3( )	9. .3( )	147. 1.9( )	117. 1.7( )	338. .0( )	296. .0( )	255. .0( )
		247. .0( )	16. .0( )	6. .0( )	8. .0( )	204. .0( )	57. .0( )	9. .0( )	117. .0( )	9. .8(S)	15. 2.1(S)
		6. 6.6(S)	3. .4(S)	8. .2(S)	47. 1.4(S)	136. 10.6(S)	97. 2.1(S)				
2	50.	322. 2.6( )	280. 2.4( )	8. .7( )	261. 2.1( )	241. 2.2( )	225. 1.8( )	16. .4( )	16. .4( )	6. .5( )	6. .6( )
		4. .2( )	8. .5( )	199. 1.9( )	53. 1.3( )	8. .3( )	139. 1.9( )	109. 1.6( )	322. .0( )	280. .0( )	241. .0( )
		233. .0( )	16. .0( )	6. .0( )	7. .0( )	192. .0( )	53. .0( )	8. .0( )	109. .0( )	8. .7(S)	15. 2.1(S)
		6. 6.6(S)	3. .4(S)	7. .2(S)	43. 1.1(S)	128. 10.5(S)	90. 1.9(S)				
2	55.	308. 2.5( )	266. 2.3( )	8. .6( )	247. 2.0( )	228. 2.2( )	213. 1.7( )	16. .4( )	16. .4( )	6. .5( )	6. .6( )
		3. .2( )	7. .4( )	187. 1.8( )	50. 1.2( )	6. .2( )	130. 1.8( )	102. 1.6( )	308. .0( )	266. .0( )	228. .0( )
		219. .0( )	16. .0( )	6. .0( )	6. .0( )	180. .0( )	50. .0( )	6. .0( )	102. .0( )	8. .6(S)	15. 2.0(S)
		6. 6.6(S)	3. .4(S)	5. .1(S)	40. .9(S)	120. 10.4(S)	83. 1.7(S)				
3	0.	293. 2.4( )	251. 2.2( )	7. .6( )	234. 1.9( )	215. 2.1( )	201. 1.7( )	15. .4( )	15. .4( )	6. .5( )	6. .6( )
		3. .2( )	5. .4( )	176. 1.8( )	47. 1.2( )	5. .2( )	123. 1.7( )	95. 1.5( )	293. .0( )	251. .0( )	215. .0( )
		206. .0( )	15. .0( )	6. .0( )	5. .0( )	169. .0( )	47. .0( )	5. .0( )	95. .0( )	7. .6(S)	14. 1.9(S)
		6. 6.6(S)	3. .4(S)	4. .1(S)	37. .7(S)	112. 10.3(S)	77. 1.5(S)				
3	5.	279. 2.4( )	238. 2.2( )	7. .6( )	221. 1.9( )	202. 2.0( )	190. 1.6( )	15. .4( )	15. .4( )	6. .5( )	6. .6( )
		3. .2( )	4. .3( )	165. 1.7( )	43. 1.1( )	5. .2( )	115. 1.7( )	88. 1.5( )	279. .0( )	238. .0( )	202. .0( )
		194. .0( )	15. .0( )	6. .0( )	5. .0( )	158. .0( )	43. .0( )	5. .0( )	88. .0( )	6. .6(S)	14. 1.9(S)
		6. 6.6(S)	3. .3(S)	3. .1(S)	33. .5(S)	105. 10.1(S)	71. 1.3(S)				
3	10.	265. 2.3( )	224. 2.1( )	6. .6( )	208. 1.8( )	190. 2.0( )	178. 1.5( )	15. .4( )	15. .4( )	6. .5( )	6. .6( )
		3. .2( )	3. .3( )	154. 1.6( )	39. 1.1( )	4. .2( )	108. 1.6( )	82. 1.4( )	265. .0( )	224. .0( )	190. .0( )
		182. .0( )	15. .0( )	6. .0( )	3. .0( )	147. .0( )	39. .0( )	4. .0( )	82. .0( )	6. .5(S)	14. 1.8(S)
		6. 6.6(S)	3. .3(S)	2. .1(S)	22. .3(S)	98. 10.0(S)	65. 1.2(S)				
3	15.	251. 2.2( )	211. 2.0( )	6. .5( )	196. 1.8( )	178. 1.9( )	167. 1.5( )	14. .4( )	14. .4( )	6. .5( )	6. .6( )

		3. .2( )	3. .3( )	142. 1.6( )	33. 1.0( )	4. .2( )	101. 1.6( )	76. 1.3( )	251. .0( )	211. .0( )	178. .0( )
		169. .0( )	14. .0( )	6. .0( )	3. .0( )	134. .0( )	33. .0( )	4. .0( )	76. .0( )	5. .5(S)	13. 1.8(S)
		6. 6.5(S)	3. .3(S)	2. .0(S)	15. .2(S)	91. 9.9(S)	60. 1.0(S)				
3	20.	238. 2.2( )	199. 2.0( )	5. .5( )	184. 1.7( )	165. 1.8( )	155. 1.4( )	14. .4( )	14. .4( )	6. .5( )	6. .6( )
		3. .2( )	2. .2( )	130. 1.5( )	28. .9( )	3. .2( )	94. 1.5( )	70. 1.3( )	238. .0( )	199. .0( )	165. .0( )
		157. .0( )	14. .0( )	6. .0( )	3. .0( )	122. .0( )	28. .0( )	3. .0( )	70. .0( )	5. .4(S)	13. 1.7(S)
		6. 6.5(S)	3. .3(S)	1. .0(S)	10. .1(S)	85. 9.8(S)	52. .9(S)				
3	25.	225. 2.1( )	187. 1.9( )	5. .5( )	172. 1.6( )	153. 1.7( )	143. 1.4( )	14. .4( )	14. .3( )	6. .5( )	6. .6( )
		3. .2( )	2. .2( )	118. 1.4( )	23. .8( )	3. .1( )	88. 1.5( )	64. 1.2( )	225. .0( )	187. .0( )	153. .0( )
		145. .0( )	14. .0( )	6. .0( )	3. .0( )	111. .0( )	23. .0( )	3. .0( )	64. .0( )	5. .4(S)	13. 1.7(S)
		6. 6.5(S)	3. .3(S)	1. .0(S)	7. .1(S)	79. 9.7(S)	46. .8(S)				
3	30.	213. 2.0( )	174. 1.8( )	4. .5( )	160. 1.6( )	141. 1.7( )	132. 1.3( )	14. .4( )	14. .3( )	6. .5( )	6. .6( )
		3. .1( )	1. .2( )	108. 1.3( )	19. .7( )	2. .1( )	82. 1.4( )	58. 1.2( )	213. .0( )	174. .0( )	141. .0( )
		133. .0( )	14. .0( )	6. .0( )	3. .0( )	101. .0( )	19. .0( )	2. .0( )	58. .0( )	4. .4(S)	13. 1.6(S)
		6. 6.5(S)	2. .2(S)	1. .0(S)	6. .1(S)	73. 9.6(S)	41. .7(S)				
3	35.	201. 2.0( )	163. 1.7( )	4. .5( )	149. 1.5( )	130. 1.6( )	121. 1.2( )	13. .4( )	13. .3( )	6. .5( )	6. .6( )
		3. .1( )	1. .1( )	98. 1.3( )	16. .6( )	2. .1( )	76. 1.3( )	53. 1.1( )	201. .0( )	163. .0( )	130. .0( )
		122. .0( )	13. .0( )	6. .0( )	3. .0( )	92. .0( )	16. .0( )	2. .0( )	53. .0( )	4. .3(S)	12. 1.6(S)
		6. 6.4(S)	2. .2(S)	1. .0(S)	4. .1(S)	67. 9.5(S)	37. .6(S)				
3	40.	189. 1.9( )	151. 1.7( )	4. .4( )	138. 1.4( )	120. 1.5( )	112. 1.2( )	13. .4( )	13. .3( )	6. .5( )	6. .6( )
		3. .1( )	1. .1( )	89. 1.2( )	13. .6( )	2. .1( )	70. 1.3( )	48. 1.0( )	189. .0( )	151. .0( )	120. .0( )
		113. .0( )	13. .0( )	6. .0( )	3. .0( )	83. .0( )	13. .0( )	2. .0( )	48. .0( )	4. .3(S)	12. 1.6(S)
		6. 6.4(S)	2. .2(S)	0. .0(S)	3. .0(S)	61. 9.4(S)	33. .6(S)				
3	45.	177. 1.8( )	140. 1.6( )	4. .4( )	127. 1.4( )	111. 1.5( )	103. 1.1( )	13. .3( )	13. .3( )	6. .5( )	6. .6( )
		2. .1( )	1. .1( )	81. 1.1( )	11. .5( )	2. .1( )	64. 1.2( )	44. 1.0( )	177. .0( )	140. .0( )	111. .0( )
		104. .0( )	13. .0( )	6. .0( )	2. .0( )	76. .0( )	11. .0( )	2. .0( )	44. .0( )	3. .3(S)	12. 1.5(S)
		6. 6.4(S)	2. .2(S)	0. .0(S)	3. .0(S)	56. 9.3(S)	30. .5(S)				
3	50.	166. 1.8( )	130. 1.5( )	3. .4( )	118. 1.3( )	102. 1.4( )	95. 1.1( )	13. .3( )	13. .3( )	6. .5( )	6. .6( )
		2. .1( )	1. .1( )	74. 1.1( )	10. .5( )	2. .1( )	59. 1.2( )	40. .9( )	166. .0( )	130. .0( )	102. .0( )
		95. .0( )	13. .0( )	6. .0( )	2. .0( )	69. .0( )	10. .0( )	2. .0( )	40. .0( )	3. .3(S)	12. 1.5(S)
		6. 6.3(S)	2. .2(S)	0. .0(S)	2. .0(S)	51. 9.3(S)	28. .5(S)				
3	55.	156. 1.7( )	120. 1.5( )	3. .4( )	109. 1.3( )	94. 1.3( )	87. 1.0( )	12. .3( )	12. .3( )	6. .5( )	6. .6( )

```
              2.      0.      67.     8.      1.      54.     37.     156.    120.    94.
               .1( )   .1( )  1.0( )   .4( )   .1( )  1.1( )   .9( )   .0( )   .0( )   .0( )

              88.     12.     6.      2.      62.     8.      1.      37.     3.      12.
               .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .2(S)  1.5(S)

              6.      2.      0.      2.      46.     25.
              6.3(S)   .2(S)   .0(S)   .0(S)  9.2(S)   .4(S)

 4    0.      146.    112.    3.      101.    87.     81.     12.     12.     6.      6.
              1.6( )  1.4( )   .4( )  1.2( )  1.3( )  1.0( )   .3( )   .3( )   .5( )   .6( )

              2.      0.      61.     7.      1.      50.     33.     146.    112.    87.
               .1( )   .1( )  1.0( )   .4( )   .1( )  1.1( )   .8( )   .0( )   .0( )   .0( )

              81.     12.     6.      2.      57.     7.      1.      33.     3.      11.
               .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .2(S)  1.4(S)

              6.      2.      0.      2.      42.     23.
              6.3(S)   .1(S)   .0(S)   .0(S)  9.1(S)   .4(S)

 4    5.      136.    104.    3.      93.     80.     75.     12.     12.     6.      6.
              1.6( )  1.4( )   .4( )  1.2( )  1.2( )   .9( )   .3( )   .3( )   .5( )   .6( )

              2.      0.      56.     6.      1.      46.     31.     136.    104.    80.
               .1( )   .1( )   .9( )   .4( )   .1( )  1.0( )   .8( )   .0( )   .0( )   .0( )

              75.     12.     6.      2.      52.     6.      1.      31.     2.      11.
               .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .2(S)  1.4(S)

              6.      2.      0.      2.      39.     21.
              6.3(S)   .1(S)   .0(S)   .0(S)  9.1(S)   .3(S)

 4   10.      127.    96.     2.      87.     74.     69.     12.     12.     6.      6.
              1.5( )  1.3( )   .3( )  1.1( )  1.2( )   .9( )   .3( )   .3( )   .5( )   .6( )

              2.      0.      51.     5.      1.      42.     28.     127.    96.     74.
               .1( )   .1( )   .9( )   .3( )   .1( )  1.0( )   .8( )   .0( )   .0( )   .0( )

              69.     12.     6.      2.      47.     5.      1.      28.     2.      11.
               .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .2(S)  1.3(S)

              6.      2.      0.      1.      35.     19.
              6.2(S)   .1(S)   .0(S)   .0(S)  9.0(S)   .3(S)
```

1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
FUTURE HYDROLOGIC AND DESIGN PLAN HYDRAULIC CONDITIONS 10 YR STORM

*** PEAK FLOWS, STAGES AND STORAGES OF GUTTERS AND DETENSION DAMS ***

CONVEYANCE ELEMENT	PEAK (CFS)	STAGE (FT)	STORAGE (AC-FT)	TIME (HR/MIN)
203	6.	.1	.9	0 55.
11	6.	.2		1 25.
106	68.	(DIRECT FLOW)		0 40.
202	6.	.1	6.6	2 50.
303	207.	.1	5.4	1 25.
22	73.	1.0		1 0.
10	6.	.6		2 55.
31	201.	2.3		1 40.
122	155.	(DIRECT FLOW)		0 45.
9	6.	.5		2 55.
130	220.	(DIRECT FLOW)		1 30.
301	91.	.1	5.1	1 25.
105	111.	(DIRECT FLOW)		0 30.
302	208.	.1	11.8	1 55.
21	89.	1.7		1 45.
201	19.	.1	3.0	1 20.
30	206.	2.3		2 0.
121	141.	(DIRECT FLOW)		0 35.
8	19.	.4		1 50.
120	309.	(DIRECT FLOW)		1 55.
104	280.	(DIRECT FLOW)		0 30.
300	40.	.1	2.1	1 0.
20	308.	2.4		2 0.
7	274.	2.1		0 30.
12	40.	1.1		1 5.
6	364.	2.3		0 40.
103	442.	(DIRECT FLOW)		0 40.
5	431.	3.0		0 40.
200	21.	.1	2.0	1 10.
102	565.	(DIRECT FLOW)		0 40.
3	21.	1.1		1 10.
4	505.	3.0		0 45.
2	514.	3.3		0 50.
101	616.	(DIRECT FLOW)		0 50.
1	490.	3.2		1 5.
100	585.	(DIRECT FLOW)		1 0.

1 99 585. (DIRECT FLOW) 1 0.

ENDPROGRAM PROGRAM CALLED

APPENDIX B - UDSWM2 - 100 YR

DESIGN PLAN CONDITIONS

CAUTION STATEMENT

The user is advised to use caution when using flow conveyance element (channels and pipes) peak flows and hydrographs given in this report. The UDSWM2-PC model assumes that all adjacent sub-basin flow enters the flow conveyance element at the sub-basin design point or the downstream end of the element. The flow conveyance element is simply routing the upstream incoming flow and ignoring the possibility that additional flow may be entering from the adjacent sub-basin. Due to this model limitation flow used for channel or pipe design should be increased appropriately using engineering judgment to reflect incoming sub-basin flow.

```
   2   1   1   2
   3   4
WATERSHED    1
ROBBINSDALE DRAINAGE BASIN DESIGN PLAN    FMG INC.  DECEMBER 1993
FUTURE HYDROLOGIC AND DESIGN PLAN HYDRAULIC CONDITIONS   100 YR STORM
         50  0 0  5.0                                                    1
         01  100
         02  101
         03  200
         04  102
         05  103
         06  104
         07  105
         08  106
         09  203
         10  300
         20  121
         21  122
         22   22
         30  130
         31  303

   0  203   11  9 2    0.1     1.     .01                  .016     .1
        0        0      .1       2.      .4       3.          .7       6.
      1.3        7       2       8      2.8       11       3.7       12
      4.8       12
   0   11  106   1    20.0    1100   .024     10.     10.    .075    10.0
   0  106  202   3             1.
   0  202   10  9 2    0.1     1.     .01                  .016     .1
        0        0      .2      1.0      1.1      4.0       2.8      5.0
      5.2      6.0     8.3      7.0     10.2      7.0      12.3      60.
     14.5    150.0
   0   10    9   2     3.5     300   .019      0.      0.    .016     3.5
   0    9  105   2     3.5     700   .030                  .016     3.5
   0  105  201   3             1.
   0  201    8  7 2    0.1     1.      .1                  .016     .1
        0        0     0.8       8.      2.8       19       5.1       24
      7.5       29    10.5       32     14.0       35
   0    8  104   1    20.0    2800   .017      5.      5.    .050    10.0
   0  104    7   3             1.
   0    7    6   1    25.0     200  .0100      3.      3.    .050    10.0
   0    6  103   1    30.0    1350  .0085      3.      3.    .050    10.0
   0  300   12  5 2    0.1     1.
        0        0      .2       8.      1.8      37.       4.5       64
      7.5       80
   0   12  103   1     4.0    1300    .01      4.      4.    .025     5.0
   0  103    5   3             1.
   0    5  102   1    20.0    1000   .008      4.      4.    .050    10.0
   0  102    4   3             1.
   0    4    2   1    25.0    2300  .0085      4.      4.    .050    10.0
   0  200    3  4 2    0.1     1.
        0        0     1.2       14      2.8       28       4.8       85
   0    3    2   1     3.0     350   .020      3.      3.    .050     5.0
   0    2  101   1    35.0     800   .005      5.      5.    .063    10.0
   0  101    1   3             1.
   0    1  100   1    35.0    3200   .005      5.      5.    .063    10.0
   0  100   99   3             1.
   0   22  122   1    20.0    3750   .031      5.      5.    .075    10.0
   0  122  301   3             1.
   0  301   21  6 2    0.1     1.
       0.       0.      .5       35      4.5       88      10.5      117
     19.5     142.    24.5      148
   0   21  121   1    15.0    2600   .005      4.      4.    .050     5.0
   0  121  120   3             1.
   0  120   20   3             1.
   0   20    6   1    30.0     700   .005      4.      4.    .050     5.0
   0  303   31  7 2    0.1     1.
        0        0       1       60      4.5      180       9.0      320
     14.5      430    21.0      510     28.0      580
   0   31  130   1    20.0    2800   .005      4.      4.    .050    10.0
   0  130  302   3             1.
   0  302   30  6 2    0.1     1.
        0        0      1.      13.      4.0       25       9.0       34
     12.0      220     16.     550.
   0   30  120   1     20.    1500   .005      4.      4.    .050    10.0

   0
  36
   1    2    3    4    5    6    7    8    9   10   11   12   20   21   22   30
  31  100  101  102  103  104  105  106  120  121  122  130  200  201  202  203
 300  301  302  303
ENDPROGRAM□□
```

1

ENVIRONMENTAL PROTECTION AGENCY - STORM WATER MANAGEMENT MODEL - VERSION PC.1

DEVELOPED BY	METCALF + EDDY, INC.
	UNIVERSITY OF FLORIDA
	WATER RESOURCES ENGINEEERS, INC. (SEPTEMBER 1970)
UPDATED BY	UNIVERSITY OF FLORIDA (JUNE 1973)
	HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS
	MISSOURI RIVER DIVISION, CORPS OF ENGINEERS (SEPTEMBER 1974)
	BOYLE ENGINEERING CORPORATION (MARCH 1985, JULY 1985)

OTAPE OR DISK ASSIGNMENTS

JIN(1)	JIN(2)	JIN(3)	JIN(4)	JIN(5)	JIN(6)	JIN(7)	JIN(8)	JIN(9)	JIN(10)
2	1	0	0	0	0	0	0	0	0

JOUT(1)	JOUT(2)	JOUT(3)	JOUT(4)	JOUT(5)	JOUT(6)	JOUT(7)	JOUT(8)	JOUT(9)	JOUT(10)
1	2	0	0	0	0	0	0	0	0

NSCRAT(1)	NSCRAT(2)	NSCRAT(3)	NSCRAT(4)	NSCRAT(5)
3	4	0	0	0

1

WATERSHED PROGRAM CALLED

*** ENTRY MADE TO RUNOFF MODEL ***

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
FUTURE HYDROLOGIC AND DESIGN PLAN HYDRAULIC CONDITIONS 100 YR STORM

ONUMBER OF TIME STEPS 50
OINTEGRATION TIME INTERVAL (MINUTES), 5.00

25.0 PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DEPTH
1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
FUTURE HYDROLOGIC AND DESIGN PLAN HYDRAULIC CONDITIONS 100 YR STORM

HYDROGRAPHS FROM CUHPE/PC ARE LISTED FOR THE FOLLOWING 15 SUBCATCHMENTS

TIME(HR/MIN)		1 20	2 21	3 22	4 30	5 31	6	7	8	9	10
0	0.	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.	0.	0.	0.	0.	0.
0	5.	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.	0.	0.	0.	0.	0.
0	10.	1. 1.	1. 2.	2. 1.	6. 1.	3. 1.	5.	5.	1.	2.	2.
0	15.	12. 8.	11. 9.	7. 4.	21. 9.	12. 3.	25.	15.	3.	4.	9.
0	20.	54. 26.	32. 22.	15. 11.	45. 27.	26. 11.	58.	29.	7.	8.	20.
0	25.	130. 61.	73. 49.	37. 27.	120. 68.	62. 29.	144.	78.	16.	33.	50.
0	30.	259. 145.	211. 164.	94. 137.	315. 185.	145. 103.	380.	218.	66.	114.	129.
0	35.	437. 246.	357. 265.	138. 246.	416. 286.	169. 240.	564.	229.	130.	98.	193.
0	40.	512. 259.	377. 283.	135. 280.	370. 285.	141. 396.	526.	182.	167.	68.	192.
0	45.	457.	343.	119.	303.	109.	434.	140.	174.	49.	171.

		230.	265.	282.	250.	529.					
0	50.	378.	300.	103.	245.	84.	353.	108.	174.	33.	149.
		197.	239.	271.	215.	619.					
0	55.	310.	257.	88.	196.	63.	284.	81.	171.	24.	128.
		166.	211.	250.	182.	665.					
1	0.	254.	221.	75.	161.	48.	233.	63.	164.	21.	110.
		139.	187.	230.	155.	677.					
1	5.	214.	195.	66.	140.	42.	201.	55.	156.	20.	97.
		121.	168.	214.	136.	671.					
1	10.	184.	166.	55.	110.	32.	163.	39.	146.	11.	82.
		103.	145.	191.	113.	659.					
1	15.	150.	133.	42.	80.	23.	121.	28.	133.	8.	65.
		81.	120.	166.	89.	638.					
1	20.	117.	105.	29.	56.	16.	89.	18.	119.	4.	50.
		62.	97.	142.	69.	609.					
1	25.	88.	81.	21.	38.	12.	60.	12.	107.	2.	34.
		44.	78.	120.	51.	573.					
1	30.	68.	62.	16.	29.	9.	44.	9.	95.	2.	25.
		33.	63.	101.	36.	532.					
1	35.	56.	45.	12.	23.	8.	35.	8.	85.	2.	19.
		26.	51.	86.	27.	491.					
1	40.	49.	35.	10.	19.	7.	29.	7.	75.	2.	15.
		22.	41.	73.	22.	453.					
1	45.	45.	29.	9.	17.	7.	26.	7.	67.	2.	13.
		19.	30.	62.	19.	418.					
1	50.	43.	25.	8.	16.	7.	24.	7.	60.	2.	11.
		17.	24.	53.	16.	387.					
1	55.	41.	22.	7.	15.	7.	23.	7.	54.	2.	10.
		16.	20.	46.	15.	358.					
2	0.	40.	20.	7.	15.	7.	22.	7.	49.	2.	9.
		15.	17.	39.	14.	332.					
2	5.	38.	17.	5.	11.	5.	18.	4.	44.	0.	8.
		13.	14.	33.	11.	307.					
2	10.	28.	12.	4.	7.	2.	11.	2.	39.	0.	5.
		9.	10.	27.	8.	283.					
2	15.	18.	8.	3.	4.	0.	7.	0.	34.	0.	4.
		6.	7.	18.	5.	261.					
2	20.	11.	6.	2.	3.	0.	4.	0.	30.	0.	3.
		4.	5.	13.	4.	240.					
2	25.	7.	4.	0.	2.	0.	3.	0.	26.	0.	2.
		3.	4.	9.	2.	220.					
2	30.	4.	3.	0.	0.	0.	2.	0.	22.	0.	0.
		2.	3.	7.	2.	202.					
2	35.	2.	2.	0.	0.	0.	0.	0.	15.	0.	0.
		0.	2.	5.	0.	185.					
2	40.	0.	0.	0.	0.	0.	0.	0.	10.	0.	0.
		0.	1.	4.	0.	170.					
2	45.	0.	0.	0.	0.	0.	0.	0.	8.	0.	0.
		0.	0.	3.	0.	156.					
2	50.	0.	0.	0.	0.	0.	0.	0.	6.	0.	0.
		0.	0.	2.	0.	143.					
2	55.	0.	0.	0.	0.	0.	0.	0.	4.	0.	0.
		0.	0.	0.	0.	131.					
3	0.	0.	0.	0.	0.	0.	0.	0.	3.	0.	0.
		0.	0.	0.	0.	120.					
3	5.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.
		0.	0.	0.	0.	110.					
3	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	101.					
3	15.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	93.					
3	20.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	85.					

3	25.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	78.					
3	30.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	71.					
3	35.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	66.					
3	40.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	60.					
3	45.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	55.					
3	50.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	51.					
3	55.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	46.					
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	43.					
4	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	39.					
4	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	36.					

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ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
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GUTTER NUMBER	GUTTER CONNECTION	NDP	NP		WIDTH OR DIAM (FT)	LENGTH (FT)	INVERT SLOPE (FT/FT)	SIDE SLOPES HORIZ TO VERT L	R	MANNING N	OVERBANK/SURCHARGE DEPTH (FT)	JK
203	11	9	2	PIPE	.1	1.	.0100	.0	.0	.016	.10	0
RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW												
.0 .0 .1 2.0 .4 3.0 .7 6.0 1.3 7.0 2.0 8.0												
2.8 11.0 3.7 12.0 4.8 12.0												
11	106	0	1	CHANNEL	20.0	1100.	.0240	10.0	10.0	.075	10.00	0
106	202	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
202	10	9	2	PIPE	.1	1.	.0100	.0	.0	.016	.10	0
RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW												
.0 .0 .2 1.0 1.1 4.0 2.8 5.0 5.2 6.0 8.3 7.0												
10.2 7.0 12.3 60.0 14.5 150.0												
10	9	0	2	PIPE	3.5	300.	.0190	.0	.0	.016	3.50	0
9	105	0	2	PIPE	3.5	700.	.0300	.0	.0	.016	3.50	0
105	201	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
201	8	7	2	PIPE	.1	1.	.1000	.0	.0	.016	.10	0
RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW												
.0 .0 .8 8.0 2.8 19.0 5.1 24.0 7.5 29.0 10.5 32.0												
14.0 35.0												
8	104	0	1	CHANNEL	20.0	2800.	.0170	5.0	5.0	.050	10.00	0
104	7	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
7	6	0	1	CHANNEL	25.0	200.	.0100	3.0	3.0	.050	10.00	0
6	103	0	1	CHANNEL	30.0	1350.	.0085	3.0	3.0	.050	10.00	0
300	12	5	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0
RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW												
.0 .0 .2 8.0 1.8 37.0 4.5 64.0 7.5 80.0												
12	103	0	1	CHANNEL	4.0	1300.	.0100	4.0	4.0	.025	5.00	0
103	5	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
5	102	0	1	CHANNEL	20.0	1000.	.0080	4.0	4.0	.050	10.00	0
102	4	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
4	2	0	1	CHANNEL	25.0	2300.	.0085	4.0	4.0	.050	10.00	0
200	3	4	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0
RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW												
.0 .0 1.2 14.0 2.8 28.0 4.8 85.0												
3	2	0	1	CHANNEL	3.0	350.	.0200	3.0	3.0	.050	5.00	0
2	101	0	1	CHANNEL	35.0	800.	.0050	5.0	5.0	.063	10.00	0
101	1	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
1	100	0	1	CHANNEL	35.0	3200.	.0050	5.0	5.0	.063	10.00	0
100	99	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
22	122	0	1	CHANNEL	20.0	3750.	.0310	5.0	5.0	.075	10.00	0
122	301	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
301	21	6	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0
RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW												
.0 .0 .5 35.0 4.5 88.0 10.5 117.0 19.5 142.0 24.5 148.0												
21	121	0	1	CHANNEL	15.0	2600.	.0050	4.0	4.0	.050	5.00	0
121	120	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
120	20	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
20	6	0	1	CHANNEL	30.0	700.	.0050	4.0	4.0	.050	5.00	0
303	31	7	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0
RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW												
.0 .0 1.0 60.0 4.5 180.0 9.0 320.0 14.5 430.0 21.0 510.0												
28.0 580.0												
31	130	0	1	CHANNEL	20.0	2800.	.0050	4.0	4.0	.050	10.00	0
130	302	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
302	30	6	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0

RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW

```
                        .0     .0     1.0   13.0     4.0   25.0     9.0   34.0     12.0  220.0     16.0  550.0
  30      120            0        1      CHANNEL      20.0   1500.    .0050     4.0   4.0     .050      10.00      0
OTOTAL NUMBER OF GUTTERS/PIPES,  36
1
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ROBBINSDALE DRAINAGE BASIN DESIGN PLAN   FMG INC.   DECEMBER 1993
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ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES

GUTTER	TRIBUTARY GUTTER/PIPE										TRIBUTARY SUBAREA										D.A.(AC)
1	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1528.3
2	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1415.0
3	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37.1
4	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1377.9
5	103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1283.2
6	7	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1194.9
7	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	299.5
8	201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167.7
9	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
10	202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
11	203	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20.5
12	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54.4
20	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	895.4
21	301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	227.8
22	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0	130.6
30	302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600.3
31	303	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	520.3
100	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1638.4
101	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1528.3
102	5	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1377.9
103	6	12	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	1283.2
104	8	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	299.5
105	9	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	167.7
106	11	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	120.3
120	121	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	895.4
121	21	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	295.0
122	22	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	227.8
130	31	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	600.3
200	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	37.1
201	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167.7
202	106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
203	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	20.5
300	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	54.4
301	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	227.8
302	130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600.3
303	0	0	0	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	0	520.3

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ROBBINSDALE DRAINAGE BASIN DESIGN PLAN   FMG INC.   DECEMBER 1993
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HYDROGRAPHS ARE LISTED FOR THE FOLLOWING  36 CONVEYANCE ELEMENTS

         THE UPPER NUMBER IS DISCHARGE IN CFS
         THE LOWER NUMBER IS ONE OF THE FOLLOWING CASES:
                  ( ) DENOTES DEPTH ABOVE INVERT IN FEET
                  (S) DENOTES STORAGE IN AC-FT FOR DETENSION DAM.  DISCHARGE INCLUDES SPILLWAY OUTFLOW.
                  (I) DENOTES GUTTER INFLOW IN CFS FROM SPECIFIED INFLOW HYDROGRAPH
                  (D) DENOTES DISCHARGE IN CFS DIVERTED FROM THIS GUTTER
                  (O) DENOTES STORAGE IN AC-FT FOR SURCHARGED GUTTER

TIME(HR/MIN)     1         2         3         4         5         6         7         8         9        10
                11        12        20        21        22        30        31       100       101       102
               103       104       105       106       120       121       122       130       200       201
               202       203       300       301       302       303

  0    5.      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
                .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )
               0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
                .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )
               0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
                .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0(S)     .0(S)
               0.        0.        0.        0.        0.        0.
                .0(S)     .0(S)     .0(S)     .0(S)     .0(S)     .0(S)

  0   10.      0.        0.        0.        0.        0.        0.        2.        0.        0.        0.
                .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .1( )     .0( )     .0( )     .0( )
               0.        0.        0.        0.        0.        0.        0.        1.        1.        6.
                .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )
               3.        5.        5.        1.        1.        1.        2.        1.        0.        0.
                .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0(S)     .0(S)
               0.        0.        0.        0.        0.        0.
                .0(S)     .0(S)     .0(S)     .0(S)     .0(S)     .0(S)

  0   15.      0.        0.        0.        1.        2.        1.       17.        0.        0.        0.
                .0( )     .0( )     .1( )     .1( )     .1( )     .1( )     .4( )     .0( )     .0( )     .1( )
               0.        0.        1.        0.        0.        0.        0.       12.       11.       23.
                .0( )     .1( )     .1( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )
              13.       25.       15.        3.        8.        8.        9.        9.        0.        1.
                .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0(S)     .1(S)
               0.        0.        2.        2.        1.        1.
                .0(S)     .0(S)     .0(S)     .0(S)     .0(S)     .0(S)

  0   20.      1.        0.        1.        7.       11.       11.       51.        0.        0.        0.
                .1( )     .1( )     .2( )     .3( )     .4( )     .3( )     .8( )     .0( )     .1( )     .1( )
               0.        1.        6.        0.        0.        0.        0.       55.       33.       56.
                .0( )     .2( )     .2( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )
              38.       58.       29.        7.       26.       26.       22.       27.        1.        2.
                .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .1(S)     .2(S)
               0.        1.        5.        7.        2.        3.
                .0(S)     .1(S)     .1(S)     .1(S)     .2(S)     .0(S)

  0   25.      4.        6.        2.       37.       53.       56.      128.        0.        0.        0.
                .2( )     .3( )     .3( )     .7( )    1.0( )     .8( )    1.3( )     .0( )     .1( )     .2( )
               0.        4.       28.        1.        2.        0.        0.      135.       79.      173.
                .0( )     .3( )     .6( )     .1( )     .1( )     .1( )     .0( )     .0( )     .0( )     .0( )
             123.      144.       79.       16.       62.       62.       50.       68.        3.        6.
                .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .3(S)     .6(S)
               1.        2.       10.       19.        6.        9.
                .1(S)     .2(S)     .3(S)     .3(S)     .4(S)     .1(S)

  0   30.     25.       56.        6.      168.      208.      216.      347.        1.        1.        1.
                .6( )     .9( )     .6( )    1.6( )    2.1( )    1.7( )    2.4( )     .1( )     .2( )     .3( )
               1.       11.       87.        5.       14.        2.        2.      284.      267.      523.
                .1( )     .5( )    1.2( )     .3( )     .4( )     .1( )     .1( )     .0( )     .0( )     .0( )
             372.      381.      219.       66.      152.      150.      177.      187.        8.       12.
                .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .7(S)    1.5(S)
               2.        6.       19.       40.       14.       28.
                .4(S)     .7(S)     .8(S)     .8(S)    1.3(S)     .5(S)

  0   35.    107.      255.       13.      475.      525.      526.      561.        3.        3.        4.
               1.4( )    2.2( )     .8( )    2.9( )    3.3( )    2.9( )    3.1( )     .1( )     .3( )     .4( )
               2.       23.      194.       13.       58.        5.        8.      544.      612.      940.
                .1( )     .8( )    1.9( )     .6( )     .8( )     .3( )     .4( )     .0( )     .0( )     .0( )
             719.      568.      232.      133.      264.      259.      323.      293.       16.       19.
```

		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	1.4(S)	3.0(S)
		4. 1.1(S)	7. 1.4(S)	36. 1.7(S)	58. 2.2(S)	20. 2.8(S)	71. 1.3(S)				
0	40.	294. 2.4( )	625. 3.6( )	21. 1.1( )	851. 3.9( )	836. 4.2( )	761. 3.5( )	542. 3.0( )	6. .2( )	5. .4( )	5. .5( )
		4. .2( )	38. 1.0( )	277. 2.3( )	26. .9( )	123. 1.3( )	10. .4( )	25. .7( )	806. .0( )	1001. .0( )	1206. .0( )
		939. .0( )	532. .0( )	187. .0( )	171. .0( )	295. .0( )	285. .0( )	406. .0( )	310. .0( )	23. 2.2(S)	22. 4.3(S)
		5. 2.1(S)	8. 1.9(S)	47. 2.8(S)	85. 4.3(S)	26. 4.7(S)	123. 2.8(S)				
0	45.	575. 3.5( )	984. 4.6( )	29. 1.2( )	1104. 4.4( )	944. 4.5( )	779. 3.6( )	451. 2.7( )	10. .3( )	5. .4( )	5. .5( )
		6. .2( )	49. 1.2( )	292. 2.3( )	44. 1.1( )	180. 1.6( )	16. .5( )	59. 1.2( )	1031. .0( )	1327. .0( )	1247. .0( )
		937. .0( )	444. .0( )	145. .0( )	180. .0( )	289. .0( )	274. .0( )	445. .0( )	309. .0( )	31. 2.9(S)	24. 5.2(S)
		5. 3.3(S)	9. 2.2(S)	56. 3.7(S)	98. 6.6(S)	30. 6.6(S)	193. 4.9(S)				
0	50.	872. 4.3( )	1167. 5.0( )	41. 1.5( )	1164. 4.6( )	890. 4.4( )	708. 3.4( )	375. 2.5( )	14. .4( )	6. .5( )	6. .5( )
		7. .3( )	58. 1.3( )	285. 2.3( )	62. 1.4( )	217. 1.8( )	21. .6( )	111. 1.7( )	1250. .0( )	1467. .0( )	1135. .0( )
		849. .0( )	367. .0( )	113. .0( )	181. .0( )	280. .0( )	258. .0( )	456. .0( )	327. .0( )	45. 3.4(S)	26. 6.0(S)
		6. 4.5(S)	10. 2.4(S)	63. 4.4(S)	109. 8.9(S)	33. 8.6(S)	267. 7.3(S)				
0	55.	1096. 4.9( )	1178. 5.1( )	53. 1.6( )	1096. 4.4( )	801. 4.1( )	633. 3.2( )	308. 2.2( )	17. .4( )	6. .5( )	6. .6( )
		8. .3( )	64. 1.3( )	284. 2.3( )	78. 1.6( )	234. 1.8( )	44. 1.0( )	177. 2.1( )	1406. .0( )	1435. .0( )	997. .0( )
		760. .0( )	302. .0( )	87. .0( )	179. .0( )	288. .0( )	244. .0( )	445. .0( )	359. .0( )	54. 3.7(S)	27. 6.5(S)
		6. 5.7(S)	10. 2.6(S)	66. 4.9(S)	119. 11.3(S)	123. 10.4(S)	333. 9.7(S)				
1	0.	1209. 5.1( )	1100. 4.9( )	58. 1.7( )	992. 4.2( )	728. 4.0( )	587. 3.0( )	258. 2.0( )	20. .4( )	6. .5( )	7. .6( )
		9. .3( )	67. 1.3( )	313. 2.4( )	93. 1.7( )	236. 1.9( )	105. 1.6( )	244. 2.5( )	1463. .0( )	1321. .0( )	890. .0( )
		702. .0( )	253. .0( )	69. .0( )	173. .0( )	337. .0( )	232. .0( )	423. .0( )	399. .0( )	59. 3.9(S)	28. 6.8(S)
		7. 6.8(S)	10. 2.7(S)	68. 5.2(S)	125. 13.4(S)	213. 11.9(S)	377. 11.8(S)				
1	5.	1231. 5.2( )	1010. 4.7( )	61. 1.7( )	906. 4.0( )	699. 3.9( )	587. 3.0( )	225. 1.9( )	23. .5( )	7. .5( )	7. .6( )
		10. .3( )	68. 1.4( )	378. 2.7( )	105. 1.8( )	231. 1.8( )	191. 2.2( )	304. 2.9( )	1444. .0( )	1204. .0( )	838. .0( )
		698. .0( )	223. .0( )	62. .0( )	166. .0( )	417. .0( )	226. .0( )	398. .0( )	440. .0( )	61. 4.0(S)	28. 7.1(S)
		7. 7.9(S)	11. 2.7(S)	69. 5.5(S)	131. 15.3(S)	303. 13.0(S)	415. 13.8(S)				
1	10.	1201. 5.1( )	943. 4.5( )	61. 1.7( )	856. 3.9( )	712. 3.9( )	624. 3.1( )	193. 1.7( )	24. .5( )	7. .5( )	7. .6( )
		10. .3( )	69. 1.4( )	461. 3.0( )	115. 1.9( )	219. 1.8( )	281. 2.7( )	355. 3.1( )	1385. .0( )	1109. .0( )	822. .0( )
		726. .0( )	187. .0( )	45. .0( )	156. .0( )	498. .0( )	217. .0( )	364. .0( )	469. .0( )	61. 4.0(S)	29. 7.3(S)
		7. 9.0(S)	11. 2.8(S)	70. 5.6(S)	135. 17.1(S)	370. 13.8(S)	441. 15.4(S)				
1	15.	1150. 5.0( )	906. 4.4( )	59. 1.7( )	834. 3.8( )	743. 4.0( )	664. 3.3( )	152. 1.5( )	26. .5( )	7. .5( )	7. .6( )
		10. .3( )	70. 1.4( )	532. 3.2( )	123. 2.0( )	204. 1.7( )	354. 3.1( )	395. 3.3( )	1300. .0( )	1039. .0( )	823. .0( )

		758.	147.	35.	143.	558.	204.	323.	485.	59.	29.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	3.9(S)	7.3(S)
		7.	11.	70.	139.	417.	458.				
		10.0(S)	2.7(S)	5.6(S)	18.5(S)	14.4(S)	16.8(S)				
1	20.	1097.	888.	56.	827.	768.	690.	119.	27.	17.	20.
		4.9( )	4.4( )	1.7( )	3.8( )	4.1( )	3.3( )	1.3( )	.5( )	.8( )	1.0( )
		11.	70.	582.	129.	185.	407.	425.	1214.	993.	823.
		.3( )	1.4( )	3.4( )	2.0( )	1.6( )	3.3( )	3.4( )	.0( )	.0( )	.0( )
		776.	115.	35.	130.	599.	191.	282.	494.	55.	29.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	3.7(S)	7.4(S)
		23.	11.	70.	142.	449.	471.				
		10.8(S)	2.7(S)	5.5(S)	19.6(S)	14.8(S)	17.9(S)				
1	25.	1049.	878.	51.	823.	780.	701.	92.	27.	36.	39.
		4.8( )	4.4( )	1.6( )	3.8( )	4.1( )	3.4( )	1.1( )	.5( )	1.2( )	1.4( )
		11.	69.	612.	134.	165.	443.	448.	1137.	959.	818.
		.3( )	1.4( )	3.5( )	2.1( )	1.5( )	3.5( )	3.5( )	.0( )	.0( )	.0( )
		782.	88.	49.	117.	621.	178.	243.	499.	49.	29.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	3.6(S)	7.5(S)
		39.	10.	69.	143.	470.	481.				
		11.5(S)	2.7(S)	5.4(S)	20.4(S)	15.0(S)	18.6(S)				
1	30.	1008.	868.	45.	817.	782.	704.	74.	28.	48.	49.
		4.7( )	4.3( )	1.5( )	3.8( )	4.1( )	3.4( )	1.0( )	.5( )	1.4( )	1.6( )
		10.	68.	630.	138.	145.	466.	464.	1076.	930.	810.
		.3( )	1.4( )	3.5( )	2.1( )	1.4( )	3.6( )	3.5( )	.0( )	.0( )	.0( )
		781.	72.	58.	105.	636.	170.	208.	500.	44.	29.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	3.4(S)	7.6(S)
		50.	10.	67.	144.	483.	487.				
		11.9(S)	2.6(S)	5.1(S)	21.0(S)	15.2(S)	19.1(S)				
1	35.	972.	856.	40.	810.	780.	705.	65.	28.	57.	58.
		4.6( )	4.3( )	1.4( )	3.8( )	4.1( )	3.4( )	.9( )	.5( )	1.5( )	1.8( )
		10.	66.	643.	140.	127.	481.	474.	1029.	901.	803.
		.3( )	1.3( )	3.6( )	2.1( )	1.3( )	3.6( )	3.6( )	.0( )	.0( )	.0( )
		780.	63.	65.	95.	647.	166.	178.	502.	39.	29.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	3.2(S)	7.9(S)
		58.	10.	66.	144.	491.	489.				
		12.2(S)	2.5(S)	4.8(S)	21.3(S)	15.3(S)	19.3(S)				
1	40.	941.	845.	35.	804.	780.	708.	59.	29.	64.	65.
		4.5( )	4.3( )	1.3( )	3.8( )	4.1( )	3.4( )	.9( )	.5( )	1.7( )	1.9( )
		10.	65.	650.	142.	111.	490.	480.	990.	880.	799.
		.3( )	1.3( )	3.6( )	2.1( )	1.2( )	3.6( )	3.6( )	.0( )	.0( )	.0( )
		780.	58.	71.	86.	653.	163.	152.	503.	34.	30.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	3.0(S)	8.1(S)
		65.	10.	64.	144.	496.	487.				
		12.4(S)	2.5(S)	4.5(S)	21.5(S)	15.3(S)	19.2(S)				
1	45.	915.	835.	30.	800.	779.	710.	56.	29.	69.	70.
		4.4( )	4.2( )	1.3( )	3.8( )	4.1( )	3.4( )	.8( )	.5( )	1.7( )	2.0( )
		10.	62.	655.	143.	96.	495.	483.	960.	864.	797.
		.3( )	1.3( )	3.6( )	2.1( )	1.1( )	3.7( )	3.6( )	.0( )	.0( )	.0( )
		779.	55.	76.	77.	656.	161.	127.	501.	29.	30.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	2.8(S)	8.4(S)
		69.	10.	60.	144.	499.	483.				
		12.5(S)	2.4(S)	4.1(S)	21.4(S)	15.4(S)	18.8(S)				
1	50.	893.	828.	28.	797.	778.	711.	54.	29.	70.	70.
		4.4( )	4.2( )	1.2( )	3.8( )	4.1( )	3.4( )	.8( )	.5( )	1.7( )	2.0( )
		10.	59.	657.	143.	84.	498.	481.	936.	852.	794.
		.3( )	1.3( )	3.6( )	2.2( )	1.1( )	3.7( )	3.6( )	.0( )	.0( )	.0( )
		777.	53.	77.	70.	658.	160.	108.	498.	27.	30.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	2.7(S)	8.7(S)
		70.	9.	57.	144.	499.	477.				
		12.6(S)	2.4(S)	3.8(S)	21.2(S)	15.4(S)	18.3(S)				
1	55.	876.	822.	26.	794.	775.	711.	53.	30.	70.	70.
		4.3( )	4.2( )	1.2( )	3.8( )	4.1( )	3.4( )	.8( )	.5( )	1.7( )	2.0( )
		10.	56.	658.	143.	73.	498.	477.	917.	844.	790.
		.3( )	1.2( )	3.6( )	2.2( )	1.0( )	3.7( )	3.6( )	.0( )	.0( )	.0( )

		774. .0( )	52. .0( )	77. .0( )	64. .0( )	657. .0( )	159. .0( )	93. .0( )	492. .0( )	26. 2.6(S)	31. 9.1(S)
		70. 12.5(S)	9. 2.3(S)	54. 3.5(S)	144. 20.9(S)	497. 15.4(S)	468. 17.6(S)				
2	0.	863. 4.3( )	818. 4.2( )	25. 1.2( )	790. 3.7( )	771. 4.1( )	709. 3.4( )	52. .8( )	30. .6( )	68. 1.7( )	67. 2.0( )
		9. .3( )	53. 1.2( )	656. 3.6( )	144. 2.2( )	64. .9( )	496. 3.7( )	471. 3.6( )	903. .0( )	838. .0( )	786. .0( )
		769. .0( )	52. .0( )	75. .0( )	58. .0( )	655. .0( )	158. .0( )	81. .0( )	485. .0( )	25. 2.4(S)	31. 9.4(S)
		67. 12.5(S)	9. 2.3(S)	51. 3.2(S)	143. 20.6(S)	493. 15.3(S)	458. 16.8(S)				
2	5.	852. 4.3( )	812. 4.2( )	24. 1.1( )	784. 3.7( )	764. 4.0( )	704. 3.4( )	49. .8( )	30. .6( )	65. 1.7( )	65. 1.9( )
		9. .3( )	50. 1.2( )	651. 3.6( )	143. 2.2( )	56. .8( )	492. 3.7( )	463. 3.5( )	890. .0( )	828. .0( )	775. .0( )
		759. .0( )	48. .0( )	69. .0( )	53. .0( )	649. .0( )	156. .0( )	70. .0( )	474. .0( )	24. 2.3(S)	31. 9.7(S)
		64. 12.4(S)	9. 2.2(S)	48. 2.9(S)	143. 20.1(S)	487. 15.2(S)	447. 15.9(S)				
2	10.	840. 4.3( )	802. 4.2( )	23. 1.1( )	772. 3.7( )	751. 4.0( )	694. 3.3( )	43. .7( )	31. .6( )	62. 1.6( )	61. 1.8( )
		9. .3( )	47. 1.1( )	642. 3.6( )	143. 2.2( )	49. .8( )	486. 3.6( )	453. 3.5( )	869. .0( )	814. .0( )	757. .0( )
		743. .0( )	41. .0( )	64. .0( )	48. .0( )	638. .0( )	152. .0( )	59. .0( )	461. .0( )	23. 2.2(S)	31. 9.9(S)
		61. 12.3(S)	9. 2.2(S)	45. 2.6(S)	142. 19.6(S)	478. 15.1(S)	435. 14.9(S)				
2	15.	827. 4.2( )	787. 4.1( )	22. 1.1( )	756. 3.7( )	733. 4.0( )	678. 3.3( )	38. .7( )	31. .6( )	58. 1.6( )	58. 1.8( )
		9. .3( )	45. 1.1( )	630. 3.5( )	142. 2.1( )	42. .7( )	477. 3.6( )	441. 3.5( )	845. .0( )	795. .0( )	737. .0( )
		723. .0( )	38. .0( )	58. .0( )	43. .0( )	625. .0( )	149. .0( )	49. .0( )	446. .0( )	22. 2.1(S)	32. 10.1(S)
		58. 12.2(S)	8. 2.1(S)	43. 2.4(S)	141. 19.0(S)	467. 15.0(S)	416. 13.8(S)				
2	20.	811. 4.2( )	769. 4.1( )	21. 1.0( )	737. 3.6( )	713. 3.9( )	662. 3.3( )	36. .6( )	31. .6( )	56. 1.5( )	55. 1.7( )
		9. .3( )	42. 1.1( )	617. 3.5( )	141. 2.1( )	35. .6( )	466. 3.6( )	425. 3.4( )	822. .0( )	774. .0( )	715. .0( )
		704. .0( )	35. .0( )	56. .0( )	38. .0( )	611. .0( )	145. .0( )	40. .0( )	429. .0( )	20. 1.9(S)	32. 10.3(S)
		55. 12.1(S)	8. 2.0(S)	40. 2.1(S)	139. 18.3(S)	454. 14.8(S)	395. 12.7(S)				
2	25.	793. 4.1( )	748. 4.0( )	20. 1.0( )	717. 3.6( )	694. 3.9( )	646. 3.2( )	34. .6( )	31. .6( )	53. 1.5( )	52. 1.7( )
		8. .3( )	39. 1.0( )	602. 3.5( )	140. 2.1( )	29. .6( )	452. 3.5( )	408. 3.3( )	800. .0( )	752. .0( )	696. .0( )
		685. .0( )	34. .0( )	53. .0( )	34. .0( )	595. .0( )	143. .0( )	33. .0( )	410. .0( )	19. 1.8(S)	32. 10.4(S)
		52. 12.0(S)	8. 2.0(S)	38. 1.9(S)	137. 17.6(S)	439. 14.7(S)	374. 11.7(S)				
2	30.	774. 4.1( )	727. 3.9( )	18. 1.0( )	697. 3.5( )	675. 3.8( )	629. 3.2( )	33. .6( )	32. .6( )	50. 1.4( )	49. 1.6( )
		8. .3( )	36. 1.0( )	585. 3.4( )	138. 2.1( )	24. .5( )	437. 3.4( )	389. 3.2( )	778. .0( )	730. .0( )	675. .0( )
		665. .0( )	33. .0( )	50. .0( )	30. .0( )	577. .0( )	140. .0( )	27. .0( )	390. .0( )	18. 1.7(S)	32. 10.6(S)
		49. 11.9(S)	8. 1.9(S)	34. 1.6(S)	135. 16.9(S)	422. 14.4(S)	353. 10.6(S)				
2	35.	754. 4.0( )	706. 3.9( )	17. 1.0( )	676. 3.4( )	654. 3.7( )	610. 3.1( )	32. .6( )	32. .6( )	46. 1.4( )	46. 1.6( )
		8.	33.	566.	137.	20.	420.	369.	756.	708.	654.

```
          .3( )    1.0( )    3.3( )    2.1( )     .5( )    3.4( )    3.2( )     .0( )     .0( )     .0( )

         643.       32.       46.       23.      557.      137.       22.      369.       17.       32.
          .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )    1.6(S)   10.7(S)

          45.        8.       30.      133.      403.      332.
         11.7(S)   1.9(S)    1.4(S)   16.1(S)   14.2(S)    9.6(S)

2   40.  733.      684.       16.      655.      630.      590.       32.       32.       42.       42.
         4.0( )    3.8( )     .9( )    3.4( )    3.7( )    3.0( )     .6( )     .6( )    1.3( )    1.5( )

           8.       29.      545.      135.       17.      402.      348.      733.      684.      630.
          .3( )     .9( )    3.3( )    2.1( )     .4( )    3.3( )    3.1( )     .0( )     .0( )     .0( )

         619.       32.       42.       18.      537.      135.       18.      348.       16.       32.
          .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )    1.4(S)   10.8(S)

          41.        8.       26.      130.      383.      308.
         11.6(S)   1.8(S)    1.2(S)   15.3(S)   14.0(S)    8.6(S)

2   45.  711.      661.       15.      632.      607.      569.       32.       32.       38.       38.
         3.9( )    3.8( )     .9( )    3.3( )    3.6( )    3.0( )     .6( )     .6( )    1.2( )    1.4( )

           8.       26.      525.      133.       14.      383.      326.      711.      661.      607.
          .3( )     .8( )    3.2( )    2.1( )     .4( )    3.2( )    3.0( )     .0( )     .0( )     .0( )

         595.       32.       38.       16.      515.      133.       14.      326.       15.       32.
          .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )    1.3(S)   10.8(S)

          38.        8.       23.      128.      363.      280.
         11.4(S)   1.8(S)    1.0(S)   14.6(S)   13.7(S)    7.7(S)

2   50.  689.      637.       15.      609.      583.      549.       32.       32.       35.       34.
         3.8( )    3.7( )     .9( )    3.3( )    3.5( )    2.9( )     .6( )     .6( )    1.2( )    1.3( )

           8.       23.      503.      131.       12.      362.      302.      689.      637.      583.
          .3( )     .8( )    3.1( )    2.1( )     .3( )    3.1( )    2.8( )     .0( )     .0( )     .0( )

         571.       32.       35.       14.      493.      131.       12.      302.       14.       32.
          .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )    1.2(S)   10.8(S)

          34.        8.       20.      126.      341.      255.
         11.3(S)   1.7(S)     .9(S)   13.8(S)   13.5(S)    6.9(S)

2   55.  666.      613.       14.      585.      559.      527.       32.       32.       31.       31.
         3.8( )    3.6( )     .9( )    3.2( )    3.5( )    2.9( )     .6( )     .6( )    1.1( )    1.2( )

           8.       20.      480.      129.       10.      341.      278.      666.      613.      559.
          .3( )     .7( )    3.1( )    2.0( )     .3( )    3.0( )    2.7( )     .0( )     .0( )     .0( )

         547.       32.       31.       12.      470.      129.       10.      278.       13.       32.
          .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )    1.1(S)   10.8(S)

          30.        8.       18.      124.      319.      232.
         11.1(S)   1.7(S)     .8(S)   13.0(S)   13.2(S)    6.2(S)

3    0.  643.      589.       13.      561.      534.      504.       32.       32.       28.       28.
         3.7( )    3.5( )     .8( )    3.1( )    3.4( )    2.8( )     .6( )     .6( )    1.1( )    1.2( )

           8.       18.      456.      127.        8.      319.      256.      643.      589.      534.
          .3( )     .7( )    3.0( )    2.0( )     .3( )    2.9( )    2.6( )     .0( )     .0( )     .0( )

         521.       32.       28.       11.      445.      127.        8.      256.       12.       32.
          .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )    1.0(S)   10.8(S)

          27.        7.       16.      122.      296.      211.
         11.0(S)   1.6(S)     .6(S)   12.2(S)   12.9(S)    5.5(S)

3    5.  619.      564.       12.      537.      509.      480.       32.       32.       25.       25.
         3.6( )    3.4( )     .8( )    3.1( )    3.3( )    2.7( )     .6( )     .6( )    1.0( )    1.1( )

           8.       16.      432.      124.        7.      297.      235.      619.      564.      509.
          .3( )     .7( )    2.9( )    2.0( )     .2( )    2.8( )    2.5( )     .0( )     .0( )     .0( )

         496.       32.       25.       10.      421.      124.        7.      235.       11.       32.
          .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )    1.0(S)   10.8(S)

          25.        7.       14.      120.      274.      193.
         10.9(S)   1.6(S)     .5(S)   11.4(S)   12.6(S)    4.9(S)

3   10.  596.      539.       11.      512.      484.      456.       32.       32.       23.       22.
         3.6( )    3.4( )     .8( )    3.0( )    3.2( )    2.6( )     .6( )     .6( )     .9( )    1.1( )

           7.       14.      408.      122.        6.      275.      216.      596.      539.      484.
          .3( )     .6( )    2.8( )    2.0( )     .2( )    2.7( )    2.4( )     .0( )     .0( )     .0( )

         470.       32.       23.        7.      397.      122.        6.      216.       10.       32.
          .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .9(S)   10.7(S)

          22.        7.       12.      117.      252.      176.
         10.8(S)   1.5(S)     .4(S)   10.7(S)   12.4(S)    4.4(S)

3   15.  571.      513.       10.      488.      458.      433.       32.       32.       20.       20.
         3.5( )    3.3( )     .7( )    2.9( )    3.1( )    2.6( )     .6( )     .6( )     .9( )    1.0( )
```

		7. .3( )	12. .6( )	385. 2.7( )	120. 2.0( )	5. .2( )	254. 2.6( )	197. 2.3( )	571. .0( )	513. .0( )	458. .0( )
		445. .0( )	32. .0( )	20. .0( )	7. .0( )	374. .0( )	120. .0( )	5. .0( )	197. .0( )	10. .8(S)	32. 10.7(S)
		20. 10.7(S)	7. 1.5(S)	11. .4(S)	114. 9.9(S)	232. 12.1(S)	159. 3.9(S)				
3	20.	547. 3.4( )	488. 3.2( )	9. .7( )	463. 2.8( )	434. 3.0( )	410. 2.5( )	32. .6( )	32. .6( )	18. .8( )	18. .9( )
		7. .3( )	11. .5( )	363. 2.6( )	117. 1.9( )	4. .2( )	235. 2.5( )	181. 2.2( )	547. .0( )	488. .0( )	434. .0( )
		421. .0( )	32. .0( )	18. .0( )	7. .0( )	352. .0( )	117. .0( )	4. .0( )	181. .0( )	9. .8(S)	32. 10.6(S)
		18. 10.6(S)	7. 1.4(S)	10. .3(S)	111. 9.2(S)	214. 11.9(S)	144. 3.5(S)				
3	25.	523. 3.3( )	463. 3.1( )	8. .7( )	439. 2.7( )	411. 2.9( )	389. 2.4( )	32. .6( )	32. .6( )	17. .8( )	16. .9( )
		7. .3( )	10. .5( )	342. 2.5( )	114. 1.9( )	4. .2( )	218. 2.4( )	165. 2.1( )	523. .0( )	463. .0( )	411. .0( )
		398. .0( )	32. .0( )	17. .0( )	7. .0( )	332. .0( )	114. .0( )	4. .0( )	165. .0( )	8. .7(S)	32. 10.5(S)
		16. 10.6(S)	7. 1.4(S)	9. .2(S)	107. 8.4(S)	200. 11.7(S)	131. 3.1(S)				
3	30.	499. 3.2( )	439. 3.0( )	8. .6( )	416. 2.7( )	389. 2.9( )	368. 2.3( )	32. .6( )	32. .6( )	15. .8( )	15. .9( )
		7. .3( )	8. .5( )	323. 2.5( )	111. 1.9( )	3. .2( )	202. 2.3( )	151. 2.0( )	499. .0( )	439. .0( )	389. .0( )
		377. .0( )	32. .0( )	15. .0( )	7. .0( )	314. .0( )	111. .0( )	3. .0( )	151. .0( )	8. .6(S)	32. 10.4(S)
		15. 10.5(S)	7. 1.3(S)	7. .2(S)	104. 7.7(S)	185. 11.4(S)	119. 2.7(S)				
3	35.	475. 3.1( )	416. 2.9( )	7. .6( )	394. 2.6( )	368. 2.8( )	350. 2.3( )	32. .6( )	32. .6( )	14. .7( )	14. .8( )
		7. .3( )	7. .4( )	305. 2.4( )	108. 1.9( )	3. .1( )	188. 2.2( )	138. 1.9( )	475. .0( )	416. .0( )	368. .0( )
		357. .0( )	32. .0( )	14. .0( )	7. .0( )	296. .0( )	108. .0( )	3. .0( )	138. .0( )	7. .6(S)	32. 10.2(S)
		13. 10.5(S)	7. 1.3(S)	5. .1(S)	100. 7.1(S)	171. 11.2(S)	108. 2.4(S)				
3	40.	452. 3.1( )	394. 2.8( )	7. .6( )	374. 2.5( )	348. 2.7( )	332. 2.2( )	32. .6( )	32. .6( )	13. .7( )	13. .8( )
		7. .3( )	6. .4( )	287. 2.3( )	105. 1.8( )	3. .1( )	174. 2.1( )	126. 1.8( )	452. .0( )	394. .0( )	348. .0( )
		337. .0( )	32. .0( )	13. .0( )	7. .0( )	278. .0( )	105. .0( )	3. .0( )	126. .0( )	6. .5(S)	32. 10.1(S)
		12. 10.4(S)	7. 1.2(S)	4. .1(S)	97. 6.4(S)	157. 11.0(S)	99. 2.1(S)				
3	45.	430. 3.0( )	374. 2.8( )	6. .6( )	354. 2.4( )	330. 2.6( )	315. 2.1( )	32. .6( )	32. .6( )	12. .7( )	12. .8( )
		7. .3( )	4. .3( )	270. 2.2( )	102. 1.8( )	2. .1( )	160. 2.0( )	116. 1.7( )	430. .0( )	374. .0( )	330. .0( )
		319. .0( )	32. .0( )	12. .0( )	7. .0( )	262. .0( )	102. .0( )	2. .0( )	116. .0( )	6. .5(S)	32. 10.0(S)
		12. 10.4(S)	7. 1.2(S)	3. .1(S)	94. 5.7(S)	144. 10.8(S)	90. 1.9(S)				
3	50.	409. 2.9( )	354. 2.7( )	6. .5( )	335. 2.4( )	312. 2.6( )	298. 2.1( )	32. .6( )	32. .6( )	11. .7( )	11. .7( )
		7. .3( )	3. .3( )	254. 2.2( )	98. 1.8( )	2. .1( )	148. 1.9( )	106. 1.6( )	409. .0( )	354. .0( )	312. .0( )
		302. .0( )	32. .0( )	11. .0( )	7. .0( )	246. .0( )	98. .0( )	2. .0( )	106. .0( )	5. .5(S)	31. 9.8(S)
		11. 10.4(S)	7. 1.1(S)	2. .1(S)	91. 5.1(S)	133. 10.6(S)	82. 1.6(S)				
3	55.	388. 2.8( )	335. 2.6( )	5. .5( )	318. 2.3( )	295. 2.5( )	283. 2.0( )	32. .6( )	32. .6( )	10. .6( )	10. .7( )

		7. .3( )	3. .3( )	239. 2.1( )	95. 1.7( )	2. .1( )	136. 1.9( )	97. 1.5( )	388. .0( )	335. .0( )	295. .0( )
		285. .0( )	32. .0( )	10. .0( )	7. .0( )	232. .0( )	95. .0( )	2. .0( )	97. .0( )	5. .4(S)	31. 9.7(S)
		10. 10.3(S)	7. 1.1(S)	2. .0(S)	88. 4.5(S)	122. 10.4(S)	75. 1.4(S)				
4	0.	369. 2.7( )	318. 2.5( )	5. .5( )	301. 2.2( )	279. 2.4( )	268. 2.0( )	31. .6( )	31. .6( )	10. .6( )	10. .7( )
		7. .3( )	2. .2( )	225. 2.0( )	92. 1.7( )	2. .1( )	125. 1.8( )	89. 1.5( )	369. .0( )	318. .0( )	279. .0( )
		270. .0( )	31. .0( )	10. .0( )	7. .0( )	217. .0( )	92. .0( )	2. .0( )	89. .0( )	5. .4(S)	31. 9.6(S)
		10. 10.3(S)	7. 1.0(S)	1. .0(S)	81. 4.0(S)	112. 10.3(S)	69. 1.2(S)				
4	5.	350. 2.7( )	301. 2.5( )	4. .5( )	285. 2.2( )	264. 2.3( )	253. 1.9( )	31. .6( )	31. .6( )	9. .6( )	9. .7( )
		7. .3( )	2. .2( )	210. 1.9( )	87. 1.7( )	2. .1( )	115. 1.7( )	82. 1.4( )	350. .0( )	301. .0( )	264. .0( )
		255. .0( )	31. .0( )	9. .0( )	7. .0( )	202. .0( )	87. .0( )	2. .0( )	82. .0( )	4. .4(S)	31. 9.4(S)
		9. 10.3(S)	6. 1.0(S)	1. .0(S)	74. 3.4(S)	102. 10.1(S)	63. 1.1(S)				
4	10.	333. 2.6( )	285. 2.4( )	4. .5( )	270. 2.1( )	249. 2.3( )	239. 1.8( )	31. .6( )	31. .6( )	9. .6( )	9. .7( )
		7. .3( )	1. .2( )	196. 1.9( )	82. 1.6( )	1. .1( )	106. 1.6( )	75. 1.3( )	333. .0( )	285. .0( )	249. .0( )
		240. .0( )	31. .0( )	9. .0( )	7. .0( )	188. .0( )	82. .0( )	1. .0( )	75. .0( )	4. .3(S)	31. 9.3(S)
		9. 10.3(S)	6. .9(S)	1. .0(S)	68. 3.0(S)	94. 10.0(S)	56. .9(S)				

1

*** PEAK FLOWS, STAGES AND STORAGES OF GUTTERS AND DETENSION DAMS ***

CONVEYANCE ELEMENT	PEAK (CFS)	STAGE (FT)	STORAGE (AC-FT)	TIME (HR/MIN)
203	11.	.1	2.8	1 10.
11	11.	.3		1 25.
106	181.	(DIRECT FLOW)		0 50.
202	70.	.1	12.6	1 50.
303	489.	.1	19.3	1 35.
22	236.	1.9		1 0.
10	70.	2.0		1 50.
31	483.	3.6		1 45.
122	456.	(DIRECT FLOW)		0 50.
9	70.	1.7		1 50.
130	503.	(DIRECT FLOW)		1 40.
301	144.	.1	21.5	1 40.
105	232.	(DIRECT FLOW)		0 35.
302	499.	.1	15.4	1 50.
21	144.	2.2		2 0.
201	32.	.1	10.8	2 55.
30	498.	3.7		1 55.
121	285.	(DIRECT FLOW)		0 40.
8	32.	.6		3 5.
120	658.	(DIRECT FLOW)		1 50.
104	568.	(DIRECT FLOW)		0 35.
300	70.	.1	5.6	1 15.
20	658.	3.6		1 55.
7	561.	3.1		0 35.
12	70.	1.4		1 15.
6	779.	3.6		0 45.
103	939.	(DIRECT FLOW)		0 40.
5	944.	4.5		0 45.
200	61.	.1	4.0	1 5.
102	1247.	(DIRECT FLOW)		0 45.
3	61.	1.7		1 10.
4	1164.	4.6		0 50.
2	1178.	5.1		0 55.
101	1467.	(DIRECT FLOW)		0 50.
1	1231.	5.2		1 5.
100	1463.	(DIRECT FLOW)		1 0.

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      99      1463.       (DIRECT FLOW)        1   0.
1

ENDPROGRAM  PROGRAM CALLED
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APPENDIX C

EXISTING CONDITION COMPUTER PRINTOUTS

This appendix contains complete existing condition computer printouts. Existing condition printouts are for existing land use and existing design plan hydraulic conditions. Printouts for both the CUHPE/PC and UDSWM2 models are included. 10 year and 100 year runs are included.

Note: Computer printouts are dated Dec. 1993 rather than Dec. 1994 due to time lag between dates of final analysis (Dec. 1993) and City approval (Dec. 1994).

APPENDIX C - CUHPE/PC - 10 YR

EXISTING LAND USE CONDITIONS

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\2      ROBBINSDALE DRAINAGE BASIN DESIGN PLAN  FMG INC.    DEC 1993
01 10 YR     10 1.86                                           0.000.000.000.00

\70 1 15.0     01 01 BASIN #1 EXISTING CONDITIONS
 .172 1.06 0.59 55.0 .012        .40  .10  3.0.0018   .5     0
\70 1 15.0     02 02 BASIN #2 EXISTING CONDITIONS
 .177 0.76 0.34 18.0 .024        .50  .10  3.0.0018   .5     0
\71 1 15.0     03 03 BASIN #3 EXISTING CONDITIONS
 .058 0.44 0.22 43.0 .028 23.0  .35  .06  3.0.0018   .5     0
\70 1 15.0     04 04 BASIN #4 EXISTING  CONDITIONS
 .148 0.55 0.21 38.0 .017        .35  .06  3.0.0018   .5     0
\71 1 15.0     05 05 BASIN #5 EXISTING CONDITIONS
 .053 0.42 0.24 47.0 .012 20.0  .35  .08  3.0.0018   .5     0
\70 1 15.0     06 06 BASIN #6 EXISTING  CONDITIONS
 .206 0.68 0.28 35.0 .028        .37  .07  3.0.0018   .5     0
\71 1 15.0     07 07 BASIN #7 EXISTING  CONDITIONS
 .074 0.46 0.17 20.0 .055 14.0  .37  .06  3.5.0018   .5     0
\70 1 15.0     08 08 BASIN #8 EXISTING CONDITIONS
 .156 1.12 0.52 07.0 .054        .50  .06  3.2.0018   .5     0
\71 1 15.0     09 09 BASIN #9 EXISTING  CONDITIONS
 .032 0.28 0.12 15.0 .060  9.0  .40  .06  3.0.0018   .5     0
\71 1 15.0     10 10 BASIN 10 EXISTING CONDITIONS
 .085 0.51 0.21 02.0 .021 30.0  .40  0.6  3.0.0018   .5     0
\71 1 15.0     20 20 BASIN #20 EXISTING CONDITIONS
 .105 0.59 0.30 01.0 .023 32.0  .60  .10  3.3.0018   .5     0
\70 1 15.0     21 21 BASIN #21 EXISTING CONDITIONS
 .152 0.80 0.37 01.0 .036        .60  .10  3.2.0018   .5     0
\70 1 15.0     22 22 BASIN #22 EXISTING  CONDITIONS
 .204 0.79 0.38 01.0 .060        .60  .10  3.3.0018   .5     0
\71 1 15.0     30 30 BASIN #30 EXISTING CONDITIONS
 .125 0.51 0.24 01.0 .025 30.0  .60  .10  3.1.0018   .5     0
\70 1 15.0     31 31 BASIN #31 EXISTING CONDITIONS
 .813 2.10 1.18 04.0 .036        .60  .10  3.4.0018   .5     0
E
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□□

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 01 -- BASIN COMMENT: BASIN #1 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.17	1.06	.59	55.00	.0120	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.086	.510

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
14.40	1645.82	283.08	9.17

WIDTH AT 50 = 18. MIN. WIDTH AT 75 = 9. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	30.	113.	*	60.	19.	*
5.	65.	*	35.	84.	*	65.	14.	*
10.	207.	*	40.	62.	*	70.	10.	*
15.	282.	*	45.	46.	*	75.	8.	*
20.	208.	*	50.	34.	*	80.	0.	*
25.	155.	*	55.	25.	*	0.	0.	*

1 BASIN ID: 01 -- BASIN COMMENT: BASIN #1 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	85.	.04	.018	59.	*
5.	.04	.000	0.	*	90.	.04	.018	51.	*
10.	.07	.003	0.	*	95.	.04	.018	43.	*
15.	.15	.080	6.	*	100.	.04	.018	36.	*
20.	.28	.146	27.	*	105.	.04	.018	32.	*
25.	.47	.363	77.	*	110.	.04	.018	30.	*
30.	.22	.194	146.	*	115.	.03	.017	28.	*
35.	.10	.080	191.	*	120.	.02	.013	26.	*
40.	.08	.057	182.	*	125.	.00	.000	24.	*
45.	.07	.049	157.	*	130.	.00	.000	19.	*
50.	.06	.039	134.	*	135.	.00	.000	14.	*
55.	.06	.039	114.	*	140.	.00	.000	10.	*
60.	.06	.039	98.	*	145.	.00	.000	7.	*
65.	.06	.039	86.	*	150.	.00	.000	5.	*
70.	.06	.039	78.	*	155.	.00	.000	4.	*
75.	.06	.039	71.	*	160.	.00	.000	3.	*
80.	.05	.026	66.	*	165.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = 1.372 INCHES
VOLUME OF EXCESS PRECIP = 13. ACRE-FEET
PEAK Q = 191. CFS TIME OF PEAK = 35. MIN.

INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 02 -- BASIN COMMENT: BASIN #2 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.18	.76	.34	18.00	.0240	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.113	.239

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
11.18	1057.13	187.11	9.44

WIDTH AT 50 = 28. MIN. WIDTH AT 75 = 15. MIN. K50 = .24 K75 = .32

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	40.	74.	*	80.	20.	*
5.	108.	*	45.	63.	*	85.	17.	*
10.	185.	*	50.	54.	*	90.	15.	*
15.	170.	*	55.	46.	*	95.	13.	*
20.	141.	*	60.	39.	*	100.	11.	*
25.	125.	*	65.	33.	*	105.	9.	*
30.	105.	*	70.	28.	*	110.	8.	*
35.	87.	*	75.	24.	*	115.	0.	*

1 BASIN ID: 02 -- BASIN COMMENT: BASIN #2 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	90.	.04	.006	38.	*
5.	.04	.000	0.	*	95.	.04	.006	34.	*
10.	.07	.001	0.	*	100.	.04	.006	30.	*
15.	.15	.026	3.	*	105.	.04	.006	27.	*
20.	.28	.048	10.	*	110.	.04	.006	24.	*
25.	.47	.217	37.	*	115.	.03	.005	22.	*
30.	.22	.178	71.	*	120.	.02	.004	19.	*
35.	.10	.064	87.	*	125.	.00	.000	17.	*
40.	.08	.042	86.	*	130.	.00	.000	14.	*
45.	.07	.034	82.	*	135.	.00	.000	11.	*
50.	.06	.024	76.	*	140.	.00	.000	8.	*
55.	.06	.024	70.	*	145.	.00	.000	6.	*
60.	.06	.024	64.	*	150.	.00	.000	5.	*
65.	.06	.025	60.	*	155.	.00	.000	4.	*
70.	.06	.025	56.	*	160.	.00	.000	3.	*
75.	.06	.025	53.	*	165.	.00	.000	3.	*
80.	.05	.012	49.	*	170.	.00	.000	2.	*
85.	.04	.006	44.	*	175.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = .815 INCHES
VOLUME OF EXCESS PRECIP = 8. ACRE-FEET
PEAK Q = 87. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN. MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 03 -- BASIN COMMENT: BASIN #3 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.06	.44	.22	43.00	.0280	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.092	.362

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
9.48	23.00	1993.90	115.65	3.09

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 6.73)

WIDTH AT 50 = 15. MIN. WIDTH AT 75 = 8. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	20.	55.	*	40.	16.	*
5.	72.	*	25.	40.	*	45.	11.	*
10.	115.	*	30.	29.	*	50.	8.	*
15.	80.	*	35.	21.	*	55.	0.	*

1 BASIN ID: 03 -- BASIN COMMENT: BASIN #3 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	70.	.06	.034	21.	*
5.	.04	.000	0.	*	75.	.06	.034	18.	*
10.	.07	.019	1.	*	80.	.05	.022	15.	*
15.	.15	.062	7.	*	85.	.04	.014	13.	*
20.	.28	.114	17.	*	90.	.04	.014	11.	*
25.	.47	.371	46.	*	95.	.04	.014	9.	*
30.	.22	.189	70.	*	100.	.04	.014	8.	*
35.	.10	.075	66.	*	105.	.04	.014	8.	*
40.	.08	.052	55.	*	110.	.04	.014	7.	*
45.	.07	.044	45.	*	115.	.03	.013	7.	*
50.	.06	.034	38.	*	120.	.02	.010	6.	*

55.	.06	.034	32.	*	125.	.00	.000	5.	*
60.	.06	.034	27.	*	130.	.00	.000	3.	*
65.	.06	.034	24.	*	135.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86)   EXECESS PRECIP. = 1.262 INCHES
VOLUME OF EXCESS PRECIP = 4. ACRE-FEET
PEAK Q = 70. CFS   TIME OF PEAK = 30. MIN.
INFILT.= 3.00 IN/HR   DECAY = .00180   FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN.   MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .59
I = 3.4 INCHES/HOUR
A = 37.1 ACRES
Q = 74. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS   EXECUTED ON DATE   AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 04 -- BASIN COMMENT: BASIN #4 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.15	.55	.21	38.00	.0170	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.094	.370

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
7.83	2669.73	395.12	7.89

WIDTH AT 50 = 11. MIN.   WIDTH AT 75 = 6. MIN.   K50 = .35   K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN.   MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR.   DECAY = .00180/SECOND   FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
		*			*			
		*			*			
0.	0.	*	20.	125.	*	40.	19.	*
5.	281.	*	25.	78.	*	45.	12.	*
10.	346.	*	30.	49.	*	50.	8.	*
15.	201.	*	35.	31.	*	55.	0.	*

1 BASIN ID: 04 -- BASIN COMMENT: BASIN #4 EXISTING CONDITIONS

**** STORM NO. = 1 ****   DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
				*					*
				*					*
0.	.00	.000	0.	*	70.	.06	.032	43.	*
5.	.04	.000	0.	*	75.	.06	.033	40.	*
10.	.07	.017	5.	*	80.	.05	.020	34.	*
15.	.15	.055	21.	*	85.	.04	.013	28.	*
20.	.28	.101	51.	*	90.	.04	.013	22.	*
25.	.47	.365	151.	*	95.	.04	.013	19.	*
30.	.22	.186	207.	*	100.	.04	.013	18.	*
35.	.10	.072	176.	*	105.	.04	.013	16.	*
40.	.08	.050	133.	*	110.	.04	.013	16.	*

45.	.07	.042	103.	*	115.	.03	.011	15.	*
50.	.06	.032	80.	*	120.	.02	.009	13.	*
55.	.06	.032	64.	*	125.	.00	.000	9.	*
60.	.06	.032	54.	*	130.	.00	.000	6.	*
65.	.06	.032	47.	*	135.	.00	.000	3.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = 1.199 INCHES
VOLUME OF EXCESS PRECIP = 9. ACRE-FEET
PEAK Q = 207. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN. MAX.IMP.RET.= .06 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 05 -- BASIN COMMENT: BASIN #5 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.05	.42	.24	47.00	.0120	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.090	.383

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
8.74	20.00	2358.31	124.99	2.83

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 7.67)

WIDTH AT 50 = 13. MIN. WIDTH AT 75 = 7. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .08 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	20.	50.	*	40.	11.	*
5.	78.	*	25.	34.	*	45.	0.	*
10.	121.	*	30.	23.	*	0.	0.	*
15.	76.	*	35.	16.	*	0.	0.	*

1 BASIN ID: 05 -- BASIN COMMENT: BASIN #5 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	70.	.06	.036	16.	*
5.	.04	.000	0.	*	75.	.06	.036	15.	*
10.	.07	.012	1.	*	80.	.05	.023	14.	*
15.	.15	.068	7.	*	85.	.04	.016	12.	*
20.	.28	.125	19.	*	90.	.04	.016	10.	*
25.	.47	.376	50.	*	95.	.04	.016	8.	*

30.	.22	.190	73.	*	100.	.04	.016	8.	*
35.	.10	.076	66.	*	105.	.04	.016	7.	*
40.	.08	.054	53.	*	110.	.04	.016	7.	*
45.	.07	.046	42.	*	115.	.03	.014	6.	*
50.	.06	.035	34.	*	120.	.02	.011	6.	*
55.	.06	.036	27.	*	125.	.00	.000	4.	*
60.	.06	.036	23.	*	130.	.00	.000	3.	*
65.	.06	.036	18.	*	135.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = 1.304 INCHES
VOLUME OF EXCESS PRECIP = 4. ACRE-FEET
PEAK Q = 73. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN. MAX.IMP.RET.= .08 IN.

RATIONAL FORMULA C = .61
I = 3.7 INCHES/HOUR
A = 33.9 ACRES
Q = 75. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 06 -- BASIN COMMENT: BASIN #6 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.21	.68	.28	35.00	.0280	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.096	.358

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
8.61	2250.25	463.55	10.99

WIDTH AT 50 = 13. MIN. WIDTH AT 75 = 7. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .37 IN. MAX. IMPERVIOUS RET. = .07 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	25.	125.	*	50.	17.	*
5.	313.	*	30.	84.	*	55.	11.	*
10.	446.	*	35.	56.	*	60.	8.	*
15.	286.	*	40.	38.	*	65.	0.	*
20.	187.	*	45.	25.	*	0.	0.	*

1 BASIN ID: 06 -- BASIN COMMENT: BASIN #6 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	75.	.06	.031	59.	*
5.	.04	.000	0.	*	80.	.05	.019	52.	*
10.	.07	.012	4.	*	85.	.04	.012	40.	*

15.	.15	.051	21.	*	90.	.04	.012	32.	*
20.	.28	.093	55.	*	95.	.04	.012	27.	*
25.	.47	.348	167.	*	100.	.04	.012	24.	*
30.	.22	.185	251.	*	105.	.04	.012	22.	*
35.	.10	.071	229.	*	110.	.04	.012	21.	*
40.	.08	.049	182.	*	115.	.03	.011	20.	*
45.	.07	.041	144.	*	120.	.02	.008	18.	*
50.	.06	.031	115.	*	125.	.00	.000	14.	*
55.	.06	.031	93.	*	130.	.00	.000	9.	*
60.	.06	.031	79.	*	135.	.00	.000	6.	*
65.	.06	.031	70.	*	140.	.00	.000	4.	*
70.	.06	.031	63.	*	145.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = 1.144 INCHES
VOLUME OF EXCESS PRECIP = 13. ACRE-FEET
PEAK Q = 251. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .37 IN. MAX.IMP.RET.= .07 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 07 -- BASIN COMMENT: BASIN #7 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.07	.46	.17	20.00	.0550	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.110	.217

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
4.81	14.00	3596.16	266.12	3.95

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER,
REPLACING THE ONE COMPUTED BY CUHPD (TP= 6.41)

WIDTH AT 50 = 8. MIN. WIDTH AT 75 = 4. MIN. K50 = .35 K75 = .47

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .37 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.50 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	15.	76.	*	30.	13.	*
5.	266.	*	20.	42.	*	35.	0.	*
10.	139.	*	25.	24.	*	0.	0.	*

1 BASIN ID: 07 -- BASIN COMMENT: BASIN #7 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*

0.	.00	.000	0.	*	65.	.06	.025	15.	*
5.	.04	.000	0.	*	70.	.06	.025	14.	*
10.	.07	.009	2.	*	75.	.06	.026	14.	*
15.	.15	.029	9.	*	80.	.05	.013	11.	*
20.	.28	.053	19.	*	85.	.04	.007	7.	*
25.	.47	.310	92.	*	90.	.04	.007	6.	*
30.	.22	.177	96.	*	95.	.04	.007	5.	*
35.	.10	.064	68.	*	100.	.04	.007	4.	*
40.	.08	.042	48.	*	105.	.04	.007	4.	*
45.	.07	.035	35.	*	110.	.04	.007	4.	*
50.	.06	.024	25.	*	115.	.03	.006	4.	*
55.	.06	.025	18.	*	120.	.02	.005	3.	*
60.	.06	.025	15.	*	125.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = .933 INCHES
VOLUME OF EXCESS PRECIP = 4. ACRE-FEET
PEAK Q = 96. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.50 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .37 IN. MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .43
I = 4.4 INCHES/HOUR
A = 47.4 ACRES
Q = 89. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 08 -- BASIN COMMENT: BASIN #8 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.16	1.12	.52	7.00	.0540	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.137	.228

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
15.28	684.32	106.75	8.32

WIDTH AT 50 = 44. MIN. WIDTH AT 75 = 23. MIN. K50 = .21 K75 = .28

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.20 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
		*			*			
		*			*			
0.	0.	*	55.	49.	*	110.	17.	*
5.	40.	*	60.	44.	*	115.	16.	*
10.	90.	*	65.	40.	*	120.	14.	*
15.	107.	*	70.	36.	*	125.	13.	*
20.	98.	*	75.	33.	*	130.	12.	*
25.	83.	*	80.	30.	*	135.	11.	*
30.	77.	*	85.	27.	*	140.	10.	*
35.	75.	*	90.	25.	*	145.	9.	*
40.	68.	*	95.	23.	*	150.	8.	*
45.	61.	*	100.	21.	*	155.	0.	*
50.	53.	*	105.	19.	*	0.	0.	*

1 BASIN ID: 08 -- BASIN COMMENT: BASIN #8 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	100.	.04	.002	26.	*
5.	.04	.000	0.	*	105.	.04	.002	24.	*
10.	.07	.003	0.	*	110.	.04	.002	22.	*
15.	.15	.010	1.	*	115.	.03	.002	20.	*
20.	.28	.019	2.	*	120.	.02	.002	19.	*
25.	.47	.179	10.	*	125.	.00	.000	17.	*
30.	.22	.173	26.	*	130.	.00	.000	16.	*
35.	.10	.059	40.	*	135.	.00	.000	14.	*
40.	.08	.037	45.	*	140.	.00	.000	13.	*
45.	.07	.030	45.	*	145.	.00	.000	12.	*
50.	.06	.019	44.	*	150.	.00	.000	11.	*
55.	.06	.020	43.	*	155.	.00	.000	10.	*
60.	.06	.020	42.	*	160.	.00	.000	9.	*
65.	.06	.020	41.	*	165.	.00	.000	8.	*
70.	.06	.020	39.	*	170.	.00	.000	7.	*
75.	.06	.020	37.	*	175.	.00	.000	5.	*
80.	.05	.008	36.	*	180.	.00	.000	3.	*
85.	.04	.002	34.	*	185.	.00	.000	3.	*
90.	.04	.002	31.	*	190.	.00	.000	2.	*
95.	.04	.002	28.	*	195.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = .655 INCHES
VOLUME OF EXCESS PRECIP = 5. ACRE-FEET
PEAK Q = 45. CFS TIME OF PEAK = 40. MIN.
INFILT.= 3.20 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN. MAX.IMP.RET.= .06 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 09 -- BASIN COMMENT: BASIN #9 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.03	.28	.12	15.00	.0600	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.118	.178

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
3.87	9.00	4990.38	159.69	1.71

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 5.22)

WIDTH AT 50 = 6. MIN. WIDTH AT 75 = 3. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*

		*			*			
		*			*			
0.	0.	*	10.	56.	*	20.	11.	*
5.	141.	*	15.	25.	*	25.	0.	*

1 BASIN ID: 09 -- BASIN COMMENT: BASIN #9 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
				*					*
				*					*
0.	.00	.000	0.	*	45.	.07	.033	11.	*
5.	.04	.000	0.	*	50.	.06	.023	7.	*
10.	.07	.007	1.	*	55.	.06	.023	6.	*
15.	.15	.022	3.	*	60.	.06	.023	6.	*
20.	.28	.040	7.	*	65.	.06	.023	5.	*
25.	.47	.294	44.	*	70.	.06	.024	5.	*
30.	.22	.177	43.	*	75.	.06	.024	5.	*
35.	.10	.063	27.	*	80.	.05	.011	4.	*
40.	.08	.041	17.	*	85.	.04	.005	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = .864 INCHES
VOLUME OF EXCESS PRECIP = 1. ACRE-FEET
PEAK Q = 44. CFS TIME OF PEAK = 25. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .40
I = 5.2 INCHES/HOUR
A = 20.5 ACRES
Q = 43. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 10 -- BASIN COMMENT: BASIN 10 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.09	.51	.21	2.00	.0210	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.156	.231

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
8.14	30.00	1570.61	133.50	4.53

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER,
REPLACING THE ONE COMPUTED BY CUHPD (TP= 10.57)

WIDTH AT 50 = 19. MIN. WIDTH AT 75 = 10. MIN. K50 = .26 K75 = .35

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .60 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT	'	TIME	UNIT	'	TIME	UNIT	'

	HYDROGRAPH	*		HYDROGRAPH	*		HYDROGRAPH	*
0.	0.	*	25.	59.	*	50.	18.	*
5.	107.	*	30.	46.	*	55.	14.	*
10.	128.	*	35.	37.	*	60.	11.	*
15.	98.	*	40.	29.	*	65.	9.	*
20.	77.	*	45.	23.	*	70.	0.	*

1 BASIN ID: 10 -- BASIN COMMENT: BASIN 10 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	60.	.06	.018	27.	*
5.	.04	.000	0.	*	65.	.06	.018	24.	*
10.	.07	.000	0.	*	70.	.06	.018	22.	*
15.	.15	.000	0.	*	75.	.06	.019	20.	*
20.	.28	.000	0.	*	80.	.05	.006	17.	*
25.	.47	.270	29.	*	85.	.04	.001	14.	*
30.	.22	.172	53.	*	90.	.04	.001	9.	*
35.	.10	.057	55.	*	95.	.04	.001	6.	*
40.	.08	.036	49.	*	100.	.04	.001	4.	*
45.	.07	.028	42.	*	105.	.04	.001	3.	*
50.	.06	.017	36.	*	110.	.04	.001	2.	*
55.	.06	.018	31.	*	115.	.03	.001	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = .682 INCHES
VOLUME OF EXCESS PRECIP = 3. ACRE-FEET
PEAK Q = 55. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .60 IN.

RATIONAL FORMULA C = .32
I = 2.9 INCHES/HOUR
A = 54.4 ACRES
Q = 50. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 20 -- BASIN COMMENT: BASIN #20 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.10	.59	.30	1.00	.0230	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.159	.244

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
8.63	32.00	1531.03	160.76	5.60

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 12.79)

WIDTH AT 50 = 20. MIN. WIDTH AT 75 = 10. MIN. K50 = .26 K75 = .36

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .60 IN.   MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.30 IN./HR.   DECAY = .00180/SECOND   FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH
0.	0.	30.	58.	60.	14.
5.	121.	35.	45.	65.	11.
10.	157.	40.	36.	70.	9.
15.	121.	45.	28.	75.	0.
20.	96.	50.	22.	0.	0.
25.	73.	55.	18.	0.	0.

1   BASIN ID: 20 -- BASIN COMMENT: BASIN #20 EXISTING CONDITIONS

**** STORM NO. = 1 ****   DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)
0.	.00	.000	0.	60.	.06	.018	25.
5.	.04	.000	0.	65.	.06	.018	23.
10.	.07	.000	0.	70.	.06	.018	21.
15.	.15	.001	0.	75.	.06	.018	20.
20.	.28	.003	1.	80.	.05	.005	18.
25.	.47	.059	8.	85.	.04	.000	14.
30.	.22	.170	30.	90.	.04	.000	11.
35.	.10	.056	41.	95.	.04	.000	8.
40.	.08	.035	40.	100.	.04	.000	5.
45.	.07	.027	36.	105.	.04	.000	4.
50.	.06	.017	32.	110.	.04	.000	3.
55.	.06	.017	28.	115.	.03	.000	2.

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86)   EXCESS PRECIP. = .465 INCHES
VOLUME OF EXCESS PRECIP = 3. ACRE-FEET
PEAK Q = 41. CFS   TIME OF PEAK = 35. MIN.
INFILT.= 3.30 IN/HR   DECAY = .00180   FNINF = .50 IN/HR
MAX.PERV.RET.= .60 IN.   MAX.IMP.RET.= .10 IN.

RATIONAL FORMULA C = .22
I = 2.8 INCHES/HOUR
A = 67.2 ACRES
Q = 41. CFS

1   U.D.F.C.D. CUHP RUNOFF ANALYSIS   EXECUTED ON DATE   AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC.   DEC 1993

BASIN ID: 21 -- BASIN COMMENT: BASIN #21 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.15	.80	.37	1.00	.0360	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.159	.258

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
14.33	838.07	127.39	8.11

WIDTH AT 50 = 36. MIN.   WIDTH AT 75 = 19. MIN.   K50 = .24 K75 = .33

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .60 IN.   MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.20 IN./HR.   DECAY = .00180/SECOND   FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	45.	58.	*	90.	19.	*
5.	53.	*	50.	52.	*	95.	17.	*
10.	112.	*	55.	46.	*	100.	15.	*
15.	127.	*	60.	40.	*	105.	13.	*
20.	113.	*	65.	36.	*	110.	12.	*
25.	97.	*	70.	31.	*	115.	10.	*
30.	89.	*	75.	28.	*	120.	9.	*
35.	78.	*	80.	25.	*	125.	8.	*
40.	67.	*	85.	22.	*	130.	0.	*

1 BASIN ID: 21 -- BASIN COMMENT: BASIN #21 EXISTING CONDITIONS

**** STORM NO. = 1 ****   DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	85.	.04	.000	26.	*
5.	.04	.000	0.	*	90.	.04	.000	23.	*
10.	.07	.000	0.	*	95.	.04	.000	20.	*
15.	.15	.001	0.	*	100.	.04	.000	18.	*
20.	.28	.003	0.	*	105.	.04	.000	16.	*
25.	.47	.063	4.	*	110.	.04	.000	14.	*
30.	.22	.170	17.	*	115.	.03	.000	12.	*
35.	.10	.056	31.	*	120.	.02	.000	11.	*
40.	.08	.035	37.	*	125.	.00	.000	10.	*
45.	.07	.027	38.	*	130.	.00	.000	9.	*
50.	.06	.017	37.	*	135.	.00	.000	8.	*
55.	.06	.017	36.	*	140.	.00	.000	7.	*
60.	.06	.018	34.	*	145.	.00	.000	6.	*
65.	.06	.018	32.	*	150.	.00	.000	5.	*
70.	.06	.018	31.	*	155.	.00	.000	3.	*
75.	.06	.018	30.	*	160.	.00	.000	2.	*
80.	.05	.005	28.	*	165.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86)   EXECESS PRECIP. = .470 INCHES
VOLUME OF EXCESS PRECIP = 4. ACRE-FEET
PEAK Q = 38. CFS   TIME OF PEAK = 45. MIN.
INFILT.= 3.20 IN/HR   DECAY = .00180   FNINF = .50 IN/HR
MAX.PERV.RET.= .60 IN.   MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS   EXECUTED ON DATE   AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 22 -- BASIN COMMENT: BASIN #22 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.20	.79	.38	1.00	.0600	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.159	.270

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)

13.04	983.45	200.62	10.88

WIDTH AT 50 = 31. MIN. WIDTH AT 75 = 16. MIN. K50 = .26 K75 = .35

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .60 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.30 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	45.	75.	*	90.	19.	*
5.	95.	*	50.	65.	*	95.	16.	*
10.	187.	*	55.	55.	*	100.	14.	*
15.	196.	*	60.	48.	*	105.	12.	*
20.	166.	*	65.	41.	*	110.	10.	*
25.	144.	*	70.	35.	*	115.	9.	*
30.	124.	*	75.	30.	*	120.	7.	*
35.	103.	*	80.	26.	*	125.	0.	*
40.	88.	*	85.	22.	*	0.	0.	*

1 BASIN ID: 22 -- BASIN COMMENT: BASIN #22 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	85.	.04	.000	34.	*
5.	.04	.000	0.	*	90.	.04	.000	29.	*
10.	.07	.000	0.	*	95.	.04	.000	25.	*
15.	.15	.001	0.	*	100.	.04	.000	21.	*
20.	.28	.003	1.	*	105.	.04	.000	18.	*
25.	.47	.059	6.	*	110.	.04	.000	16.	*
30.	.22	.170	28.	*	115.	.03	.000	14.	*
35.	.10	.056	49.	*	120.	.02	.000	12.	*
40.	.08	.035	58.	*	125.	.00	.000	10.	*
45.	.07	.027	57.	*	130.	.00	.000	9.	*
50.	.06	.017	55.	*	135.	.00	.000	7.	*
55.	.06	.017	51.	*	140.	.00	.000	6.	*
60.	.06	.018	48.	*	145.	.00	.000	5.	*
65.	.06	.018	45.	*	150.	.00	.000	3.	*
70.	.06	.018	43.	*	155.	.00	.000	2.	*
75.	.06	.018	41.	*	160.	.00	.000	2.	*
80.	.05	.005	38.	*	165.	.00	.000	1.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = .465 INCHES
VOLUME OF EXCESS PRECIP = 5. ACRE-FEET
PEAK Q = 58. CFS TIME OF PEAK = 40. MIN.
INFILT.= 3.30 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .60 IN. MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 30 -- BASIN COMMENT: BASIN #30 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.13	.51	.24	1.00	.0250	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.159	.251

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
8.24	30.00	1676.58	209.57	6.67

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 10.95)

WIDTH AT 50 = 18. MIN. WIDTH AT 75 = 9. MIN. K50 = .28 K75 = .38

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .60 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.10 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	30.	65.	*	60.	13.	*
5.	165.	*	35.	50.	*	65.	10.	*
10.	201.	*	40.	38.	*	70.	8.	*
15.	150.	*	45.	29.	*	75.	0.	*
20.	114.	*	50.	22.	*	0.	0.	*
25.	85.	*	55.	17.	*	0.	0.	*

1 BASIN ID: 30 -- BASIN COMMENT: BASIN #30 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	60.	.06	.018	30.	*
5.	.04	.000	0.	*	65.	.06	.018	27.	*
10.	.07	.000	0.	*	70.	.06	.018	25.	*
15.	.15	.001	0.	*	75.	.06	.018	23.	*
20.	.28	.003	1.	*	80.	.05	.005	20.	*
25.	.47	.067	12.	*	85.	.04	.000	16.	*
30.	.22	.171	42.	*	90.	.04	.000	12.	*
35.	.10	.056	54.	*	95.	.04	.000	9.	*
40.	.08	.035	51.	*	100.	.04	.000	6.	*
45.	.07	.027	45.	*	105.	.04	.000	4.	*
50.	.06	.017	39.	*	110.	.04	.000	3.	*
55.	.06	.018	34.	*	115.	.03	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = .475 INCHES
VOLUME OF EXCESS PRECIP = 3. ACRE-FEET
PEAK Q = 54. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.10 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .60 IN. MAX.IMP.RET.= .10 IN.

RATIONAL FORMULA C = .22
I = 2.9 INCHES/HOUR
A = 80.0 ACRES
Q = 51. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 31 -- BASIN COMMENT: BASIN #31 EXISTING CONDITIONS

AREA OF BASIN LENGTH OF BASIN DIST TO CENTROID IMPERVIOUS AREA SLOPE UNIT DURATION

(SQMI)	(MI)	(MI)	(PCT)	(FT/FT)	(MIN)
.81	2.10	1.18	4.00	.0360	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.148	.309

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
33.02	388.79	316.09	43.36

WIDTH AT 50 = 77. MIN. WIDTH AT 75 = 40. MIN. K50 = .26 K75 = .35

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .60 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.40 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	115.	116.	*	230.	27.	*
5.	36.	*	120.	109.	*	235.	26.	*
10.	107.	*	125.	102.	*	240.	24.	*
15.	186.	*	130.	96.	*	245.	23.	*
20.	249.	*	135.	90.	*	250.	21.	*
25.	293.	*	140.	85.	*	255.	20.	*
30.	313.	*	145.	79.	*	260.	19.	*
35.	315.	*	150.	75.	*	265.	17.	*
40.	304.	*	155.	70.	*	270.	16.	*
45.	285.	*	160.	66.	*	275.	15.	*
50.	264.	*	165.	62.	*	280.	14.	*
55.	246.	*	170.	58.	*	285.	14.	*
60.	235.	*	175.	54.	*	290.	13.	*
65.	222.	*	180.	51.	*	295.	12.	*
70.	210.	*	185.	48.	*	300.	11.	*
75.	197.	*	190.	45.	*	305.	11.	*
80.	184.	*	195.	42.	*	310.	10.	*
85.	172.	*	200.	40.	*	315.	9.	*
90.	159.	*	205.	37.	*	320.	9.	*
95.	149.	*	210.	35.	*	325.	8.	*
100.	140.	*	215.	33.	*	330.	8.	*
105.	131.	*	220.	31.	*	335.	0.	*
110.	123.	*	225.	29.	*	0.	0.	*

1 BASIN ID: 31 -- BASIN COMMENT: BASIN #31 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 10 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	185.	.00	.000	39.	*
5.	.04	.000	0.	*	190.	.00	.000	37.	*
10.	.07	.000	0.	*	195.	.00	.000	34.	*
15.	.15	.006	0.	*	200.	.00	.000	32.	*
20.	.28	.011	1.	*	205.	.00	.000	30.	*
25.	.47	.067	5.	*	210.	.00	.000	28.	*
30.	.22	.171	17.	*	215.	.00	.000	27.	*
35.	.10	.057	37.	*	220.	.00	.000	25.	*
40.	.08	.036	61.	*	225.	.00	.000	24.	*
45.	.07	.028	83.	*	230.	.00	.000	22.	*
50.	.06	.018	101.	*	235.	.00	.000	21.	*
55.	.06	.019	113.	*	240.	.00	.000	19.	*
60.	.06	.019	120.	*	245.	.00	.000	18.	*
65.	.06	.019	123.	*	250.	.00	.000	17.	*
70.	.06	.019	124.	*	255.	.00	.000	16.	*
75.	.06	.019	123.	*	260.	.00	.000	15.	*
80.	.05	.006	123.	*	265.	.00	.000	14.	*

85.	.04	.001	122.	*	270.	.00	.000	13.	*
90.	.04	.001	119.	*	275.	.00	.000	13.	*
95.	.04	.001	115.	*	280.	.00	.000	12.	*
100.	.04	.001	111.	*	285.	.00	.000	11.	*
105.	.04	.001	105.	*	290.	.00	.000	10.	*
110.	.04	.001	99.	*	295.	.00	.000	10.	*
115.	.03	.001	93.	*	300.	.00	.000	9.	*
120.	.02	.001	88.	*	305.	.00	.000	9.	*
125.	.00	.000	83.	*	310.	.00	.000	8.	*
130.	.00	.000	78.	*	315.	.00	.000	8.	*
135.	.00	.000	73.	*	320.	.00	.000	7.	*
140.	.00	.000	69.	*	325.	.00	.000	7.	*
145.	.00	.000	65.	*	330.	.00	.000	6.	*
150.	.00	.000	61.	*	335.	.00	.000	6.	*
155.	.00	.000	57.	*	340.	.00	.000	6.	*
160.	.00	.000	53.	*	345.	.00	.000	5.	*
165.	.00	.000	50.	*	350.	.00	.000	5.	*
170.	.00	.000	47.	*	355.	.00	.000	4.	*
175.	.00	.000	44.	*	360.	.00	.000	2.	*
180.	.00	.000	41.	*	365.	.00	.000	2.	*

TOTAL PRECIP. = 2.15 (1-HOUR RAIN = 1.86) EXECESS PRECIP. = .505 INCHES
VOLUME OF EXCESS PRECIP = 22. ACRE-FEET
PEAK Q = 124. CFS TIME OF PEAK = 70. MIN.
INFILT.= 3.40 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .60 IN. MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHPD RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985 TO WRITE OUTPUT FILE OF STORM HYDROGRAPHS FOR SUBSEQUENT USE WITH MULTI-PLAN RIVER ROUTING ROUTINES OF HEC-1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

NO HYDROGRAPH VALUES WERE WRITTEN TO AN OUTPUTFILE FOR THIS RUN OF CUHPD.

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\2      ROBBINSDALE DRAINAGE BASIN DESIGN PLAN  FMG INC.     DEC 1993
01100 YR    100 2.95                                            0.000.000.000.00

\70 1 15.0     01 01 BASIN #1 EXISTING CONDITIONS
 .172 1.06 0.59 55.0 .012        .40  .10  3.0.0018   .5     0
\70 1 15.0     02 02 BASIN #2 EXISTING CONDITIONS
 .177 0.76 0.34 18.0 .024        .50  .10  3.0.0018   .5     0
\71 1 15.0     03 03 BASIN #3 EXISTING CONDITIONS
 .058 0.44 0.22 43.0 .028 23.0  .35  .06  3.0.0018   .5     0
\70 1 15.0     04 04 BASIN #4 EXISTING  CONDITIONS
 .148 0.55 0.21 38.0 .017        .35  .06  3.0.0018   .5     0
\71 1 15.0     05 05 BASIN #5 EXISTING CONDITIONS
 .053 0.42 0.24 47.0 .012 20.0  .35  .08  3.0.0018   .5     0
\70 1 15.0     06 06 BASIN #6 EXISTING  CONDITIONS
 .206 0.68 0.28 35.0 .028        .37  .07  3.0.0018   .5     0
\71 1 15.0     07 07 BASIN #7 EXISTING  CONDITIONS
 .074 0.46 0.17 20.0 .055 14.0  .37  .06  3.5.0018   .5     0
\70 1 15.0     08 08 BASIN #8 EXISTING CONDITIONS
 .156 1.12 0.52 07.0 .054        .50  .06  3.2.0018   .5     0
\71 1 15.0     09 09 BASIN #9 EXISTING  CONDITIONS
 .032 0.28 0.12 15.0 .060  9.0  .40  .06  3.0.0018   .5     0
\71 1 15.0     10 10 BASIN 10 EXISTING CONDITIONS
 .085 0.51 0.21 02.0 .021 30.0  .40  0.6  3.0.0018   .5     0
\71 1 15.0     20 20 BASIN #20 EXISTING CONDITIONS
 .105 0.59 0.30 01.0 .023 32.0  .60  .10  3.3.0018   .5     0
\70 1 15.0     21 21 BASIN #21 EXISTING CONDITIONS
 .152 0.80 0.37 01.0 .036        .60  .10  3.2.0018   .5     0
\70 1 15.0     22 22 BASIN #22 EXISTING  CONDITIONS
 .204 0.79 0.38 01.0 .060        .60  .10  3.3.0018   .5     0
\71 1 15.0     30 30 BASIN #30 EXISTING CONDITIONS
 .125 0.51 0.24 01.0 .025 30.0  .60  .10  3.1.0018   .5     0
\70 1 15.0     31 31 BASIN #31 EXISTING CONDITIONS
 .813 2.10 1.18 04.0 .036        .60  .10  3.4.0018   .5     0
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1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 01 -- BASIN COMMENT: BASIN #1 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.17	1.06	.59	55.00	.0120	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.086	.510

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
14.40	1645.82	283.08	9.17

WIDTH AT 50 = 18. MIN. WIDTH AT 75 = 9. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	30.	113.	*	60.	19.	*
5.	65.	*	35.	84.	*	65.	14.	*
10.	207.	*	40.	62.	*	70.	10.	*
15.	282.	*	45.	46.	*	75.	8.	*
20.	208.	*	50.	34.	*	80.	0.	*
25.	155.	*	55.	25.	*	0.	0.	*

1 BASIN ID: 01 -- BASIN COMMENT: BASIN #1 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	85.	.04	.018	108.	*
5.	.03	.000	0.	*	90.	.04	.018	86.	*
10.	.09	.009	1.	*	95.	.04	.018	70.	*
15.	.14	.071	7.	*	100.	.04	.018	57.	*
20.	.24	.123	25.	*	105.	.04	.018	44.	*
25.	.41	.286	66.	*	110.	.04	.018	37.	*
30.	.74	.694	155.	*	115.	.04	.018	33.	*
35.	.41	.380	287.	*	120.	.04	.018	30.	*
40.	.24	.209	375.	*	125.	.00	.000	27.	*
45.	.18	.158	370.	*	130.	.00	.000	22.	*
50.	.15	.124	334.	*	135.	.00	.000	15.	*
55.	.12	.096	293.	*	140.	.00	.000	11.	*
60.	.12	.096	254.	*	145.	.00	.000	8.	*
65.	.12	.096	222.	*	150.	.00	.000	6.	*
70.	.06	.039	194.	*	155.	.00	.000	4.	*
75.	.06	.039	165.	*	160.	.00	.000	3.	*
80.	.04	.018	134.	*	165.	.00	.000	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.586 INCHES
VOLUME OF EXCESS PRECIP = 24. ACRE-FEET
PEAK Q = 375. CFS TIME OF PEAK = 40. MIN.

APPENDIX C - CUHPE/PC - 100 YR

EXISTING LAND USE CONDITIONS

INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 02 -- BASIN COMMENT: BASIN #2 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.18	.76	.34	18.00	.0240	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.113	.239

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
11.18	1057.13	187.11	9.44

WIDTH AT 50 = 28. MIN. WIDTH AT 75 = 15. MIN. K50 = .24 K75 = .32

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	40.	74.	*	80.	20.	*
5.	108.	*	45.	63.	*	85.	17.	*
10.	185.	*	50.	54.	*	90.	15.	*
15.	170.	*	55.	46.	*	95.	13.	*
20.	141.	*	60.	39.	*	100.	11.	*
25.	125.	*	65.	33.	*	105.	9.	*
30.	105.	*	70.	28.	*	110.	8.	*
35.	87.	*	75.	24.	*	115.	0.	*

1 BASIN ID: 02 -- BASIN COMMENT: BASIN #2 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	90.	.04	.006	97.	*
5.	.03	.000	0.	*	95.	.04	.006	84.	*
10.	.09	.003	0.	*	100.	.04	.006	72.	*
15.	.14	.023	3.	*	105.	.04	.006	63.	*
20.	.24	.040	9.	*	110.	.04	.006	55.	*
25.	.41	.116	24.	*	115.	.04	.006	48.	*
30.	.74	.688	106.	*	120.	.04	.006	42.	*
35.	.41	.370	196.	*	125.	.00	.000	36.	*
40.	.24	.197	231.	*	130.	.00	.000	31.	*
45.	.18	.145	233.	*	135.	.00	.000	25.	*
50.	.15	.111	228.	*	140.	.00	.000	17.	*
55.	.12	.082	215.	*	145.	.00	.000	12.	*
60.	.12	.082	200.	*	150.	.00	.000	9.	*
65.	.12	.083	187.	*	155.	.00	.000	7.	*
70.	.06	.024	170.	*	160.	.00	.000	5.	*
75.	.06	.024	150.	*	165.	.00	.000	4.	*
80.	.04	.006	131.	*	170.	.00	.000	3.	*
85.	.04	.006	113.	*	175.	.00	.000	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.044 INCHES
VOLUME OF EXCESS PRECIP = 19. ACRE-FEET
PEAK Q = 233. CFS TIME OF PEAK = 45. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN. MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 03 -- BASIN COMMENT: BASIN #3 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.06	.44	.22	43.00	.0280	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.092	.362

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
9.48	23.00	1993.90	115.65	3.09

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 6.73)

WIDTH AT 50 = 15. MIN. WIDTH AT 75 = 8. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	20.	55.	*	40.	16.	*
5.	72.	*	25.	40.	*	45.	11.	*
10.	115.	*	30.	29.	*	50.	8.	*
15.	80.	*	35.	21.	*	55.	0.	*

1 BASIN ID: 03 -- BASIN COMMENT: BASIN #3 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	70.	.06	.034	55.	*
5.	.03	.000	0.	*	75.	.06	.034	42.	*
10.	.09	.024	2.	*	80.	.04	.014	29.	*
15.	.14	.055	7.	*	85.	.04	.014	21.	*
20.	.24	.096	15.	*	90.	.04	.014	16.	*
25.	.41	.286	37.	*	95.	.04	.014	12.	*
30.	.74	.692	94.	*	100.	.04	.014	10.	*
35.	.41	.377	138.	*	105.	.04	.014	9.	*
40.	.24	.205	135.	*	110.	.04	.014	8.	*
45.	.18	.154	119.	*	115.	.04	.014	7.	*
50.	.15	.120	103.	*	120.	.04	.014	7.	*

55.	.12	.091	88.	*	125.	.00	.000	5.	*
60.	.12	.091	75.	*	130.	.00	.000	4.	*
65.	.12	.092	66.	*	135.	.00	.000	3.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.482 INCHES
VOLUME OF EXCESS PRECIP = 8. ACRE-FEET
PEAK Q = 138. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN. MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .73
I = 5.4 INCHES/HOUR
A = 37.1 ACRES
Q = 145. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 04 -- BASIN COMMENT: BASIN #4 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.15	.55	.21	38.00	.0170	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.094	.370

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
7.83	2669.73	395.12	7.89

WIDTH AT 50 = 11. MIN. WIDTH AT 75 = 6. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	20.	125.	*	40.	19.	*
5.	281.	*	25.	78.	*	45.	12.	*
10.	346.	*	30.	49.	*	50.	8.	*
15.	201.	*	35.	31.	*	55.	0.	*

1 BASIN ID: 04 -- BASIN COMMENT: BASIN #4 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	75.	.06	.032	80.	*
5.	.03	.000	0.	*	80.	.04	.013	56.	*
10.	.09	.021	6.	*	85.	.04	.013	38.	*
15.	.14	.049	21.	*	90.	.04	.013	29.	*
20.	.24	.085	45.	*	95.	.04	.013	23.	*
25.	.41	.277	120.	*	100.	.04	.013	19.	*
30.	.74	.691	315.	*	105.	.04	.013	17.	*
35.	.41	.375	416.	*	110.	.04	.013	16.	*
40.	.24	.203	370.	*	115.	.04	.013	15.	*

45.	.18	.152	303.	*	120.	.04	.013	15.	*
50.	.15	.118	245.	*	125.	.00	.000	11.	*
55.	.12	.089	196.	*	130.	.00	.000	7.	*
60.	.12	.090	161.	*	135.	.00	.000	4.	*
65.	.12	.090	140.	*	140.	.00	.000	3.	*
70.	.06	.032	110.	*	145.	.00	.000	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXCESS PRECIP. = 2.420 INCHES
VOLUME OF EXCESS PRECIP = 19. ACRE-FEET
PEAK Q = 416. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN. MAX.IMP.RET.= .06 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 05 -- BASIN COMMENT: BASIN #5 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.05	.42	.24	47.00	.0120	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.090	.383

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
8.74	20.00	2358.31	124.99	2.83

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER,
REPLACING THE ONE COMPUTED BY CUHPD (TP= 7.67)

WIDTH AT 50 = 13. MIN. WIDTH AT 75 = 7. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .08 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	20.	50.	*	40.	11.	*
5.	78.	*	25.	34.	*	45.	0.	*
10.	121.	*	30.	23.	*	0.	0.	*
15.	76.	*	35.	16.	*	0.	0.	*

1 BASIN ID: 05 -- BASIN COMMENT: BASIN #5 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	70.	.06	.035	41.	*
5.	.03	.000	0.	*	75.	.06	.035	29.	*
10.	.09	.017	1.	*	80.	.04	.016	22.	*
15.	.14	.061	7.	*	85.	.04	.016	16.	*
20.	.24	.105	17.	*	90.	.04	.016	12.	*

25.	.41	.294	41.	*	95.	.04	.016	10.	*
30.	.74	.692	101.	*	100.	.04	.016	8.	*
35.	.41	.378	143.	*	105.	.04	.016	7.	*
40.	.24	.206	134.	*	110.	.04	.016	7.	*
45.	.18	.155	114.	*	115.	.04	.016	6.	*
50.	.15	.121	95.	*	120.	.04	.016	6.	*
55.	.12	.093	78.	*	125.	.00	.000	5.	*
60.	.12	.093	65.	*	130.	.00	.000	3.	*
65.	.12	.093	55.	*	135.	.00	.000	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.522 INCHES
VOLUME OF EXCESS PRECIP = 7. ACRE-FEET
PEAK Q = 143. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .35 IN. MAX.IMP.RET.= .08 IN.

RATIONAL FORMULA C = .74
I = 5.8 INCHES/HOUR
A = 33.9 ACRES
Q = 145. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 06 -- BASIN COMMENT: BASIN #6 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.21	.68	.28	35.00	.0280	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.096	.358

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
8.61	2250.25	463.55	10.99

WIDTH AT 50 = 13. MIN. WIDTH AT 75 = 7. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .37 IN. MAX. IMPERVIOUS RET. = .07 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	25.	125.	*	50.	17.	*
5.	313.	*	30.	84.	*	55.	11.	*
10.	446.	*	35.	56.	*	60.	8.	*
15.	286.	*	40.	38.	*	65.	0.	*
20.	187.	*	45.	25.	*	0.	0.	*

1 BASIN ID: 06 -- BASIN COMMENT: BASIN #6 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	75.	.06	.031	127.	*
5.	.03	.000	0.	*	80.	.04	.012	95.	*

10.	.09	.016	5.	*	85.	.04	.012	68.	*
15.	.14	.045	21.	*	90.	.04	.012	48.	*
20.	.24	.078	49.	*	95.	.04	.012	37.	*
25.	.41	.258	132.	*	100.	.04	.012	30.	*
30.	.74	.691	364.	*	105.	.04	.012	26.	*
35.	.41	.375	521.	*	110.	.04	.012	23.	*
40.	.24	.202	491.	*	115.	.04	.012	21.	*
45.	.18	.151	416.	*	120.	.04	.012	20.	*
50.	.15	.117	347.	*	125.	.00	.000	15.	*
55.	.12	.088	285.	*	130.	.00	.000	10.	*
60.	.12	.089	237.	*	135.	.00	.000	6.	*
65.	.12	.089	206.	*	140.	.00	.000	4.	*
70.	.06	.031	167.	*	145.	.00	.000	3.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 2.367 INCHES
VOLUME OF EXCESS PRECIP = 26. ACRE-FEET
PEAK Q = 521. CFS TIME OF PEAK = 35. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .37 IN. MAX.IMP.RET.= .07 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 07 -- BASIN COMMENT: BASIN #7 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.07	.46	.17	20.00	.0550	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.110	.217

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
4.81	14.00	3596.16	266.12	3.95

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 6.41)

WIDTH AT 50 = 8. MIN. WIDTH AT 75 = 4. MIN. K50 = .35 K75 = .47

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .37 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.50 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	15.	76.	*	30.	13.	*
5.	266.	*	20.	42.	*	35.	0.	*
10.	139.	*	25.	24.	*	0.	0.	*

1 BASIN ID: 07 -- BASIN COMMENT: BASIN #7 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*

0.	.00	.000	0.	*	65.	.12	.083	51.
5.	.03	.000	0.	*	70.	.06	.025	33.
10.	.09	.011	3.	*	75.	.06	.025	23.
15.	.14	.026	8.	*	80.	.04	.007	14.
20.	.24	.045	16.	*	85.	.04	.007	9.
25.	.41	.211	65.	*	90.	.04	.007	6.
30.	.74	.687	216.	*	95.	.04	.007	4.
35.	.41	.370	212.	*	100.	.04	.007	4.
40.	.24	.197	166.	*	105.	.04	.007	4.
45.	.18	.146	129.	*	110.	.04	.007	4.
50.	.15	.112	99.	*	115.	.04	.007	4.
55.	.12	.083	75.	*	120.	.04	.007	4.
60.	.12	.083	58.	*	125.	.00	.000	2.

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXCESS PRECIP. = 2.162 INCHES
VOLUME OF EXCESS PRECIP = 9. ACRE-FEET
PEAK Q = 216. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.50 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .37 IN. MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .63
I = 6.9 INCHES/HOUR
A = 47.4 ACRES
Q = 207. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 08 -- BASIN COMMENT: BASIN #8 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.16	1.12	.52	7.00	.0540	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.137	.228

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
15.28	684.32	106.75	8.32

WIDTH AT 50 = 44. MIN. WIDTH AT 75 = 23. MIN. K50 = .21 K75 = .28

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .50 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.20 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	55.	49.	*	110.	17.	*
5.	40.	*	60.	44.	*	115.	16.	*
10.	90.	*	65.	40.	*	120.	14.	*
15.	107.	*	70.	36.	*	125.	13.	*
20.	98.	*	75.	33.	*	130.	12.	*
25.	83.	*	80.	30.	*	135.	11.	*
30.	77.	*	85.	27.	*	140.	10.	*
35.	75.	*	90.	25.	*	145.	9.	*
40.	68.	*	95.	23.	*	150.	8.	*
45.	61.	*	100.	21.	*	155.	0.	*
50.	53.	*	105.	19.	*	0.	0.	*

1 BASIN ID: 08 -- BASIN COMMENT: BASIN #8 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	105.	.04	.002	70.	*
5.	.03	.000	0.	*	110.	.04	.002	63.	*
10.	.09	.004	0.	*	115.	.04	.002	58.	*
15.	.14	.009	1.	*	120.	.04	.002	53.	*
20.	.24	.016	2.	*	125.	.00	.000	48.	*
25.	.41	.072	6.	*	130.	.00	.000	44.	*
30.	.74	.685	37.	*	135.	.00	.000	40.	*
35.	.41	.367	87.	*	140.	.00	.000	36.	*
40.	.24	.193	123.	*	145.	.00	.000	33.	*
45.	.18	.141	138.	*	150.	.00	.000	30.	*
50.	.15	.107	138.	*	155.	.00	.000	27.	*
55.	.12	.078	137.	*	160.	.00	.000	25.	*
60.	.12	.078	138.	*	165.	.00	.000	23.	*
65.	.12	.079	135.	*	170.	.00	.000	20.	*
70.	.06	.020	130.	*	175.	.00	.000	18.	*
75.	.06	.020	121.	*	180.	.00	.000	11.	*
80.	.04	.002	111.	*	185.	.00	.000	8.	*
85.	.04	.002	101.	*	190.	.00	.000	6.	*
90.	.04	.002	92.	*	195.	.00	.000	4.	*
95.	.04	.002	84.	*	200.	.00	.000	3.	*
100.	.04	.002	76.	*	205.	.00	.000	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 1.890 INCHES
VOLUME OF EXCESS PRECIP = 16. ACRE-FEET
PEAK Q = 138. CFS TIME OF PEAK = 50. MIN.
INFILT.= 3.20 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .50 IN. MAX.IMP.RET.= .06 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 09 -- BASIN COMMENT: BASIN #9 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.03	.28	.12	15.00	.0600	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.118	.178

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
3.87	9.00	4990.38	159.69	1.71

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 5.22)

WIDTH AT 50 = 6. MIN. WIDTH AT 75 = 3. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .06 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	10.	56.	*	20.	11.	*
5.	141.	*	15.	25.	*	25.	0.	*

1 BASIN ID: 09 -- BASIN COMMENT: BASIN #9 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	45.	.18	.144	48.	*
5.	.03	.000	0.	*	50.	.15	.110	33.	*
10.	.09	.008	1.	*	55.	.12	.081	23.	*
15.	.14	.019	3.	*	60.	.12	.081	20.	*
20.	.24	.034	6.	*	65.	.12	.081	19.	*
25.	.41	.191	29.	*	70.	.06	.023	11.	*
30.	.74	.687	109.	*	75.	.06	.023	8.	*
35.	.41	.369	96.	*	80.	.04	.005	4.	*
40.	.24	.196	68.	*	85.	.04	.005	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXCESS PRECIP. = 2.095 INCHES
VOLUME OF EXCESS PRECIP = 4. ACRE-FEET
PEAK Q = 109. CFS TIME OF PEAK = 30. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .06 IN.

RATIONAL FORMULA C = .61
I = 8.3 INCHES/HOUR
A = 20.5 ACRES
Q = 104. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 10 -- BASIN COMMENT: BASIN 10 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.09	.51	.21	2.00	.0210	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.156	.231

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
8.14	30.00	1570.61	133.50	4.53

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 10.57)

WIDTH AT 50 = 19. MIN. WIDTH AT 75 = 10. MIN. K50 = .26 K75 = .35

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .40 IN. MAX. IMPERVIOUS RET. = .60 IN.
INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	25.	59.	*	50.	18.	*
5.	107.	*	30.	46.	*	55.	14.	*
10.	128.	*	35.	37.	*	60.	11.	*
15.	98.	*	40.	29.	*	65.	9.	*
20.	77.	*	45.	23.	*	70.	0.	*

1 BASIN ID: 10 -- BASIN COMMENT: BASIN 10 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	65.	.12	.077	88.	*
5.	.03	.000	0.	*	70.	.06	.018	74.	*
10.	.09	.000	0.	*	75.	.06	.018	61.	*
15.	.14	.000	0.	*	80.	.04	.001	48.	*
20.	.24	.000	0.	*	85.	.04	.001	38.	*
25.	.41	.159	17.	*	90.	.04	.001	29.	*
30.	.74	.685	93.	*	95.	.04	.001	18.	*
35.	.41	.366	142.	*	100.	.04	.001	12.	*
40.	.24	.191	147.	*	105.	.04	.001	8.	*
45.	.18	.140	137.	*	110.	.04	.001	6.	*
50.	.15	.105	124.	*	115.	.04	.001	4.	*
55.	.12	.076	109.	*	120.	.04	.001	3.	*
60.	.12	.077	97.	*	125.	.00	.000	1.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 1.918 INCHES
VOLUME OF EXCESS PRECIP = 9. ACRE-FEET
PEAK Q = 147. CFS TIME OF PEAK = 40. MIN.
INFILT.= 3.00 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .40 IN. MAX.IMP.RET.= .60 IN.

RATIONAL FORMULA C = .56
I = 4.6 INCHES/HOUR
A = 54.4 ACRES
Q = 141. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 20 -- BASIN COMMENT: BASIN #20 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.10	.59	.30	1.00	.0230	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.159	.244

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
8.63	32.00	1531.03	160.76	5.60

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 12.79)

WIDTH AT 50 = 20. MIN. WIDTH AT 75 = 10. MIN. K50 = .26 K75 = .36

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .60 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.30 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	30.	58.	*	60.	14.	*
5.	121.	*	35.	45.	*	65.	11.	*
10.	157.	*	40.	36.	*	70.	9.	*
15.	121.	*	45.	28.	*	75.	0.	*
20.	96.	*	50.	22.	*	0.	0.	*
25.	73.	*	55.	18.	*	0.	0.	*

1 BASIN ID: 20 -- BASIN COMMENT: BASIN #20 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	65.	.12	.076	101.	*
5.	.03	.000	0.	*	70.	.06	.018	86.	*
10.	.09	.000	0.	*	75.	.06	.018	71.	*
15.	.14	.001	0.	*	80.	.04	.000	57.	*
20.	.24	.002	0.	*	85.	.04	.000	44.	*
25.	.41	.004	1.	*	90.	.04	.000	35.	*
30.	.74	.628	77.	*	95.	.04	.000	28.	*
35.	.41	.365	144.	*	100.	.04	.000	18.	*
40.	.24	.191	157.	*	105.	.04	.000	11.	*
45.	.18	.139	152.	*	110.	.04	.000	8.	*
50.	.15	.105	139.	*	115.	.04	.000	5.	*
55.	.12	.076	124.	*	120.	.04	.000	3.	*
60.	.12	.076	111.	*	125.	.00	.000	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 1.702 INCHES
VOLUME OF EXCESS PRECIP = 10. ACRE-FEET
PEAK Q = 157. CFS TIME OF PEAK = 40. MIN.
INFILT.= 3.30 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .60 IN. MAX.IMP.RET.= .10 IN.

RATIONAL FORMULA C = .50
I = 4.4 INCHES/HOUR
A = 67.2 ACRES
Q = 149. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 21 -- BASIN COMMENT: BASIN #21 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.15	.80	.37	1.00	.0360	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.159	.258

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)

14.33	838.07	127.39	8.11

WIDTH AT 50 = 36. MIN. WIDTH AT 75 = 19. MIN. K50 = .24 K75 = .33

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .60 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.20 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	45.	58.	*	90.	19.	*
5.	53.	*	50.	52.	*	95.	17.	*
10.	112.	*	55.	46.	*	100.	15.	*
15.	127.	*	60.	40.	*	105.	13.	*
20.	113.	*	65.	36.	*	110.	12.	*
25.	97.	*	70.	31.	*	115.	10.	*
30.	89.	*	75.	28.	*	120.	9.	*
35.	78.	*	80.	25.	*	125.	8.	*
40.	67.	*	85.	22.	*	130.	0.	*

1 BASIN ID: 21 -- BASIN COMMENT: BASIN #21 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	90.	.04	.000	81.	*
5.	.03	.000	0.	*	95.	.04	.000	71.	*
10.	.09	.000	0.	*	100.	.04	.000	63.	*
15.	.14	.001	0.	*	105.	.04	.000	56.	*
20.	.24	.002	0.	*	110.	.04	.000	49.	*
25.	.41	.004	1.	*	115.	.04	.000	44.	*
30.	.74	.633	34.	*	120.	.04	.000	38.	*
35.	.41	.365	91.	*	125.	.00	.000	34.	*
40.	.24	.191	132.	*	130.	.00	.000	30.	*
45.	.18	.139	147.	*	135.	.00	.000	27.	*
50.	.15	.105	149.	*	140.	.00	.000	23.	*
55.	.12	.076	147.	*	145.	.00	.000	21.	*
60.	.12	.076	142.	*	150.	.00	.000	18.	*
65.	.12	.076	136.	*	155.	.00	.000	12.	*
70.	.06	.018	127.	*	160.	.00	.000	8.	*
75.	.06	.018	116.	*	165.	.00	.000	5.	*
80.	.04	.000	104.	*	170.	.00	.000	4.	*
85.	.04	.000	92.	*	175.	.00	.000	3.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 1.707 INCHES
VOLUME OF EXCESS PRECIP = 14. ACRE-FEET
PEAK Q = 149. CFS TIME OF PEAK = 50. MIN.
INFILT.= 3.20 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .60 IN. MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 22 -- BASIN COMMENT: BASIN #22 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.20	.79	.38	1.00	.0600	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.159	.270

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
13.04	983.45	200.62	10.88

WIDTH AT 50 = 31. MIN. WIDTH AT 75 = 16. MIN. K50 = .26 K75 = .35

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .60 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.30 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	45.	75.	*	90.	19.	*
5.	95.	*	50.	65.	*	95.	16.	*
10.	187.	*	55.	55.	*	100.	14.	*
15.	196.	*	60.	48.	*	105.	12.	*
20.	166.	*	65.	41.	*	110.	10.	*
25.	144.	*	70.	35.	*	115.	9.	*
30.	124.	*	75.	30.	*	120.	7.	*
35.	103.	*	80.	26.	*	125.	0.	*
40.	88.	*	85.	22.	*	0.	0.	*

1 BASIN ID: 22 -- BASIN COMMENT: BASIN #22 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	90.	.04	.000	100.	*
5.	.03	.000	0.	*	95.	.04	.000	86.	*
10.	.09	.000	0.	*	100.	.04	.000	74.	*
15.	.14	.001	0.	*	105.	.04	.000	63.	*
20.	.24	.002	0.	*	110.	.04	.000	54.	*
25.	.41	.004	1.	*	115.	.04	.000	46.	*
30.	.74	.628	61.	*	120.	.04	.000	40.	*
35.	.41	.365	153.	*	125.	.00	.000	34.	*
40.	.24	.191	211.	*	130.	.00	.000	29.	*
45.	.18	.139	226.	*	135.	.00	.000	25.	*
50.	.15	.105	225.	*	140.	.00	.000	22.	*
55.	.12	.076	217.	*	145.	.00	.000	18.	*
60.	.12	.076	203.	*	150.	.00	.000	12.	*
65.	.12	.076	191.	*	155.	.00	.000	8.	*
70.	.06	.018	175.	*	160.	.00	.000	5.	*
75.	.06	.018	156.	*	165.	.00	.000	4.	*
80.	.04	.000	136.	*	170.	.00	.000	3.	*
85.	.04	.000	117.	*	175.	.00	.000	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 1.702 INCHES
VOLUME OF EXCESS PRECIP = 19. ACRE-FEET
PEAK Q = 226. CFS TIME OF PEAK = 45. MIN.
INFILT.= 3.30 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .60 IN. MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 30 -- BASIN COMMENT: BASIN #30 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)

.13	.51	.24	1.00	.0250	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.159	.251

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	TIME OF CONCENTRATION (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAPH PEAK (CFS)	VOLUME OF RUNOFF (AF)
8.24	30.00	1676.58	209.57	6.67

*** NOTE : THE TIME TO PEAK IS CALCULATED BASED ON THE TIME OF CONCENTRATION PROVIDED BY THE USER, REPLACING THE ONE COMPUTED BY CUHPD (TP= 10.95)

WIDTH AT 50 = 18. MIN. WIDTH AT 75 = 9. MIN. K50 = .28 K75 = .38

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .60 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.10 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH	TIME	UNIT HYDROGRAPH
0.	0.	30.	65.	60.	13.
5.	165.	35.	50.	65.	10.
10.	201.	40.	38.	70.	8.
15.	150.	45.	29.	75.	0.
20.	114.	50.	22.	0.	0.
25.	85.	55.	17.	0.	0.

1 BASIN ID: 30 -- BASIN COMMENT: BASIN #30 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)
0.	.00	.000	0.	65.	.12	.076	119.
5.	.03	.000	0.	70.	.06	.018	99.
10.	.09	.000	0.	75.	.06	.018	79.
15.	.14	.001	0.	80.	.04	.000	62.
20.	.24	.002	1.	85.	.04	.000	47.
25.	.41	.004	1.	90.	.04	.000	36.
30.	.74	.637	107.	95.	.04	.000	28.
35.	.41	.365	189.	100.	.04	.000	17.
40.	.24	.191	201.	105.	.04	.000	11.
45.	.18	.139	189.	110.	.04	.000	8.
50.	.15	.105	170.	115.	.04	.000	5.
55.	.12	.076	149.	120.	.04	.000	3.
60.	.12	.076	132.	125.	.00	.000	2.

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 1.712 INCHES
VOLUME OF EXCESS PRECIP = 11. ACRE-FEET
PEAK Q = 201. CFS TIME OF PEAK = 40. MIN.
INFILT.= 3.10 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .60 IN. MAX.IMP.RET.= .10 IN.

RATIONAL FORMULA C = .50
I = 4.6 INCHES/HOUR
A = 80.0 ACRES
Q = 185. CFS

1 U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 7

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

BASIN ID: 31 -- BASIN COMMENT: BASIN #31 EXISTING CONDITIONS

AREA OF BASIN (SQMI)	LENGTH OF BASIN (MI)	DIST TO CENTROID (MI)	IMPERVIOUS AREA (PCT)	SLOPE (FT/FT)	UNIT DURATION (MIN)
.81	2.10	1.18	4.00	.0360	5.00

COEFFICIENT (REFLECTING TIME TO PEAK)	COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF)
.148	.309

CALCULATED UNIT HYDROGRAPH

TIME TO PEAK (MIN)	PEAK RATE OF RUNOFF (CFS/SQMI)	UNIT HYDROGRAP PEAK (CFS)	VOLUME OF RUNOFF (AF)
33.02	388.79	316.09	43.36

WIDTH AT 50 = 77. MIN. WIDTH AT 75 = 40. MIN. K50 = .26 K75 = .35

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .60 IN. MAX. IMPERVIOUS RET. = .10 IN.
INFILTRATION = 3.40 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*	TIME	UNIT HYDROGRAPH	*
0.	0.	*	115.	116.	*	230.	27.	*
5.	36.	*	120.	109.	*	235.	26.	*
10.	107.	*	125.	102.	*	240.	24.	*
15.	186.	*	130.	96.	*	245.	23.	*
20.	249.	*	135.	90.	*	250.	21.	*
25.	293.	*	140.	85.	*	255.	20.	*
30.	313.	*	145.	79.	*	260.	19.	*
35.	315.	*	150.	75.	*	265.	17.	*
40.	304.	*	155.	70.	*	270.	16.	*
45.	285.	*	160.	66.	*	275.	15.	*
50.	264.	*	165.	62.	*	280.	14.	*
55.	246.	*	170.	58.	*	285.	14.	*
60.	235.	*	175.	54.	*	290.	13.	*
65.	222.	*	180.	51.	*	295.	12.	*
70.	210.	*	185.	48.	*	300.	11.	*
75.	197.	*	190.	45.	*	305.	11.	*
80.	184.	*	195.	42.	*	310.	10.	*
85.	172.	*	200.	40.	*	315.	9.	*
90.	159.	*	205.	37.	*	320.	9.	*
95.	149.	*	210.	35.	*	325.	8.	*
100.	140.	*	215.	33.	*	330.	8.	*
105.	131.	*	220.	31.	*	335.	0.	*
110.	123.	*	225.	29.	*	0.	0.	*

1 BASIN ID: 31 -- BASIN COMMENT: BASIN #31 EXISTING CONDITIONS

**** STORM NO. = 1 **** DATE OR RETURN PERIOD = 100 YR

TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*	TIME (MIN.)	INCREMENT RAINFALL (IN)	TOTAL EXCESS PRECIP	STORM HYDROGRAPH (CFS)	*
0.	.00	.000	0.	*	195.	.00	.000	116.	*
5.	.03	.000	0.	*	200.	.00	.000	109.	*
10.	.09	.001	0.	*	205.	.00	.000	102.	*
15.	.14	.005	0.	*	210.	.00	.000	96.	*
20.	.24	.009	1.	*	215.	.00	.000	90.	*
25.	.41	.016	3.	*	220.	.00	.000	84.	*
30.	.74	.626	27.	*	225.	.00	.000	79.	*
35.	.41	.365	87.	*	230.	.00	.000	74.	*
40.	.24	.191	170.	*	235.	.00	.000	70.	*
45.	.18	.140	258.	*	240.	.00	.000	66.	*

50.	.15	.106	338.	*	245.	.00	.000	62.	*
55.	.12	.077	400.	*	250.	.00	.000	58.	*
60.	.12	.077	442.	*	255.	.00	.000	54.	*
65.	.12	.077	466.	*	260.	.00	.000	51.	*
70.	.06	.019	475.	*	265.	.00	.000	48.	*
75.	.06	.019	471.	*	270.	.00	.000	45.	*
80.	.04	.001	459.	*	275.	.00	.000	42.	*
85.	.04	.001	445.	*	280.	.00	.000	40.	*
90.	.04	.001	428.	*	285.	.00	.000	37.	*
95.	.04	.001	407.	*	290.	.00	.000	35.	*
100.	.04	.001	385.	*	295.	.00	.000	33.	*
105.	.04	.001	363.	*	300.	.00	.000	31.	*
110.	.04	.001	341.	*	305.	.00	.000	29.	*
115.	.04	.001	319.	*	310.	.00	.000	27.	*
120.	.04	.001	299.	*	315.	.00	.000	26.	*
125.	.00	.000	281.	*	320.	.00	.000	24.	*
130.	.00	.000	264.	*	325.	.00	.000	22.	*
135.	.00	.000	247.	*	330.	.00	.000	21.	*
140.	.00	.000	232.	*	335.	.00	.000	20.	*
145.	.00	.000	218.	*	340.	.00	.000	19.	*
150.	.00	.000	204.	*	345.	.00	.000	17.	*
155.	.00	.000	192.	*	350.	.00	.000	16.	*
160.	.00	.000	180.	*	355.	.00	.000	15.	*
165.	.00	.000	169.	*	360.	.00	.000	10.	*
170.	.00	.000	159.	*	365.	.00	.000	6.	*
175.	.00	.000	149.	*	370.	.00	.000	5.	*
180.	.00	.000	140.	*	375.	.00	.000	3.	*
185.	.00	.000	131.	*	380.	.00	.000	2.	*
190.	.00	.000	123.	*	385.	.00	.000	2.	*

TOTAL PRECIP. = 3.41 (1-HOUR RAIN = 2.95) EXECESS PRECIP. = 1.740 INCHES
VOLUME OF EXCESS PRECIP = 75. ACRE-FEET
PEAK Q = 475. CFS TIME OF PEAK = 70. MIN.
INFILT.= 3.40 IN/HR DECAY = .00180 FNINF = .50 IN/HR
MAX.PERV.RET.= .60 IN. MAX.IMP.RET.= .10 IN.

1 U.D.F.C.D. CUHPD RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985 TO WRITE OUTPUT FILE OF STORM HYDROGRAPHS FOR SUBSEQUENT
USE WITH MULTI-PLAN RIVER ROUTING ROUTINES OF HEC-1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DEC 1993

NO HYDROGRAPH VALUES WERE WRITTEN TO AN OUTPUTFILE FOR THIS RUN OF CUHPD.

APPENDIX C - UDSWM2 - 10 YR

EXISTING CONDITIONS

CAUTION STATEMENT

The user is advised to use caution when using flow conveyance element (channels and pipes) peak flows and hydrographs given in this report. The UDSWM2-PC model assumes that all adjacent sub-basin flow enters the flow conveyance element at the sub-basin design point or the downstream end of the element. The flow conveyance element is simply routing the upstream incoming flow and ignoring the possibility that additional flow may be entering from the adjacent sub-basin. Due to this model limitation flow used for channel or pipe design should be increased appropriately using engineering judgment to reflect incoming sub-basin flow.

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  2   1   1   2
  3   4
WATERSHED    1
ROBBINSDALE DRAINAGE BASIN DESIGN PLAN     FMG INC.  DECEMBER 1993
EXISTING HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS    10 YR STORM
        50  0 0  5.0                                                        1
        01  100
        02  101
        03  200
        04  102
        05  103
        06  104
        07  105
        08  106
        09  203
        10   12
        20  121
        21  122
        22   22
        30  130
        31   31

    0  203    11  9 2    0.1     1.     .01                         .016      .1
         0           0      .1        2.        .4        3.         .7        6.
       1.3           7       2         8       2.8        11        3.7       12
       4.8          12
    0   11   106     1   20.0    1100    .024     10.      10.     .075     10.0
    0  106   202     3            1.
    0  202    10  9 2    0.1     1.     .01                        .016      .1
         0           0      .2       1.0      1.1       4.0        2.8       5.0
       5.2         6.0     8.3       7.0     10.2       7.0       12.3       60.
     14.5        150.0
    0   10     9     2    3.5     300    .019      0.       0.     .016      3.5
    0    9   105     1    5.0     700    .033      3.       3.     .050      5.0
    0  105   201     3            1.
    0  201     8  6 2    0.1     1.      .1                        .016      .1
         0           0     0.5       6.       2.4        20        4.6        28
       7.1          36     8.4     190.
    0    8   104     1   20.0    2800    .020      5.       5.    .050      10.0
    0  104     7     3            1.
    0    7     6     1   25.0     200   .0100      3.       3.     .050     10.0
    0    6   103     1   30.0    1350   .0085      3.       3.     .050     10.0
    0   12   103     1    2.0    1300     .01      4.       4.     .063      5.0
    0  103     5     3            1.
    0    5   102     1   20.0    1000    .008      4.       4.     .050     10.0
    0  102     4     3            1.
    0    4     2     1   20.0    2300    .010      5.       5.     .063     10.0
    0  200     3  4 2    0.1     1.
         0           0     1.2        14      2.8        28        4.8        85
    0    3     2     1    3.0     350    .020      3.       3.     .050      5.0
    0    2   101     1   30.0     800    .016      3.       3.     .088     10.0
    0  101     1     3            1.
    0    1   100     4   20.0    3700    .007      4.       4.     .075      5.0
                         50.0    3700    .007     20.      20.     .063     10.0
    0  100    99     3            1.
    0   22   122     1   20.0    3750    .031      5.       5.     .075     10.0
    0  122    21     3            1.
    0   21   121     1   15.0    2600    .012      4.       4.     .063      5.0
    0  121   120     3            1.
    0  120    20     3            1.
    0   20     6     1   30.0     700    .010      5.       5.     .050      5.0
    0   31   130     1   20.0    3100    .017      3.       3.     .063     10.0
    0  130    30     3            1.
    0   30   120     1    25.     1500    .010      3.       3.     .050     10.0

    0
   32
    1    2    3    4    5    6    7    8    9   10   11   12   20   21   22   30
   31  100  101  102  103  104  105  106  120  121  122  130  200  201  202  203
ENDPROGRAM□□
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ENVIRONMENTAL PROTECTION AGENCY - STORM WATER MANAGEMENT MODEL - VERSION PC.1

DEVELOPED BY METCALF + EDDY, INC.
UNIVERSITY OF FLORIDA
WATER RESOURCES ENGINEEERS, INC. (SEPTEMBER 1970)

UPDATED BY UNIVERSITY OF FLORIDA (JUNE 1973)
HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS
MISSOURI RIVER DIVISION, CORPS OF ENGINEERS (SEPTEMBER 1974)
BOYLE ENGINEERING CORPORATION (MARCH 1985, JULY 1985)

OTAPE OR DISK ASSIGNMENTS

JIN(1)	JIN(2)	JIN(3)	JIN(4)	JIN(5)	JIN(6)	JIN(7)	JIN(8)	JIN(9)	JIN(10)
2	1	0	0	0	0	0	0	0	0

JOUT(1)	JOUT(2)	JOUT(3)	JOUT(4)	JOUT(5)	JOUT(6)	JOUT(7)	JOUT(8)	JOUT(9)	JOUT(10)
1	2	0	0	0	0	0	0	0	0

NSCRAT(1)	NSCRAT(2)	NSCRAT(3)	NSCRAT(4)	NSCRAT(5)
3	4	0	0	0

1

WATERSHED PROGRAM CALLED

*** ENTRY MADE TO RUNOFF MODEL ***

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
EXISTING HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 10 YR STORM

ONUMBER OF TIME STEPS 50
OINTEGRATION TIME INTERVAL (MINUTES), 5.00

25.0 PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DEPTH
1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
EXISTING HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 10 YR STORM

HYDROGRAPHS FROM CUHPE/PC ARE LISTED FOR THE FOLLOWING 15 SUBCATCHMENTS

TIME(HR/MIN)		1	2	3	4	5	6	7	8	9	10
		20	21	22	30	31					
0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.					
0	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.					
0	10.	0.	0.	1.	5.	1.	4.	2.	0.	1.	0.
		0.	0.	0.	0.	0.					
0	15.	6.	3.	7.	21.	7.	21.	9.	1.	3.	0.
		0.	0.	0.	0.	0.					
0	20.	27.	10.	17.	51.	19.	55.	19.	2.	7.	0.
		1.	0.	1.	1.	1.					
0	25.	77.	37.	46.	151.	50.	167.	92.	10.	44.	29.
		8.	4.	6.	12.	5.					
0	30.	146.	71.	70.	207.	73.	251.	96.	26.	43.	53.
		30.	17.	28.	42.	17.					
0	35.	191.	87.	66.	176.	66.	229.	68.	40.	27.	55.
		41.	31.	49.	54.	37.					
0	40.	182.	86.	55.	133.	53.	182.	48.	45.	17.	49.
		40.	37.	58.	51.	61.					
0	45.	157.	82.	45.	103.	42.	144.	35.	45.	11.	42.

		36.	38.	57.	45.	83.					
0	50.	134.	76.	38.	80.	34.	115.	25.	44.	7.	36.
		32.	37.	55.	39.	101.					
0	55.	114.	70.	32.	64.	27.	93.	18.	43.	6.	31.
		28.	36.	51.	34.	113.					
1	0.	98.	64.	27.	54.	23.	79.	15.	42.	6.	27.
		25.	34.	48.	30.	120.					
1	5.	86.	60.	24.	47.	18.	70.	15.	41.	5.	24.
		23.	32.	45.	27.	123.					
1	10.	78.	56.	21.	43.	16.	63.	14.	39.	5.	22.
		21.	31.	43.	25.	124.					
1	15.	71.	53.	18.	40.	15.	59.	14.	38.	5.	20.
		20.	30.	41.	23.	123.					
1	20.	66.	49.	15.	34.	14.	52.	11.	36.	4.	17.
		18.	28.	38.	20.	123.					
1	25.	59.	44.	13.	28.	12.	40.	7.	34.	2.	14.
		14.	26.	34.	16.	122.					
1	30.	51.	38.	11.	22.	10.	32.	6.	31.	2.	9.
		11.	23.	29.	12.	119.					
1	35.	43.	34.	9.	19.	8.	27.	5.	28.	0.	6.
		8.	20.	25.	9.	115.					
1	40.	36.	30.	8.	18.	8.	24.	4.	26.	0.	4.
		5.	18.	21.	6.	111.					
1	45.	32.	27.	8.	16.	7.	22.	4.	24.	0.	3.
		4.	16.	18.	4.	105.					
1	50.	30.	24.	7.	16.	7.	21.	4.	22.	0.	2.
		3.	14.	16.	3.	99.					
1	55.	28.	22.	7.	15.	6.	20.	4.	20.	0.	2.
		2.	12.	14.	2.	93.					
2	0.	26.	19.	6.	13.	6.	18.	3.	19.	0.	1.
		2.	11.	12.	2.	88.					
2	5.	24.	17.	5.	9.	4.	14.	2.	17.	0.	0.
		0.	10.	10.	0.	83.					
2	10.	19.	14.	3.	6.	3.	9.	0.	16.	0.	0.
		0.	9.	9.	0.	78.					
2	15.	14.	11.	2.	3.	2.	6.	0.	14.	0.	0.
		0.	8.	7.	0.	73.					
2	20.	10.	8.	2.	2.	0.	4.	0.	13.	0.	0.
		0.	7.	6.	0.	69.					
2	25.	7.	6.	0.	0.	0.	2.	0.	12.	0.	0.
		0.	6.	5.	0.	65.					
2	30.	5.	5.	0.	0.	0.	2.	0.	11.	0.	0.
		0.	5.	3.	0.	61.					
2	35.	4.	4.	0.	0.	0.	0.	0.	10.	0.	0.
		0.	3.	2.	0.	57.					
2	40.	3.	3.	0.	0.	0.	0.	0.	9.	0.	0.
		0.	2.	2.	0.	53.					
2	45.	2.	3.	0.	0.	0.	0.	0.	8.	0.	0.
		0.	2.	1.	0.	50.					
2	50.	0.	2.	0.	0.	0.	0.	0.	7.	0.	0.
		0.	0.	0.	0.	47.					
2	55.	0.	2.	0.	0.	0.	0.	0.	5.	0.	0.
		0.	0.	0.	0.	44.					
3	0.	0.	0.	0.	0.	0.	0.	0.	3.	0.	0.
		0.	0.	0.	0.	41.					
3	5.	0.	0.	0.	0.	0.	0.	0.	3.	0.	0.
		0.	0.	0.	0.	39.					
3	10.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.
		0.	0.	0.	0.	37.					
3	15.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.
		0.	0.	0.	0.	34.					
3	20.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.
		0.	0.	0.	0.	32.					

3	25.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	30.					
3	30.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	28.					
3	35.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	27.					
3	40.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	25.					
3	45.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	24.					
3	50.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	22.					
3	55.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	21.					
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	19.					
4	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	18.					
4	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	17.					

1

GUTTER NUMBER	GUTTER CONNECTION	NDP	NP		WIDTH OR DIAM (FT)	LENGTH (FT)	INVERT SLOPE (FT/FT)	SIDE SLOPES HORIZ TO VERT L	R	MANNING N	OVERBANK/SURCHARGE DEPTH (FT)	JK
203	11	9	2	PIPE	.1	1.	.0100	.0	.0	.016	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0 .0 .1 2.0 .4 3.0 .7 6.0 1.3 7.0 2.0 8.0										
		2.8 11.0 3.7 12.0 4.8 12.0										
11	106	0	1	CHANNEL	20.0	1100.	.0240	10.0	10.0	.075	10.00	0
106	202	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
202	10	9	2	PIPE	.1	1.	.0100	.0	.0	.016	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0 .0 .2 1.0 1.1 4.0 2.8 5.0 5.2 6.0 8.3 7.0										
		10.2 7.0 12.3 60.0 14.5 150.0										
10	9	0	2	PIPE	3.5	300.	.0190	.0	.0	.016	3.50	0
9	105	0	1	CHANNEL	5.0	700.	.0330	3.0	3.0	.050	5.00	0
105	201	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
201	8	6	2	PIPE	.1	1.	.1000	.0	.0	.016	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0 .0 .5 6.0 2.4 20.0 4.6 28.0 7.1 36.0 8.4 190.0										
8	104	0	1	CHANNEL	20.0	2800.	.0200	5.0	5.0	.050	10.00	0
104	7	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
7	6	0	1	CHANNEL	25.0	200.	.0100	3.0	3.0	.050	10.00	0
6	103	0	1	CHANNEL	30.0	1350.	.0085	3.0	3.0	.050	10.00	0
12	103	0	1	CHANNEL	2.0	1300.	.0100	4.0	4.0	.063	5.00	0
103	5	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
5	102	0	1	CHANNEL	20.0	1000.	.0080	4.0	4.0	.050	10.00	0
102	4	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
4	2	0	1	CHANNEL	20.0	2300.	.0100	5.0	5.0	.063	10.00	0
200	3	4	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0 .0 1.2 14.0 2.8 28.0 4.8 85.0										
3	2	0	1	CHANNEL	3.0	350.	.0200	3.0	3.0	.050	5.00	0
2	101	0	1	CHANNEL	30.0	800.	.0160	3.0	3.0	.088	10.00	0
101	1	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
1	100	0	4	CHANNEL	20.0	3700.	.0070	4.0	4.0	.075	5.00	0
				OVERFLOW	50.0	3700.	.0070	20.0	20.0	.063	10.00	
100	99	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
22	122	0	1	CHANNEL	20.0	3750.	.0310	5.0	5.0	.075	10.00	0
122	21	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
21	121	0	1	CHANNEL	15.0	2600.	.0120	4.0	4.0	.063	5.00	0
121	120	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
120	20	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
20	6	0	1	CHANNEL	30.0	700.	.0100	5.0	5.0	.050	5.00	0
31	130	0	1	CHANNEL	20.0	3100.	.0170	3.0	3.0	.063	10.00	0
130	30	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
30	120	0	1	CHANNEL	25.0	1500.	.0100	3.0	3.0	.050	10.00	0

OTOTAL NUMBER OF GUTTERS/PIPES, 32
1

ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES

GUTTER	TRIBUTARY GUTTER/PIPE										TRIBUTARY SUBAREA										D.A.(AC)
1	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1528.3
2	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1415.0
3	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37.1
4	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1377.9
5	103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1283.2
6	7	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1194.9
7	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	299.5
8	201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167.7
9	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
10	202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
11	203	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20.5
12	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	54.4
20	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	895.4
21	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	227.8
22	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0	130.6
30	130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600.3
31	0	0	0	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	0	520.3
100	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1638.4
101	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1528.3
102	5	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1377.9
103	6	12	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	1283.2
104	8	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	299.5
105	9	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	167.7
106	11	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	120.3
120	121	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	895.4
121	21	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	295.0
122	22	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	227.8
130	31	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	600.3
200	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	37.1
201	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167.7
202	106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
203	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	20.5

1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN   FMG INC.   DECEMBER 1993
EXISTING HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS   10 YR STORM

HYDROGRAPHS ARE LISTED FOR THE FOLLOWING 32 CONVEYANCE ELEMENTS

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        THE UPPER NUMBER IS DISCHARGE IN CFS
        THE LOWER NUMBER IS ONE OF THE FOLLOWING CASES:
                ( ) DENOTES DEPTH ABOVE INVERT IN FEET
                (S) DENOTES STORAGE IN AC-FT FOR DETENSION DAM.  DISCHARGE INCLUDES SPILLWAY OUTFLOW.
                (I) DENOTES GUTTER INFLOW IN CFS FROM SPECIFIED INFLOW HYDROGRAPH
                (D) DENOTES DISCHARGE IN CFS DIVERTED FROM THIS GUTTER
                (O) DENOTES STORAGE IN AC-FT FOR SURCHARGED GUTTER

TIME(HR/MIN)    1        2        3        4        5        6        7        8        9        10
               11       12       20       21       22       30       31      100      101      102
              103      104      105      106      120      121      122      130      200      201
              202      203

  0    5.      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
                .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )

               0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
                .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )
```

		0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0(S)	0. .0(S)
		0. .0(S)	0. .0(S)								
0	10.	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	1. .1( )	0. .0( )	0. .0( )	0. .0( )
		0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	5. .0( )
		1. .0( )	4. .0( )	2. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0(S)	0. .0(S)
		0. .0(S)	0. .0(S)								
0	15.	0. .0( )	0. .0( )	0. .1( )	1. .1( )	1. .1( )	1. .1( )	14. .4( )	0. .0( )	0. .0( )	0. .0( )
		0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	6. .0( )	3. .0( )	22. .0( )
		7. .0( )	21. .0( )	9. .0( )	1. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0(S)	1. .0(S)
		0. .0(S)	0. .0(S)								
0	20.	0. .0( )	1. .1( )	1. .2( )	7. .3( )	6. .3( )	8. .2( )	48. .8( )	0. .0( )	0. .0( )	0. .1( )
		0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	27. .0( )	11. .0( )	56. .0( )
		27. .0( )	55. .0( )	19. .0( )	2. .0( )	1. .0( )	1. .0( )	0. .0( )	1. .0( )	1. .1(S)	2. .1(S)
		0. .0(S)	1. .0(S)								
0	25.	1. .1( )	8. .3( )	2. .3( )	36. .8( )	38. .8( )	48. .7( )	146. 1.4( )	0. .0( )	0. .0( )	0. .1( )
		0. .0( )	4. .6( )	1. .1( )	0. .0( )	0. .0( )	1. .1( )	0. .0( )	78. .0( )	45. .0( )	188. .0( )
		102. .0( )	167. .0( )	92. .0( )	10. .0( )	8. .0( )	8. .0( )	4. .0( )	12. .0( )	4. .3(S)	6. .5(S)
		0. .1(S)	2. .2(S)								
0	30.	8. .4( )	52. .9( )	6. .6( )	119. 1.6( )	136. 1.6( )	145. 1.4( )	249. 2.0( )	1. .1( )	0. .0( )	1. .2( )
		1. .1( )	19. 1.3( )	12. .3( )	1. .1( )	1. .1( )	7. .2( )	1. .1( )	154. .0( )	123. .0( )	343. .0( )
		237. .0( )	252. .0( )	96. .0( )	27. .0( )	38. .0( )	31. .0( )	18. .0( )	43. .0( )	8. .7(S)	10. 1.1(S)
		1. .2(S)	4. .5(S)								
0	35.	33. 1.0( )	160. 1.7( )	11. .8( )	239. 2.3( )	267. 2.3( )	236. 1.8( )	237. 1.9( )	2. .1( )	1. .1( )	2. .3( )
		2. .1( )	36. 1.7( )	42. .6( )	4. .3( )	5. .2( )	24. .5( )	4. .2( )	224. .0( )	247. .0( )	443. .0( )
		338. .0( )	232. .0( )	69. .0( )	42. .0( )	69. .0( )	45. .0( )	36. .0( )	58. .0( )	12. 1.1(S)	14. 1.6(S)
		2. .4(S)	6. .7(S)								
0	40.	85. 1.6( )	294. 2.4( )	15. .9( )	345. 2.8( )	343. 2.7( )	264. 1.9( )	191. 1.7( )	5. .2( )	2. .2( )	3. .4( )
		3. .2( )	44. 1.9( )	75. .9( )	12. .5( )	14. .4( )	41. .7( )	12. .4( )	268. .0( )	380. .0( )	476. .0( )
		361. .0( )	186. .0( )	50. .0( )	48. .0( )	93. .0( )	52. .0( )	51. .0( )	62. .0( )	16. 1.4(S)	16. 1.9(S)
		3. .7(S)	6. .8(S)								
0	45.	162. 2.3( )	391. 2.8( )	17. 1.0( )	407. 3.0( )	355. 2.7( )	263. 1.9( )	155. 1.5( )	7. .2( )	3. .2( )	4. .4( )
		4.	45.	102.	24.	23.	55.	26.	320.	472.	457.

		.2( )	1.9( )	1.0( )	.7( )	.5( )	.8( )	.6( )	.0( )	.0( )	.0( )
		350. .0( )	152. .0( )	38. .0( )	49. .0( )	115. .0( )	60. .0( )	61. .0( )	72. .0( )	18. 1.6(S)	17. 2.1(S)
		4. 1.0(S)	6. .9(S)								
0	50.	246. 2.9( )	434. 3.0( )	19. 1.0( )	424. 3.1( )	342. 2.7( )	257. 1.9( )	128. 1.3( )	10. .3( )	4. .3( )	4. .5( )
		5. .2( )	42. 1.9( )	124. 1.2( )	35. .9( )	30. .6( )	68. .9( )	45. .8( )	380. .0( )	510. .0( )	421. .0( )
		332. .0( )	125. .0( )	29. .0( )	48. .0( )	135. .0( )	67. .0( )	68. .0( )	84. .0( )	19. 1.8(S)	18. 2.2(S)
		4. 1.3(S)	6. .9(S)								
0	55.	318. 3.3( )	438. 3.0( )	20. 1.0( )	414. 3.0( )	327. 2.6( )	254. 1.9( )	108. 1.2( )	12. .3( )	4. .3( )	4. .5( )
		5. .2( )	37. 1.8( )	146. 1.3( )	46. 1.0( )	36. .6( )	82. 1.0( )	66. 1.0( )	432. .0( )	508. .0( )	390. .0( )
		319. .0( )	105. .0( )	22. .0( )	48. .0( )	157. .0( )	74. .0( )	72. .0( )	99. .0( )	20. 1.9(S)	19. 2.2(S)
		4. 1.6(S)	6. .9(S)								
1	0.	370. 3.6( )	425. 2.9( )	20. 1.0( )	397. 3.0( )	316. 2.6( )	257. 1.9( )	95. 1.1( )	14. .3( )	4. .3( )	4. .5( )
		6. .2( )	33. 1.7( )	167. 1.4( )	55. 1.2( )	40. .7( )	97. 1.1( )	84. 1.2( )	468. .0( )	490. .0( )	370. .0( )
		312. .0( )	93. .0( )	20. .0( )	48. .0( )	178. .0( )	80. .0( )	74. .0( )	114. .0( )	21. 1.9(S)	19. 2.2(S)
		4. 1.9(S)	6. .9(S)								
1	5.	402. 3.7( )	409. 2.9( )	21. 1.0( )	381. 2.9( )	313. 2.6( )	265. 1.9( )	86. 1.1( )	15. .4( )	5. .3( )	5. .5( )
		6. .2( )	29. 1.6( )	187. 1.5( )	62. 1.2( )	41. .7( )	111. 1.2( )	98. 1.3( )	488. .0( )	469. .0( )	360. .0( )
		312. .0( )	85. .0( )	19. .0( )	46. .0( )	196. .0( )	85. .0( )	74. .0( )	125. .0( )	21. 2.0(S)	19. 2.2(S)
		5. 2.2(S)	6. .9(S)								
1	10.	419. 3.8( )	396. 2.8( )	21. 1.1( )	369. 2.9( )	314. 2.6( )	276. 2.0( )	80. 1.0( )	16. .4( )	5. .3( )	5. .5( )
		6. .2( )	26. 1.5( )	204. 1.5( )	66. 1.3( )	42. .7( )	123. 1.3( )	108. 1.3( )	497. .0( )	452. .0( )	358. .0( )
		317. .0( )	80. .0( )	19. .0( )	45. .0( )	210. .0( )	87. .0( )	73. .0( )	133. .0( )	21. 2.0(S)	19. 2.2(S)
		5. 2.5(S)	6. .9(S)								
1	15.	427. 3.8( )	388. 2.8( )	21. 1.1( )	364. 2.8( )	320. 2.6( )	285. 2.0( )	76. 1.0( )	17. .4( )	5. .3( )	5. .5( )
		6. .2( )	23. 1.5( )	215. 1.6( )	68. 1.3( )	42. .7( )	131. 1.4( )	114. 1.4( )	499. .0( )	440. .0( )	359. .0( )
		323. .0( )	76. .0( )	19. .0( )	44. .0( )	219. .0( )	88. .0( )	72. .0( )	137. .0( )	21. 2.0(S)	19. 2.2(S)
		5. 2.8(S)	6. .9(S)								
1	20.	430. 3.8( )	383. 2.8( )	21. 1.0( )	361. 2.8( )	324. 2.6( )	290. 2.0( )	71. .9( )	18. .4( )	5. .3( )	5. .5( )
		6. .2( )	21. 1.4( )	221. 1.6( )	69. 1.3( )	41. .7( )	135. 1.4( )	118. 1.4( )	496. .0( )	432. .0( )	358. .0( )
		325. .0( )	69. .0( )	16. .0( )	42. .0( )	222. .0( )	87. .0( )	70. .0( )	138. .0( )	21. 1.9(S)	19. 2.2(S)
		5. 3.0(S)	6. .8(S)								
1	25.	429. 3.8( )	380. 2.7( )	20. 1.0( )	357. 2.8( )	321. 2.6( )	287. 2.0( )	60. .9( )	18. .4( )	5. .4( )	5. .5( )

6. 18. 220. 69. 40. 136. 119. 488. 423. 349.
.2( ) 1.3( ) 1.6( ) 1.3( ) .7( ) 1.4( ) 1.4( ) .0( ) .0( ) .0( )

317. 58. 13. 40. 219. 83. 66. 135. 20. 19.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 1.9(S) 2.2(S)

5. 6.
3.3(S) .8(S)

1 30. 426. 373. 20. 349. 310. 276. 51. 18. 5. 5.
3.8( ) 2.7( ) 1.0( ) 2.8( ) 2.5( ) 2.0( ) .8( ) .4( ) .4( ) .5( )

6. 15. 215. 67. 38. 134. 120. 477. 412. 332.
.2( ) 1.2( ) 1.6( ) 1.3( ) .7( ) 1.4( ) 1.4( ) .0( ) .0( ) .0( )

301. 50. 11. 37. 212. 78. 61. 132. 20. 18.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 1.8(S) 2.2(S)

5. 6.
3.5(S) .8(S)

1 35. 419. 362. 19. 336. 294. 263. 46. 18. 5. 5.
3.8( ) 2.7( ) 1.0( ) 2.7( ) 2.5( ) 1.9( ) .7( ) .4( ) .4( ) .5( )

6. 12. 207. 64. 35. 131. 119. 462. 396. 313.
.2( ) 1.1( ) 1.6( ) 1.2( ) .6( ) 1.4( ) 1.4( ) .0( ) .0( ) .0( )

284. 45. 10. 34. 203. 72. 55. 128. 19. 18.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 1.8(S) 2.1(S)

5. 6.
3.7(S) .7(S)

1 40. 409. 347. 19. 320. 277. 251. 43. 18. 5. 5.
3.8( ) 2.6( ) 1.0( ) 2.7( ) 2.4( ) 1.9( ) .7( ) .4( ) .4( ) .5( )

6. 9. 197. 60. 32. 127. 117. 446. 377. 295.
.2( ) 1.0( ) 1.5( ) 1.2( ) .6( ) 1.3( ) 1.4( ) .0( ) .0( ) .0( )

267. 42. 10. 32. 192. 65. 50. 122. 19. 17.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 1.7(S) 2.0(S)

5. 6.
3.9(S) .7(S)

1 45. 397. 330. 18. 303. 261. 238. 40. 18. 5. 6.
3.7( ) 2.5( ) 1.0( ) 2.6( ) 2.3( ) 1.8( ) .7( ) .4( ) .4( ) .5( )

6. 7. 187. 56. 29. 122. 113. 429. 357. 277.
.2( ) .9( ) 1.5( ) 1.2( ) .6( ) 1.3( ) 1.4( ) .0( ) .0( ) .0( )

252. 40. 9. 30. 182. 60. 45. 117. 18. 17.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 1.6(S) 2.0(S)

6. 6.
4.1(S) .7(S)

1 50. 382. 313. 18. 287. 246. 225. 39. 17. 6. 6.
3.6( ) 2.5( ) 1.0( ) 2.5( ) 2.2( ) 1.8( ) .7( ) .4( ) .4( ) .5( )

6. 5. 176. 51. 26. 117. 109. 412. 337. 262.
.2( ) .8( ) 1.4( ) 1.1( ) .5( ) 1.3( ) 1.3( ) .0( ) .0( ) .0( )

237. 39. 9. 28. 171. 54. 40. 112. 17. 17.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 1.6(S) 1.9(S)

6. 5.
4.2(S) .6(S)

1 55. 366. 297. 17. 271. 232. 213. 37. 17. 6. 6.
3.5( ) 2.4( ) .9( ) 2.5( ) 2.2( ) 1.7( ) .7( ) .4( ) .4( ) .5( )

6. 4. 166. 47. 24. 112. 104. 395. 319. 247.
.2( ) .7( ) 1.4( ) 1.1( ) .5( ) 1.2( ) 1.3( ) .0( ) .0( ) .0( )

224. 37. 9. 26. 161. 49. 36. 106. 17. 16.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 1.5(S) 1.9(S)

6. 5.
4.4(S) .6(S)

2 0. 350. 281. 16. 256. 219. 201. 35. 17. 6. 6.
3.5( ) 2.3( ) .9( ) 2.4( ) 2.1( ) 1.7( ) .6( ) .4( ) .4( ) .5( )

5. 3. 156. 43. 21. 106. 99. 377. 301. 232.
.2( ) .6( ) 1.3( ) 1.0( ) .5( ) 1.2( ) 1.3( ) .0( ) .0( ) .0( )

210. 35. 9. 24. 151. 44. 32. 100. 16. 16.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 1.4(S) 1.8(S)

6. 5.
4.5(S) .6(S)

2 5. 333. 265. 16. 241. 205. 188. 31. 17. 6. 6.
3.4( ) 2.2( ) .9( ) 2.3( ) 2.0( ) 1.6( ) .6( ) .4( ) .4( ) .5( )

		5. .2( )	3. .5( )	145. 1.3( )	39. .9( )	19. .4( )	100. 1.2( )	93. 1.2( )	357. .0( )	282. .0( )	214. .0( )
		195. .0( )	30. .0( )	7. .0( )	22. .0( )	139. .0( )	39. .0( )	29. .0( )	93. .0( )	16. 1.4(S)	16. 1.8(S)
		6. 4.6(S)	4. .5(S)								
2	10.	316. 3.3( )	249. 2.2( )	15. .9( )	224. 2.2( )	189. 2.0( )	174. 1.5( )	26. .5( )	16. .4( )	6. .4( )	6. .5( )
		5. .2( )	2. .4( )	134. 1.2( )	35. .9( )	17. .4( )	94. 1.1( )	88. 1.2( )	335. .0( )	263. .0( )	195. .0( )
		178. .0( )	25. .0( )	6. .0( )	20. .0( )	130. .0( )	35. .0( )	26. .0( )	88. .0( )	15. 1.3(S)	15. 1.7(S)
		6. 4.8(S)	4. .5(S)								
2	15.	298. 3.2( )	231. 2.1( )	14. .9( )	207. 2.1( )	173. 1.9( )	160. 1.4( )	22. .5( )	16. .4( )	6. .4( )	6. .5( )
		4. .2( )	1. .4( )	125. 1.2( )	32. .8( )	15. .4( )	89. 1.1( )	84. 1.2( )	312. .0( )	242. .0( )	177. .0( )
		163. .0( )	21. .0( )	6. .0( )	19. .0( )	121. .0( )	32. .0( )	23. .0( )	84. .0( )	14. 1.2(S)	15. 1.7(S)
		6. 4.8(S)	4. .5(S)								
2	20.	280. 3.1( )	214. 2.0( )	14. .8( )	190. 2.0( )	158. 1.8( )	148. 1.4( )	20. .4( )	15. .4( )	6. .4( )	6. .5( )
		4. .2( )	1. .3( )	117. 1.1( )	29. .8( )	14. .4( )	84. 1.1( )	79. 1.1( )	290. .0( )	221. .0( )	161. .0( )
		149. .0( )	19. .0( )	6. .0( )	17. .0( )	113. .0( )	29. .0( )	20. .0( )	79. .0( )	13. 1.1(S)	14. 1.6(S)
		6. 4.9(S)	4. .5(S)								
2	25.	261. 3.0( )	196. 1.9( )	13. .8( )	174. 1.9( )	146. 1.7( )	137. 1.3( )	18. .4( )	15. .3( )	6. .4( )	6. .5( )
		4. .2( )	1. .3( )	110. 1.1( )	26. .8( )	12. .3( )	80. 1.0( )	75. 1.1( )	269. .0( )	203. .0( )	146. .0( )
		138. .0( )	17. .0( )	6. .0( )	16. .0( )	106. .0( )	26. .0( )	18. .0( )	75. .0( )	12. 1.0(S)	14. 1.6(S)
		6. 5.0(S)	3. .4(S)								
2	30.	243. 2.9( )	180. 1.8( )	12. .8( )	159. 1.9( )	135. 1.6( )	128. 1.3( )	16. .4( )	15. .3( )	6. .4( )	6. .5( )
		4. .2( )	1. .2( )	103. 1.0( )	23. .7( )	11. .3( )	76. 1.0( )	70. 1.1( )	248. .0( )	185. .0( )	135. .0( )
		128. .0( )	16. .0( )	6. .0( )	14. .0( )	99. .0( )	23. .0( )	15. .0( )	70. .0( )	11. 1.0(S)	13. 1.5(S)
		6. 5.1(S)	3. .4(S)								
2	35.	226. 2.8( )	166. 1.7( )	11. .8( )	147. 1.8( )	126. 1.6( )	119. 1.2( )	15. .4( )	14. .3( )	6. .4( )	6. .5( )
		3. .2( )	0. .2( )	96. 1.0( )	21. .7( )	9. .3( )	71. 1.0( )	66. 1.0( )	230. .0( )	170. .0( )	126. .0( )
		120. .0( )	14. .0( )	6. .0( )	13. .0( )	92. .0( )	21. .0( )	12. .0( )	66. .0( )	10. .9(S)	13. 1.4(S)
		6. 5.1(S)	3. .4(S)								
2	40.	210. 2.7( )	154. 1.6( )	10. .7( )	137. 1.7( )	118. 1.5( )	111. 1.2( )	14. .4( )	14. .3( )	6. .4( )	6. .5( )
		3. .2( )	0. .2( )	89. 1.0( )	18. .6( )	8. .3( )	67. .9( )	63. 1.0( )	213. .0( )	157. .0( )	118. .0( )
		111. .0( )	14. .0( )	6. .0( )	12. .0( )	86. .0( )	18. .0( )	10. .0( )	63. .0( )	10. .8(S)	13. 1.4(S)
		6. 5.2(S)	3. .4(S)								
2	45.	195.	143.	9.	127.	110.	104.	14.	13.	6.	6.

		2.6( )	1.6( )	.7( )	1.6( )	1.4( )	1.1( )	.4( )	.3( )	.4( )	.5( )
		3.	0.	83.	16.	7.	64.	59.	197.	146.	110.
		.2( )	.2( )	.9( )	.6( )	.2( )	.9( )	.9( )	.0( )	.0( )	.0( )
		104.	13.	6.	11.	80.	16.	9.	59.	9.	12.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.8(S)	1.4(S)
		6.	3.								
		5.2(S)	.3(S)								
2	50.	181.	133.	8.	119.	103.	97.	13.	13.	6.	6.
		2.5( )	1.5( )	.7( )	1.6( )	1.4( )	1.1( )	.4( )	.3( )	.4( )	.5( )
		3.	0.	77.	14.	6.	60.	55.	181.	136.	103.
		.2( )	.2( )	.9( )	.5( )	.2( )	.9( )	.9( )	.0( )	.0( )	.0( )
		98.	13.	6.	10.	74.	14.	6.	55.	8.	12.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.7(S)	1.3(S)
		6.	3.								
		5.2(S)	.3(S)								
2	55.	169.	125.	8.	111.	96.	91.	13.	13.	6.	6.
		2.4( )	1.4( )	.6( )	1.5( )	1.3( )	1.0( )	.3( )	.3( )	.4( )	.5( )
		3.	0.	72.	12.	5.	57.	52.	169.	126.	96.
		.2( )	.1( )	.9( )	.5( )	.2( )	.8( )	.9( )	.0( )	.0( )	.0( )
		91.	13.	6.	8.	69.	12.	5.	52.	8.	12.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.6(S)	1.3(S)
		6.	3.								
		5.2(S)	.3(S)								
3	0.	157.	117.	7.	104.	90.	85.	13.	12.	6.	6.
		2.3( )	1.4( )	.6( )	1.5( )	1.3( )	1.0( )	.3( )	.3( )	.4( )	.5( )
		3.	0.	67.	10.	4.	53.	49.	157.	117.	90.
		.2( )	.1( )	.8( )	.4( )	.2( )	.8( )	.9( )	.0( )	.0( )	.0( )
		86.	12.	6.	6.	64.	10.	4.	49.	7.	11.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.6(S)	1.2(S)
		6.	3.								
		5.3(S)	.3(S)								
3	5.	147.	109.	7.	98.	85.	80.	12.	12.	6.	6.
		2.2( )	1.3( )	.6( )	1.4( )	1.2( )	1.0( )	.3( )	.3( )	.4( )	.5( )
		3.	0.	62.	9.	4.	50.	46.	147.	109.	85.
		.2( )	.1( )	.8( )	.4( )	.2( )	.8( )	.8( )	.0( )	.0( )	.0( )
		80.	12.	6.	5.	59.	9.	4.	46.	6.	11.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.6(S)	1.2(S)
		6.	3.								
		5.3(S)	.3(S)								
3	10.	137.	103.	6.	92.	80.	75.	12.	12.	6.	6.
		2.1( )	1.3( )	.6( )	1.4( )	1.2( )	.9( )	.3( )	.3( )	.4( )	.5( )
		3.	0.	58.	8.	3.	47.	44.	137.	103.	80.
		.2( )	.1( )	.8( )	.4( )	.2( )	.8( )	.8( )	.0( )	.0( )	.0( )
		75.	12.	6.	5.	55.	8.	3.	44.	6.	11.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.5(S)	1.2(S)
		6.	3.								
		5.2(S)	.3(S)								
3	15.	129.	96.	6.	86.	75.	71.	12.	12.	6.	6.
		2.0( )	1.2( )	.5( )	1.3( )	1.2( )	.9( )	.3( )	.3( )	.4( )	.5( )
		3.	0.	54.	7.	3.	45.	41.	129.	96.	75.
		.1( )	.1( )	.7( )	.3( )	.1( )	.7( )	.8( )	.0( )	.0( )	.0( )
		71.	12.	6.	4.	52.	7.	3.	41.	5.	11.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.5(S)	1.1(S)
		6.	2.								
		5.2(S)	.2(S)								
3	20.	121.	91.	5.	81.	71.	67.	11.	11.	6.	6.
		2.0( )	1.2( )	.5( )	1.3( )	1.1( )	.9( )	.3( )	.3( )	.4( )	.5( )
		3.	0.	51.	6.	3.	42.	39.	121.	91.	71.
		.1( )	.1( )	.7( )	.3( )	.1( )	.7( )	.7( )	.0( )	.0( )	.0( )
		67.	11.	6.	4.	48.	6.	3.	39.	5.	10.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.4(S)	1.1(S)
		6.	2.								
		5.2(S)	.2(S)								

3	25.	113. 1.9( )	85. 1.2( )	5. .5( )	77. 1.2( )	67. 1.1( )	63. .8( )	11. .3( )	11. .3( )	6. .4( )	6. .5( )
		3. .1( )	0. .1( )	48. .7( )	5. .3( )	2. .1( )	40. .7( )	37. .7( )	113. .0( )	85. .0( )	67. .0( )
		63. .0( )	11. .0( )	6. .0( )	3. .0( )	45. .0( )	5. .0( )	2. .0( )	37. .0( )	5. .4(S)	10. 1.1(S)
		6. 5.2(S)	2. .2(S)								
3	30.	107. 1.8( )	80. 1.1( )	4. .5( )	72. 1.2( )	63. 1.1( )	60. .8( )	11. .3( )	11. .3( )	6. .4( )	6. .5( )
		2. .1( )	0. .1( )	45. .6( )	5. .3( )	2. .1( )	38. .7( )	34. .7( )	107. .0( )	80. .0( )	63. .0( )
		60. .0( )	11. .0( )	6. .0( )	2. .0( )	43. .0( )	5. .0( )	2. .0( )	34. .0( )	4. .4(S)	10. 1.0(S)
		6. 5.2(S)	2. .2(S)								
3	35.	100. 1.8( )	76. 1.1( )	4. .5( )	68. 1.2( )	60. 1.0( )	56. .8( )	11. .3( )	11. .3( )	6. .4( )	6. .5( )
		2. .1( )	0. .1( )	42. .6( )	4. .3( )	2. .1( )	36. .6( )	32. .7( )	100. .0( )	76. .0( )	60. .0( )
		57. .0( )	11. .0( )	6. .0( )	2. .0( )	40. .0( )	4. .0( )	2. .0( )	32. .0( )	4. .3(S)	10. 1.0(S)
		6. 5.2(S)	2. .2(S)								
3	40.	95. 1.7( )	72. 1.0( )	4. .4( )	65. 1.1( )	56. 1.0( )	53. .8( )	10. .3( )	10. .3( )	6. .4( )	6. .5( )
		2. .1( )	0. .1( )	39. .6( )	4. .3( )	2. .1( )	34. .6( )	31. .6( )	95. .0( )	72. .0( )	56. .0( )
		54. .0( )	10. .0( )	6. .0( )	2. .0( )	38. .0( )	4. .0( )	2. .0( )	31. .0( )	4. .3(S)	10. 1.0(S)
		6. 5.1(S)	2. .2(S)								
3	45.	89. 1.7( )	68. 1.0( )	4. .4( )	61. 1.1( )	53. 1.0( )	51. .7( )	10. .3( )	10. .3( )	6. .4( )	6. .5( )
		2. .1( )	0. .1( )	37. .6( )	4. .2( )	2. .1( )	32. .6( )	29. .6( )	89. .0( )	68. .0( )	53. .0( )
		51. .0( )	10. .0( )	6. .0( )	2. .0( )	35. .0( )	4. .0( )	2. .0( )	29. .0( )	3. .3(S)	9. 1.0(S)
		6. 5.1(S)	2. .1(S)								
3	50.	85. 1.6( )	64. 1.0( )	3. .4( )	58. 1.1( )	51. .9( )	48. .7( )	10. .3( )	10. .3( )	6. .4( )	6. .5( )
		2. .1( )	0. .1( )	35. .6( )	3. .2( )	1. .1( )	30. .6( )	27. .6( )	85. .0( )	64. .0( )	51. .0( )
		48. .0( )	10. .0( )	6. .0( )	2. .0( )	33. .0( )	3. .0( )	1. .0( )	27. .0( )	3. .3(S)	9. .9(S)
		6. 5.1(S)	2. .1(S)								
3	55.	80. 1.6( )	61. 1.0( )	3. .4( )	55. 1.0( )	48. .9( )	46. .7( )	10. .3( )	10. .3( )	6. .4( )	6. .5( )
		2. .1( )	0. .1( )	33. .5( )	3. .2( )	1. .1( )	28. .6( )	26. .6( )	80. .0( )	61. .0( )	48. .0( )
		46. .0( )	10. .0( )	6. .0( )	2. .0( )	31. .0( )	3. .0( )	1. .0( )	26. .0( )	3. .2(S)	9. .9(S)
		6. 5.1(S)	2. .1(S)								
4	0.	76. 1.5( )	58. .9( )	3. .4( )	52. 1.0( )	46. .9( )	44. .7( )	10. .3( )	10. .3( )	6. .4( )	6. .5( )
		2. .1( )	0. .0( )	31. .5( )	3. .2( )	1. .1( )	27. .5( )	24. .6( )	76. .0( )	58. .0( )	46. .0( )
		44. .0( )	10. .0( )	6. .0( )	2. .0( )	29. .0( )	3. .0( )	1. .0( )	24. .0( )	3. .2(S)	9. .9(S)
		6. 5.0(S)	2. .1(S)								

```
  4    5.    72.      55.      3.      50.      44.      41.      9.       9.       6.       6.
             1.5( )   .9( )   .4( )   1.0( )   .9( )    .7( )    .3( )    .3( )    .4( )    .5( )

             2.       0.      29.      2.       1.      25.      23.      72.      55.      44.
             .1( )    .0( )   .5( )    .2( )    .1( )   .5( )    .5( )    .0( )    .0( )    .0( )

             41.      9.      6.       2.       28.     2.       1.       23.      2.       9.
             .0( )    .0( )   .0( )    .0( )    .0( )   .0( )    .0( )    .0( )    .2(S)    .9(S)

             6.       2.
             5.0(S)   .1(S)

  4   10.    68.      52.     2.       47.      42.     40.      9.       9.       6.       6.
             1.4( )   .9( )   .3( )    1.0( )   .8( )   .6( )    .3( )    .3( )    .4( )    .5( )

             2.       0.      27.      2.       1.      24.      21.      68.      52.      42.
             .1( )    .0( )   .5( )    .2( )    .1( )   .5( )    .5( )    .0( )    .0( )    .0( )

             40.      9.      6.       2.       26.     2.       1.       21.      2.       9.
             .0( )    .0( )   .0( )    .0( )    .0( )   .0( )    .0( )    .0( )    .2(S)    .9(S)

             6.       1.
             5.0(S)   .1(S)
```

1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
EXISTING HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 10 YR STORM

*** PEAK FLOWS, STAGES AND STORAGES OF GUTTERS AND DETENSION DAMS ***

CONVEYANCE ELEMENT	PEAK (CFS)	STAGE (FT)	STORAGE (AC-FT)	TIME (HR/MIN)
203	6.	.1	.9	0 50.
11	6.	.2		1 25.
106	49.	(DIRECT FLOW)		0 45.
202	6.	.1	5.3	3 0.
10	6.	.5		3 0.
22	42.	.7		1 10.
9	6.	.4		3 5.
31	120.	1.4		1 30.
122	74.	(DIRECT FLOW)		1 5.
105	96.	(DIRECT FLOW)		0 30.
130	138.	(DIRECT FLOW)		1 20.
21	69.	1.3		1 20.
201	19.	.1	2.2	1 15.
30	136.	1.4		1 25.
121	88.	(DIRECT FLOW)		1 15.
8	18.	.4		1 30.
120	222.	(DIRECT FLOW)		1 20.
104	252.	(DIRECT FLOW)		0 30.
20	221.	1.6		1 20.
7	249.	2.0		0 30.
12	45.	1.9		0 45.
6	290.	2.0		1 20.
103	361.	(DIRECT FLOW)		0 40.
5	355.	2.7		0 45.
200	21.	.1	2.0	1 10.
102	476.	(DIRECT FLOW)		0 40.
3	21.	1.1		1 10.
4	424.	3.1		0 50.
2	438.	3.0		0 55.
101	510.	(DIRECT FLOW)		0 50.
1	430.	3.8		1 20.
100	499.	(DIRECT FLOW)		1 15.
99	499.	(DIRECT FLOW)		1 15.

1

ENDPROGRAM PROGRAM CALLED

□

APPENDIX C - UDSWM2 - 100 YR

EXISTING CONDITIONS

CAUTION STATEMENT

The user is advised to use caution when using flow conveyance element (channels and pipes) peak flows and hydrographs given in this report. The UDSWM2-PC model assumes that all adjacent sub-basin flow enters the flow conveyance element at the sub-basin design point or the downstream end of the element. The flow conveyance element is simply routing the upstream incoming flow and ignoring the possibility that additional flow may be entering from the adjacent sub-basin. Due to this model limitation flow used for channel or pipe design should be increased appropriately using engineering judgment to reflect incoming sub-basin flow.

```
   2  1   1   2
   3  4
WATERSHED    1
ROBBINSDALE DRAINAGE BASIN DESIGN PLAN     FMG INC.  DECEMBER 1993
EXISTING HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS    100 YR STORM
         50  0 0  5.0                                                      1
         01  100
         02  101
         03  200
         04  102
         05  103
         06  104
         07  105
         08  106
         09  203
         10   12
         20  121
         21  122
         22   22
         30  130
         31   31

  0  203   11  9 2    0.1     1.     .01                    .016     .1
       0        0       .1       2.      .4       3.       .7       6.
     1.3        7        2       8      2.8       11      3.7       12
     4.8       12
  0   11  106   1    20.0    1100   .024     10.      10.   .075    10.0
  0  106  202   3             1.
  0  202   10  9 2    0.1     1.     .01                    .016     .1
       0        0       .2      1.0     1.1      4.0      2.8      5.0
     5.2      6.0      8.3      7.0    10.2      7.0     12.3      60.
    14.5    150.0
  0   10    9   2     3.5     300   .019      0.      0.   .016     3.5
  0    9  105   1     5.0     700   .033      3.      3.   .050     5.0
  0  105  201   3             1.
  0  201    8  6 2    0.1     1.      .1                    .016     .1
       0        0      0.5       6.     2.4       20      4.6       28
     7.1       36      8.4     190.
  0    8  104   1    20.0    2800   .020      5.      5.  .050    10.0
  0  104    7   3             1.
  0    7    6   1    25.0     200  .0100      3.      3.   .050    10.0
  0    6  103   1    30.0    1350  .0085      3.      3.   .050    10.0
  0   12  103   1     2.0    1300    .01      4.      4.   .063     5.0
  0  103    5   3             1.
  0    5  102   1    20.0    1000   .008      4.      4.   .050    10.0
  0  102    4   3             1.
  0    4    2   1    20.0    2300   .010      5.      5.   .063    10.0
  0  200    3  4 2    0.1     1.
       0        0      1.2       14     2.8       28      4.8       85
  0    3    2   1     3.0     350   .020      3.      3.   .050     5.0
  0    2  101   1    30.0     800   .016      3.      3.   .088    10.0
  0  101    1   3             1.
  0    1  100   4    20.0    3700   .007      4.      4.   .075     5.0
                     50.0    3700   .007     20.     20.   .063    10.0
  0  100   99   3             1.
  0   22  122   1    20.0    3750   .031      5.      5.   .075    10.0
  0  122   21   3             1.
  0   21  121   1    15.0    2600   .012      4.      4.   .063     5.0
  0  121  120   3             1.
  0  120   20   3             1.
  0   20    6   1    30.0     700   .010      5.      5.   .050     5.0
  0   31  130   1    20.0    3100   .017      3.      3.   .063    10.0
  0  130   30   3             1.
  0   30  120   1     25.     1500   .010      3.      3.   .050    10.0

  0
 32
  1    2    3    4    5    6    7    8    9   10   11   12   20   21   22   30
 31  100  101  102  103  104  105  106  120  121  122  130  200  201  202  203
ENDPROGRAM□□
```

1

ENVIRONMENTAL PROTECTION AGENCY - STORM WATER MANAGEMENT MODEL - VERSION PC.1

DEVELOPED BY METCALF + EDDY, INC.
UNIVERSITY OF FLORIDA
WATER RESOURCES ENGINEEERS, INC. (SEPTEMBER 1970)

UPDATED BY UNIVERSITY OF FLORIDA (JUNE 1973)
HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS
MISSOURI RIVER DIVISION, CORPS OF ENGINEERS (SEPTEMBER 1974)
BOYLE ENGINEERING CORPORATION (MARCH 1985, JULY 1985)

OTAPE OR DISK ASSIGNMENTS

JIN(1)	JIN(2)	JIN(3)	JIN(4)	JIN(5)	JIN(6)	JIN(7)	JIN(8)	JIN(9)	JIN(10)
2	1	0	0	0	0	0	0	0	0

JOUT(1)	JOUT(2)	JOUT(3)	JOUT(4)	JOUT(5)	JOUT(6)	JOUT(7)	JOUT(8)	JOUT(9)	JOUT(10)
1	2	0	0	0	0	0	0	0	0

NSCRAT(1)	NSCRAT(2)	NSCRAT(3)	NSCRAT(4)	NSCRAT(5)
3	4	0	0	0

1

WATERSHED PROGRAM CALLED

*** ENTRY MADE TO RUNOFF MODEL ***

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
EXISTING HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 100 YR STORM

ONUMBER OF TIME STEPS 50
OINTEGRATION TIME INTERVAL (MINUTES), 5.00

25.0 PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DEPTH
1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
EXISTING HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 100 YR STORM

HYDROGRAPHS FROM CUHPE/PC ARE LISTED FOR THE FOLLOWING 15 SUBCATCHMENTS

TIME(HR/MIN)		1 20	2 21	3 22	4 30	5 31	6	7	8	9	10
0	0.	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.	0.	0.	0.	0.	0.
0	5.	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.	0.	0.	0.	0.	0.
0	10.	1. 0.	0. 0.	2. 0.	6. 0.	1. 0.	5.	3.	0.	1.	0.
0	15.	7. 0.	3. 0.	7. 0.	21. 0.	7. 0.	21.	8.	1.	3.	0.
0	20.	25. 1.	9. 0.	15. 0.	45. 1.	17. 1.	49.	16.	2.	6.	0.
0	25.	66. 1.	24. 1.	37. 1.	120. 1.	41. 3.	132.	65.	6.	29.	17.
0	30.	155. 77.	106. 34.	94. 61.	315. 107.	101. 27.	364.	216.	37.	109.	93.
0	35.	287. 144.	196. 91.	138. 153.	416. 189.	143. 87.	521.	212.	87.	96.	142.
0	40.	375. 157.	231. 132.	135. 211.	370. 201.	134. 170.	491.	166.	123.	68.	147.
0	45.	370.	233.	119.	303.	114.	416.	129.	138.	48.	137.

		152.	147.	226.	189.	258.					
0	50.	334.	228.	103.	245.	95.	347.	99.	138.	33.	124.
		139.	149.	225.	170.	338.					
0	55.	293.	215.	88.	196.	78.	285.	75.	137.	23.	109.
		124.	147.	217.	149.	400.					
1	0.	254.	200.	75.	161.	65.	237.	58.	138.	20.	97.
		111.	142.	203.	132.	442.					
1	5.	222.	187.	66.	140.	55.	206.	51.	135.	19.	88.
		101.	136.	191.	119.	466.					
1	10.	194.	170.	55.	110.	41.	167.	33.	130.	11.	74.
		86.	127.	175.	99.	475.					
1	15.	165.	150.	42.	80.	29.	127.	23.	121.	8.	61.
		71.	116.	156.	79.	471.					
1	20.	134.	131.	29.	56.	22.	95.	14.	111.	4.	48.
		57.	104.	136.	62.	459.					
1	25.	108.	113.	21.	38.	16.	68.	9.	101.	2.	38.
		44.	92.	117.	47.	445.					
1	30.	86.	97.	16.	29.	12.	48.	6.	92.	0.	29.
		35.	81.	100.	36.	428.					
1	35.	70.	84.	12.	23.	10.	37.	4.	84.	0.	18.
		28.	71.	86.	28.	407.					
1	40.	57.	72.	10.	19.	8.	30.	4.	76.	0.	12.
		18.	63.	74.	17.	385.					
1	45.	44.	63.	9.	17.	7.	26.	4.	70.	0.	8.
		11.	56.	63.	11.	363.					
1	50.	37.	55.	8.	16.	7.	23.	4.	63.	0.	6.
		8.	49.	54.	8.	341.					
1	55.	33.	48.	7.	15.	6.	21.	4.	58.	0.	4.
		5.	44.	46.	5.	319.					
2	0.	30.	42.	7.	15.	6.	20.	4.	53.	0.	3.
		3.	39.	40.	3.	299.					
2	5.	27.	36.	5.	11.	5.	15.	2.	48.	0.	1.
		2.	34.	34.	2.	281.					
2	10.	22.	31.	4.	7.	3.	10.	0.	44.	0.	0.
		0.	30.	29.	0.	264.					
2	15.	15.	25.	3.	4.	2.	7.	0.	40.	0.	0.
		0.	27.	25.	0.	247.					
2	20.	11.	17.	2.	3.	0.	4.	0.	36.	0.	0.
		0.	23.	22.	0.	232.					
2	25.	8.	12.	0.	2.	0.	3.	0.	33.	0.	0.
		0.	21.	18.	0.	218.					
2	30.	6.	9.	0.	0.	0.	2.	0.	30.	0.	0.
		0.	18.	12.	0.	204.					
2	35.	4.	7.	0.	0.	0.	0.	0.	27.	0.	0.
		0.	12.	8.	0.	192.					
2	40.	3.	5.	0.	0.	0.	0.	0.	25.	0.	0.
		0.	8.	5.	0.	180.					
2	45.	2.	4.	0.	0.	0.	0.	0.	23.	0.	0.
		0.	5.	4.	0.	169.					
2	50.	1.	3.	0.	0.	0.	0.	0.	20.	0.	0.
		0.	4.	3.	0.	159.					
2	55.	0.	2.	0.	0.	0.	0.	0.	18.	0.	0.
		0.	3.	2.	0.	149.					
3	0.	0.	0.	0.	0.	0.	0.	0.	11.	0.	0.
		0.	2.	0.	0.	140.					
3	5.	0.	0.	0.	0.	0.	0.	0.	8.	0.	0.
		0.	0.	0.	0.	131.					
3	10.	0.	0.	0.	0.	0.	0.	0.	6.	0.	0.
		0.	0.	0.	0.	123.					
3	15.	0.	0.	0.	0.	0.	0.	0.	4.	0.	0.
		0.	0.	0.	0.	116.					
3	20.	0.	0.	0.	0.	0.	0.	0.	3.	0.	0.
		0.	0.	0.	0.	109.					

3	25.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.
		0.	0.	0.	0.	102.					
3	30.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	96.					
3	35.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	90.					
3	40.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	84.					
3	45.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	79.					
3	50.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	74.					
3	55.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	70.					
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	66.					
4	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	62.					
4	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	58.					

1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
EXISTING HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 100 YR STORM

GUTTER NUMBER	GUTTER CONNECTION	NDP	NP		WIDTH OR DIAM (FT)	LENGTH (FT)	INVERT SLOPE (FT/FT)	SIDE SLOPES HORIZ TO VERT L	R	MANNING N	OVERBANK/SURCHARGE DEPTH (FT)	JK
203	11	9	2	PIPE	.1	1.	.0100	.0	.0	.016	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0	.0	.1 2.0	.4	3.0	.7	6.0	1.3	7.0	2.0 8.0	
		2.8	11.0	3.7 12.0	4.8	12.0						
11	106	0	1	CHANNEL	20.0	1100.	.0240	10.0	10.0	.075	10.00	0
106	202	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
202	10	9	2	PIPE	.1	1.	.0100	.0	.0	.016	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0	.0	.2 1.0	1.1	4.0	2.8	5.0	5.2	6.0	8.3 7.0	
		10.2	7.0	12.3 60.0	14.5	150.0						
10	9	0	2	PIPE	3.5	300.	.0190	.0	.0	.016	3.50	0
9	105	0	1	CHANNEL	5.0	700.	.0330	3.0	3.0	.050	5.00	0
105	201	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
201	8	6	2	PIPE	.1	1.	.1000	.0	.0	.016	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0	.0	.5 6.0	2.4	20.0	4.6	28.0	7.1	36.0	8.4 190.0	
8	104	0	1	CHANNEL	20.0	2800.	.0200	5.0	5.0	.050	10.00	0
104	7	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
7	6	0	1	CHANNEL	25.0	200.	.0100	3.0	3.0	.050	10.00	0
6	103	0	1	CHANNEL	30.0	1350.	.0085	3.0	3.0	.050	10.00	0
12	103	0	1	CHANNEL	2.0	1300.	.0100	4.0	4.0	.063	5.00	0
103	5	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
5	102	0	1	CHANNEL	20.0	1000.	.0080	4.0	4.0	.050	10.00	0
102	4	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
4	2	0	1	CHANNEL	20.0	2300.	.0100	5.0	5.0	.063	10.00	0
200	3	4	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0	.0	1.2 14.0	2.8	28.0	4.8	85.0				
3	2	0	1	CHANNEL	3.0	350.	.0200	3.0	3.0	.050	5.00	0
2	101	0	1	CHANNEL	30.0	800.	.0160	3.0	3.0	.088	10.00	0
101	1	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
1	100	0	4	CHANNEL	20.0	3700.	.0070	4.0	4.0	.075	5.00	0
				OVERFLOW	50.0	3700.	.0070	20.0	20.0	.063	10.00	
100	99	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
22	122	0	1	CHANNEL	20.0	3750.	.0310	5.0	5.0	.075	10.00	0
122	21	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
21	121	0	1	CHANNEL	15.0	2600.	.0120	4.0	4.0	.063	5.00	0
121	120	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
120	20	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
20	6	0	1	CHANNEL	30.0	700.	.0100	5.0	5.0	.050	5.00	0
31	130	0	1	CHANNEL	20.0	3100.	.0170	3.0	3.0	.063	10.00	0
130	30	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
30	120	0	1	CHANNEL	25.0	1500.	.0100	3.0	3.0	.050	10.00	0

OTOTAL NUMBER OF GUTTERS/PIPES, 32
1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
EXISTING HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 100 YR STORM

ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES

GUTTER	TRIBUTARY GUTTER/PIPE										TRIBUTARY SUBAREA										D.A.(AC)
1	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1528.3
2	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1415.0
3	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37.1
4	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1377.9
5	103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1283.2
6	7	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1194.9
7	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	299.5
8	201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167.7
9	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
10	202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
11	203	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20.5
12	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	54.4
20	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	895.4
21	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	227.8
22	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0	130.6
30	130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600.3
31	0	0	0	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	0	520.3
100	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1638.4
101	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1528.3
102	5	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1377.9
103	6	12	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	1283.2
104	8	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	299.5
105	9	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	167.7
106	11	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	120.3
120	121	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	895.4
121	21	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	295.0
122	22	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	227.8
130	31	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	600.3
200	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	37.1
201	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167.7
202	106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
203	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	20.5

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ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
EXISTING HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 100 YR STORM

HYDROGRAPHS ARE LISTED FOR THE FOLLOWING 32 CONVEYANCE ELEMENTS

THE UPPER NUMBER IS DISCHARGE IN CFS
THE LOWER NUMBER IS ONE OF THE FOLLOWING CASES:
( ) DENOTES DEPTH ABOVE INVERT IN FEET
(S) DENOTES STORAGE IN AC-FT FOR DETENSION DAM. DISCHARGE INCLUDES SPILLWAY OUTFLOW.
(I) DENOTES GUTTER INFLOW IN CFS FROM SPECIFIED INFLOW HYDROGRAPH
(D) DENOTES DISCHARGE IN CFS DIVERTED FROM THIS GUTTER
(O) DENOTES STORAGE IN AC-FT FOR SURCHARGED GUTTER

TIME(HR/MIN)										
	1	2	3	4	5	6	7	8	9	10
	11	12	20	21	22	30	31	100	101	102
	103	104	105	106	120	121	122	130	200	201
	202	203								
0 5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )
	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )

		0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0(S)	0. .0(S)
		0. .0(S)	0. .0(S)								
0	10.	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	2. .1( )	0. .0( )	0. .0( )	0. .0( )
		0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	1. .0( )	0. .0( )	6. .0( )
		1. .0( )	5. .0( )	3. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0(S)	0. .0(S)
		0. .0(S)	0. .0(S)								
0	15.	0. .0( )	0. .0( )	0. .1( )	1. .1( )	1. .1( )	1. .1( )	15. .4( )	0. .0( )	0. .0( )	0. .0( )
		0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	7. .0( )	3. .0( )	22. .0( )
		8. .0( )	21. .0( )	8. .0( )	1. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0(S)	1. .0(S)
		0. .0(S)	0. .0(S)								
0	20.	0. .0( )	1. .1( )	1. .2( )	6. .3( )	5. .3( )	8. .2( )	43. .7( )	0. .0( )	0. .0( )	0. .1( )
		0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	25. .0( )	10. .0( )	51. .0( )
		24. .0( )	49. .0( )	16. .0( )	2. .0( )	1. .0( )	1. .0( )	0. .0( )	1. .0( )	1. .1(S)	2. .1(S)
		0. .0(S)	1. .0(S)								
0	25.	1. .1( )	6. .2( )	2. .3( )	29. .7( )	30. .7( )	38. .6( )	115. 1.3( )	0. .0( )	0. .0( )	0. .1( )
		0. .0( )	2. .5( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	67. .0( )	31. .0( )	150. .0( )
		81. .0( )	132. .0( )	65. .0( )	6. .0( )	1. .0( )	1. .0( )	1. .0( )	1. .0( )	3. .3(S)	5. .4(S)
		0. .0(S)	2. .2(S)								
0	30.	9. .4( )	51. .9( )	6. .6( )	128. 1.6( )	144. 1.7( )	162. 1.5( )	332. 2.3( )	1. .1( )	0. .0( )	1. .2( )
		1. .1( )	24. 1.5( )	26. .5( )	1. .1( )	2. .1( )	15. .4( )	1. .1( )	164. .0( )	157. .0( )	459. .0( )
		286. .0( )	365. .0( )	216. .0( )	38. .0( )	93. .0( )	79. .0( )	36. .0( )	108. .0( )	8. .7(S)	12. 1.3(S)
		1. .2(S)	5. .6(S)								
0	35.	51. 1.2( )	226. 2.0( )	13. .8( )	375. 2.9( )	442. 3.1( )	442. 2.6( )	521. 3.0( )	3. .1( )	1. .1( )	2. .3( )
		2. .1( )	75. 2.4( )	156. 1.3( )	16. .6( )	20. .5( )	87. 1.1( )	9. .3( )	338. .0( )	422. .0( )	858. .0( )
		660. .0( )	524. .0( )	213. .0( )	89. .0( )	246. .0( )	159. .0( )	111. .0( )	199. .0( )	16. 1.4(S)	21. 2.7(S)
		2. .6(S)	7. 1.3(S)								
0	40.	173. 2.4( )	568. 3.4( )	21. 1.1( )	727. 4.0( )	820. 4.2( )	719. 3.4( )	504. 2.9( )	7. .2( )	2. .2( )	4. .4( )
		4. .2( )	118. 2.9( )	329. 2.0( )	57. 1.2( )	62. .9( )	175. 1.6( )	40. .8( )	548. .0( )	798. .0( )	1190. .0( )
		971. .0( )	498. .0( )	168. .0( )	127. .0( )	389. .0( )	214. .0( )	194. .0( )	241. .0( )	23. 2.2(S)	25. 3.8(S)
		4. 1.3(S)	8. 1.8(S)								
0	45.	395. 3.7( )	945. 4.5( )	29. 1.2( )	1051. 4.8( )	1051. 4.7( )	857. 3.7( )	435. 2.7( )	12. .3( )	4. .3( )	5. .5( )
		5.	134.	469.	121.	111.	241.	100.	765.	1178.	1354.

		.2( )	3.0( )	2.4( )	1.8( )	1.2( )	1.9( )	1.3( )	.0( )	.0( )	.0( )
		1104. .0( )	428. .0( )	133. .0( )	143. .0( )	513. .0( )	272. .0( )	258. .0( )	289. .0( )	31. 2.9(S)	28. 4.7(S)
		5. 2.2(S)	8. 2.1(S)								
0	50.	684. 4.8( )	1217. 5.2( )	41. 1.5( )	1248. 5.2( )	1135. 4.9( )	927. 3.9( )	369. 2.5( )	17. .4( )	5. .3( )	5. .5( )
		7. .3( )	132. 3.0( )	590. 2.8( )	188. 2.2( )	151. 1.5( )	302. 2.2( )	182. 1.8( )	1018. .0( )	1445. .0( )	1381. .0( )
		1154. .0( )	363. .0( )	104. .0( )	144. .0( )	629. .0( )	327. .0( )	299. .0( )	352. .0( )	45. 3.4(S)	30. 5.3(S)
		5. 3.2(S)	9. 2.3(S)								
0	55.	909. 5.4( )	1354. 5.5( )	53. 1.6( )	1328. 5.4( )	1171. 5.0( )	983. 4.0( )	312. 2.2( )	21. .4( )	5. .4( )	6. .5( )
		8. .3( )	122. 2.9( )	702. 3.0( )	244. 2.5( )	176. 1.6( )	368. 2.4( )	268. 2.2( )	1201. .0( )	1569. .0( )	1368. .0( )
		1183. .0( )	306. .0( )	80. .0( )	145. .0( )	736. .0( )	368. .0( )	323. .0( )	417. .0( )	54. 3.7(S)	32. 5.7(S)
		6. 4.1(S)	10. 2.5(S)								
1	0.	1100. 5.8( )	1402. 5.6( )	58. 1.7( )	1351. 5.4( )	1200. 5.1( )	1037. 4.2( )	266. 2.0( )	25. .5( )	6. .4( )	6. .5( )
		9. .3( )	110. 2.8( )	799. 3.3( )	284. 2.8( )	189. 1.6( )	432. 2.7( )	343. 2.6( )	1353. .0( )	1602. .0( )	1361. .0( )
		1212. .0( )	262. .0( )	63. .0( )	146. .0( )	826. .0( )	395. .0( )	331. .0( )	474. .0( )	59. 3.9(S)	32. 6.0(S)
		6. 5.1(S)	10. 2.6(S)								
1	5.	1248. 6.0( )	1417. 5.6( )	61. 1.7( )	1359. 5.4( )	1228. 5.1( )	1086. 4.3( )	236. 1.9( )	27. .5( )	6. .4( )	6. .6( )
		9. .3( )	99. 2.7( )	874. 3.4( )	306. 2.9( )	192. 1.7( )	486. 2.9( )	399. 2.8( )	1469. .0( )	1604. .0( )	1367. .0( )
		1239. .0( )	234. .0( )	57. .0( )	145. .0( )	892. .0( )	407. .0( )	328. .0( )	518. .0( )	61. 4.0(S)	33. 6.2(S)
		6. 6.1(S)	10. 2.6(S)								
1	10.	1353. 6.2( )	1421. 5.6( )	61. 1.7( )	1359. 5.4( )	1241. 5.1( )	1112. 4.3( )	202. 1.7( )	29. .5( )	6. .4( )	7. .6( )
		10. .3( )	88. 2.5( )	914. 3.5( )	314. 2.9( )	189. 1.6( )	520. 3.0( )	436. 2.9( )	1547. .0( )	1591. .0( )	1351. .0( )
		1240. .0( )	197. .0( )	39. .0( )	139. .0( )	920. .0( )	400. .0( )	316. .0( )	535. .0( )	61. 4.0(S)	33. 6.3(S)
		7. 7.0(S)	10. 2.7(S)								
1	15.	1421. 6.3( )	1406. 5.6( )	59. 1.7( )	1337. 5.4( )	1219. 5.1( )	1098. 4.3( )	162. 1.5( )	31. .5( )	7. .4( )	7. .6( )
		10. .3( )	75. 2.4( )	917. 3.5( )	310. 2.9( )	180. 1.6( )	533. 3.0( )	455. 3.0( )	1586. .0( )	1557. .0( )	1300. .0( )
		1203. .0( )	158. .0( )	30. .0( )	131. .0( )	913. .0( )	380. .0( )	296. .0( )	535. .0( )	59. 3.9(S)	33. 6.3(S)
		7. 7.9(S)	10. 2.6(S)								
1	20.	1453. 6.3( )	1364. 5.5( )	56. 1.7( )	1288. 5.3( )	1166. 5.0( )	1053. 4.2( )	131. 1.4( )	32. .5( )	7. .4( )	7. .6( )
		10. .3( )	63. 2.2( )	893. 3.5( )	297. 2.8( )	167. 1.5( )	529. 3.0( )	460. 3.0( )	1587. .0( )	1495. .0( )	1221. .0( )
		1138. .0( )	127. .0( )	21. .0( )	121. .0( )	883. .0( )	353. .0( )	271. .0( )	522. .0( )	55. 3.7(S)	33. 6.2(S)
		7. 8.7(S)	10. 2.6(S)								
1	25.	1453. 6.3( )	1297. 5.4( )	51. 1.6( )	1218. 5.1( )	1093. 4.8( )	992. 4.1( )	104. 1.2( )	32. .5( )	7. .4( )	7. .6( )

```
        10.      52.      852.     278.     152.     515.     456.     1561.    1409.    1131.
         .3( )   2.0( )   3.4( )   2.7( )   1.5( )   2.9( )   3.0( )    .0( )    .0( )    .0( )
     1060.      100.      16.      111.     838.     322.     244.     503.     49.      33.
         .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )   3.6(S)   6.1(S)
        7.       10.
        9.4(S)   2.6(S)
1  30.  1424.    1213.    45.      1136.    1013.    924.     83.      32.      7.       7.
        6.3( )   5.2( )   1.5( )   5.0( )   4.7( )   3.9( )   1.0( )    .5( )    .4( )    .6( )
        10.      42.      803.     256.     137.     496.     446.     1510.    1310.    1042.
         .3( )   1.9( )   3.3( )   2.6( )   1.4( )   2.9( )   3.0( )    .0( )    .0( )    .0( )
        978.     81.      13.      102.     787.     291.     218.     482.     44.      32.
         .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )   3.4(S)   6.0(S)
        7.       10.
        10.1(S)  2.5(S)
1  35.  1373.    1125.    40.      1051.    934.     858.     71.      32.      12.      18.
        6.2( )   5.0( )   1.4( )   4.8( )   4.5( )   3.7( )    .9( )    .5( )    .6( )    .9( )
        10.      32.      751.     232.     122.     474.     431.     1443.    1208.    956.
         .3( )   1.7( )   3.2( )   2.5( )   1.3( )   2.8( )   2.9( )    .0( )    .0( )    .0( )
        900.     69.      17.      94.      734.     260.     193.     459.     39.      32.
         .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )   3.2(S)   5.9(S)
        20.      10.
        10.7(S)  2.4(S)
1  40.  1308.    1037.    35.      970.     859.     794.     63.      32.      25.      31.
        6.1( )   4.8( )   1.3( )   4.6( )   4.3( )   3.6( )    .9( )    .5( )    .8( )   1.3( )
        10.      24.      695.     209.     107.     449.     413.     1365.    1110.    878.
         .3( )   1.5( )   3.0( )   2.4( )   1.2( )   2.7( )   2.8( )    .0( )    .0( )    .0( )
        826.     62.      29.      86.      676.     227.     170.     430.     34.      32.
         .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )   3.0(S)   5.8(S)
        31.      9.
        11.2(S)  2.4(S)
1  45.  1235.    955.     30.      893.     788.     733.     58.      32.      36.      38.
        6.0( )   4.5( )   1.3( )   4.4( )   4.1( )   3.4( )    .8( )    .5( )   1.0( )   1.4( )
        10.      17.      639.     187.     95.      423.     393.     1279.    1017.    806.
         .3( )   1.3( )   2.9( )   2.2( )   1.1( )   2.6( )   2.8( )    .0( )    .0( )    .0( )
        757.     58.      40.      79.      621.     199.     150.     404.     29.      32.
         .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )   2.8(S)   5.8(S)
        39.      9.
        11.5(S)  2.3(S)
1  50.  1158.    878.     28.      822.     724.     676.     55.      32.      43.      45.
        5.9( )   4.3( )   1.2( )   4.3( )   3.9( )   3.3( )    .8( )    .5( )   1.1( )   1.5( )
        9.       13.      588.     167.     83.      397.     372.     1195.    933.     740.
         .3( )   1.1( )   2.8( )   2.1( )   1.0( )   2.6( )   2.7( )    .0( )    .0( )    .0( )
        695.     55.      46.      73.      572.     175.     132.     379.     27.      32.
         .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )   2.7(S)   5.9(S)
        45.      9.
        11.7(S)  2.2(S)
1  55.  1082.    810.     26.      757.     667.     625.     53.      32.      48.      49.
        5.7( )   4.2( )   1.2( )   4.1( )   3.8( )   3.1( )    .8( )    .5( )   1.2( )   1.6( )
        9.       9.       542.     149.     73.      373.     350.     1115.    858.     682.
         .3( )   1.0( )   2.6( )   2.0( )   1.0( )   2.5( )   2.6( )    .0( )    .0( )    .0( )
        641.     53.      51.      67.      527.     154.     116.     356.     26.      33.
         .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )   2.6(S)   6.0(S)
        49.      9.
        11.9(S)  2.2(S)
2   0.  1008.    749.     25.      699.     616.     580.     52.      32.      51.      52.
        5.6( )   4.0( )   1.2( )   3.9( )   3.6( )   3.0( )    .8( )    .5( )   1.2( )   1.7( )
        9.       7.       500.     132.     64.      350.     330.     1038.    791.     631.
         .3( )    .9( )   2.5( )   1.9( )    .9( )   2.4( )   2.5( )    .0( )    .0( )    .0( )
        593.     52.      54.      62.      486.     136.     103.     333.     25.      33.
         .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )   2.4(S)   6.1(S)
        52.      8.
        12.0(S)  2.1(S)
2   5.  939.     693.     24.      647.     570.     537.     49.      33.      52.      53.
        5.5( )   3.8( )   1.1( )   3.8( )   3.5( )   2.9( )    .8( )    .6( )   1.2( )   1.7( )
```

		9. .3( )	5. .7( )	461. 2.4( )	118. 1.7( )	56. .8( )	328. 2.3( )	310. 2.4( )	965. .0( )	730. .0( )	581. .0( )
		548. .0( )	48. .0( )	54. .0( )	57. .0( )	448. .0( )	120. .0( )	90. .0( )	312. .0( )	24. 2.3(S)	33. 6.3(S)
		53. 12.0(S)	8. 2.1(S)								
2	10.	874. 5.3( )	641. 3.7( )	23. 1.1( )	596. 3.6( )	525. 3.3( )	496. 2.8( )	44. .7( )	33. .6( )	53. 1.3( )	53. 1.7( )
		8. .3( )	4. .6( )	425. 2.3( )	105. 1.6( )	49. .8( )	307. 2.2( )	291. 2.3( )	895. .0( )	672. .0( )	532. .0( )
		503. .0( )	43. .0( )	53. .0( )	52. .0( )	412. .0( )	105. .0( )	79. .0( )	291. .0( )	23. 2.2(S)	34. 6.4(S)
		53. 12.0(S)	8. 2.0(S)								
2	15.	813. 5.2( )	592. 3.5( )	22. 1.1( )	549. 3.5( )	483. 3.2( )	457. 2.6( )	40. .7( )	33. .6( )	53. 1.3( )	53. 1.7( )
		8. .3( )	2. .5( )	392. 2.2( )	93. 1.5( )	43. .7( )	288. 2.1( )	274. 2.3( )	828. .0( )	617. .0( )	487. .0( )
		462. .0( )	40. .0( )	53. .0( )	48. .0( )	381. .0( )	93. .0( )	70. .0( )	274. .0( )	22. 2.1(S)	34. 6.6(S)
		53. 12.0(S)	8. 1.9(S)								
2	20.	755. 5.1( )	546. 3.4( )	21. 1.0( )	505. 3.4( )	445. 3.1( )	424. 2.5( )	38. .7( )	34. .6( )	52. 1.2( )	52. 1.7( )
		8. .3( )	2. .4( )	364. 2.1( )	83. 1.4( )	38. .7( )	271. 2.1( )	258. 2.2( )	766. .0( )	563. .0( )	447. .0( )
		425. .0( )	38. .0( )	52. .0( )	45. .0( )	354. .0( )	83. .0( )	62. .0( )	258. .0( )	20. 1.9(S)	35. 6.7(S)
		52. 12.0(S)	8. 1.9(S)								
2	25.	692. 4.9( )	503. 3.2( )	20. 1.0( )	465. 3.2( )	412. 3.0( )	395. 2.4( )	37. .7( )	34. .6( )	51. 1.2( )	50. 1.6( )
		8. .3( )	1. .4( )	338. 2.0( )	74. 1.3( )	34. .6( )	255. 2.0( )	242. 2.1( )	700. .0( )	515. .0( )	413. .0( )
		396. .0( )	37. .0( )	51. .0( )	41. .0( )	329. .0( )	74. .0( )	54. .0( )	242. .0( )	19. 1.8(S)	35. 6.8(S)
		50. 11.9(S)	8. 1.8(S)								
2	30.	627. 4.6( )	465. 3.1( )	18. 1.0( )	430. 3.1( )	384. 2.8( )	369. 2.3( )	37. .6( )	35. .6( )	49. 1.2( )	49. 1.6( )
		8. .3( )	1. .3( )	315. 2.0( )	65. 1.3( )	29. .6( )	240. 1.9( )	228. 2.0( )	633. .0( )	474. .0( )	384. .0( )
		370. .0( )	36. .0( )	49. .0( )	38. .0( )	305. .0( )	65. .0( )	47. .0( )	228. .0( )	18. 1.7(S)	35. 6.9(S)
		49. 11.8(S)	8. 1.8(S)								
2	35.	572. 4.4( )	432. 2.9( )	17. 1.0( )	400. 3.0( )	359. 2.7( )	344. 2.3( )	35. .6( )	35. .6( )	47. 1.2( )	47. 1.6( )
		8. .3( )	1. .3( )	292. 1.9( )	57. 1.2( )	25. .5( )	226. 1.9( )	214. 2.0( )	576. .0( )	439. .0( )	359. .0( )
		345. .0( )	35. .0( )	47. .0( )	35. .0( )	283. .0( )	57. .0( )	36. .0( )	214. .0( )	17. 1.6(S)	36. 7.0(S)
		47. 11.8(S)	8. 1.7(S)								
2	40.	525. 4.3( )	403. 2.8( )	16. .9( )	373. 2.9( )	335. 2.7( )	322. 2.2( )	35. .6( )	35. .6( )	45. 1.2( )	45. 1.5( )
		8. .3( )	1. .2( )	270. 1.8( )	49. 1.1( )	21. .5( )	212. 1.8( )	201. 1.9( )	528. .0( )	408. .0( )	335. .0( )
		322. .0( )	35. .0( )	45. .0( )	33. .0( )	261. .0( )	49. .0( )	28. .0( )	201. .0( )	16. 1.4(S)	36. 7.1(S)
		45. 11.7(S)	8. 1.7(S)								
2	45.	484.	376.	15.	348.	313.	301.	36.	36.	43.	43.

		4.1( )	2.7( )	.9( )	2.8( )	2.6( )	2.1( )	.6( )	.6( )	1.1( )	1.5( )
		8. .3( )	0. .2( )	250. 1.7( )	41. 1.0( )	17. .4( )	200. 1.7( )	189. 1.8( )	486. .0( )	380. .0( )	313. .0( )
		301. .0( )	36. .0( )	43. .0( )	30. .0( )	241. .0( )	41. .0( )	23. .0( )	189. .0( )	15. 1.3(S)	38. 7.1(S)
		42. 11.6(S)	7. 1.6(S)								
2	50.	448. 3.9( )	352. 2.6( )	15. .9( )	326. 2.7( )	293. 2.5( )	281. 2.0( )	37. .6( )	37. .6( )	41. 1.1( )	41. 1.5( )
		8. .3( )	0. .2( )	231. 1.7( )	35. .9( )	14. .4( )	188. 1.7( )	178. 1.8( )	450. .0( )	355. .0( )	293. .0( )
		282. .0( )	37. .0( )	41. .0( )	28. .0( )	223. .0( )	35. .0( )	18. .0( )	178. .0( )	14. 1.2(S)	41. 7.1(S)
		40. 11.5(S)	7. 1.6(S)								
2	55.	417. 3.8( )	330. 2.5( )	14. .9( )	305. 2.6( )	275. 2.4( )	264. 1.9( )	38. .7( )	38. .6( )	39. 1.1( )	38. 1.4( )
		7. .3( )	0. .2( )	214. 1.6( )	29. .8( )	12. .3( )	177. 1.6( )	168. 1.7( )	417. .0( )	332. .0( )	275. .0( )
		265. .0( )	38. .0( )	39. .0( )	26. .0( )	206. .0( )	29. .0( )	15. .0( )	168. .0( )	13. 1.1(S)	40. 7.1(S)
		38. 11.4(S)	7. 1.5(S)								
3	0.	388. 3.7( )	310. 2.4( )	13. .8( )	287. 2.5( )	259. 2.3( )	249. 1.9( )	39. .7( )	39. .6( )	37. 1.0( )	36. 1.4( )
		7. .3( )	0. .2( )	198. 1.5( )	25. .7( )	10. .3( )	167. 1.6( )	158. 1.7( )	388. .0( )	310. .0( )	259. .0( )
		249. .0( )	39. .0( )	37. .0( )	19. .0( )	192. .0( )	25. .0( )	12. .0( )	158. .0( )	12. 1.0(S)	39. 7.1(S)
		36. 11.3(S)	7. 1.5(S)								
3	5.	363. 3.5( )	291. 2.4( )	12. .8( )	270. 2.4( )	244. 2.2( )	234. 1.8( )	39. .7( )	39. .6( )	34. 1.0( )	33. 1.3( )
		7. .3( )	0. .1( )	184. 1.5( )	21. .7( )	8. .3( )	157. 1.5( )	148. 1.6( )	363. .0( )	291. .0( )	244. .0( )
		235. .0( )	39. .0( )	34. .0( )	15. .0( )	178. .0( )	21. .0( )	8. .0( )	148. .0( )	11. 1.0(S)	37. 7.1(S)
		33. 11.2(S)	7. 1.4(S)								
3	10.	339. 3.4( )	274. 2.3( )	11. .8( )	254. 2.4( )	229. 2.2( )	220. 1.7( )	38. .7( )	38. .6( )	31. .9( )	30. 1.2( )
		7. .3( )	0. .1( )	171. 1.4( )	17. .6( )	7. .2( )	148. 1.5( )	140. 1.6( )	339. .0( )	274. .0( )	229. .0( )
		221. .0( )	38. .0( )	31. .0( )	13. .0( )	165. .0( )	17. .0( )	7. .0( )	140. .0( )	10. .9(S)	36. 7.1(S)
		30. 11.1(S)	7. 1.4(S)								
3	15.	319. 3.3( )	258. 2.2( )	10. .7( )	239. 2.3( )	216. 2.1( )	207. 1.7( )	37. .7( )	37. .6( )	28. .9( )	27. 1.2( )
		7. .3( )	0. .1( )	159. 1.3( )	15. .5( )	6. .2( )	139. 1.4( )	131. 1.5( )	319. .0( )	258. .0( )	216. .0( )
		207. .0( )	37. .0( )	28. .0( )	11. .0( )	154. .0( )	15. .0( )	6. .0( )	131. .0( )	10. .8(S)	36. 7.0(S)
		27. 11.0(S)	7. 1.3(S)								
3	20.	299. 3.2( )	243. 2.1( )	9. .7( )	226. 2.2( )	203. 2.0( )	195. 1.6( )	37. .6( )	37. .6( )	26. .9( )	24. 1.1( )
		7. .3( )	0. .1( )	149. 1.3( )	12. .5( )	5. .2( )	131. 1.4( )	124. 1.5( )	299. .0( )	243. .0( )	203. .0( )
		195. .0( )	37. .0( )	26. .0( )	10. .0( )	144. .0( )	12. .0( )	5. .0( )	124. .0( )	9. .8(S)	36. 7.0(S)
		24. 10.9(S)	7. 1.3(S)								

3	25.	282. 3.1( )	229. 2.1( )	8. .7( )	213. 2.2( )	192. 2.0( )	184. 1.6( )	36. .6( )	36. .6( )	23. .8( )	22. 1.1( )
		7. .3( )	0. .1( )	139. 1.2( )	11. .4( )	4. .2( )	124. 1.3( )	116. 1.4( )	282. .0( )	229. .0( )	192. .0( )
		184. .0( )	36. .0( )	23. .0( )	9. .0( )	134. .0( )	11. .0( )	4. .0( )	116. .0( )	8. .7(S)	35. 6.9(S)
		22. 10.8(S)	7. 1.2(S)								
3	30.	266. 3.0( )	216. 2.0( )	8. .6( )	201. 2.1( )	181. 1.9( )	174. 1.5( )	36. .6( )	36. .6( )	21. .8( )	20. 1.0( )
		7. .3( )	0. .1( )	130. 1.2( )	9. .4( )	4. .2( )	117. 1.3( )	109. 1.4( )	266. .0( )	216. .0( )	181. .0( )
		175. .0( )	36. .0( )	21. .0( )	7. .0( )	126. .0( )	9. .0( )	4. .0( )	109. .0( )	8. .6(S)	35. 6.8(S)
		20. 10.7(S)	7. 1.2(S)								
3	35.	251. 2.9( )	204. 1.9( )	7. .6( )	190. 2.0( )	172. 1.9( )	165. 1.5( )	36. .6( )	36. .6( )	19. .7( )	18. .9( )
		7. .3( )	0. .1( )	122. 1.2( )	8. .4( )	3. .2( )	110. 1.2( )	103. 1.3( )	251. .0( )	204. .0( )	172. .0( )
		166. .0( )	36. .0( )	19. .0( )	7. .0( )	118. .0( )	8. .0( )	3. .0( )	103. .0( )	7. .6(S)	35. 6.7(S)
		18. 10.6(S)	7. 1.1(S)								
3	40.	237. 2.8( )	193. 1.9( )	7. .6( )	180. 2.0( )	163. 1.8( )	157. 1.4( )	35. .6( )	35. .6( )	17. .7( )	16. .9( )
		7. .3( )	0. .1( )	114. 1.1( )	7. .4( )	3. .1( )	104. 1.2( )	97. 1.3( )	237. .0( )	193. .0( )	163. .0( )
		157. .0( )	35. .0( )	17. .0( )	7. .0( )	111. .0( )	7. .0( )	3. .0( )	97. .0( )	6. .5(S)	34. 6.6(S)
		16. 10.6(S)	7. 1.1(S)								
3	45.	224. 2.7( )	183. 1.8( )	6. .6( )	171. 1.9( )	155. 1.7( )	149. 1.4( )	35. .6( )	35. .6( )	15. .7( )	15. .9( )
		7. .3( )	0. .1( )	107. 1.1( )	6. .3( )	3. .1( )	98. 1.1( )	91. 1.2( )	224. .0( )	183. .0( )	155. .0( )
		149. .0( )	35. .0( )	15. .0( )	7. .0( )	104. .0( )	6. .0( )	3. .0( )	91. .0( )	6. .5(S)	34. 6.5(S)
		14. 10.5(S)	7. 1.0(S)								
3	50.	212. 2.7( )	174. 1.8( )	6. .5( )	162. 1.9( )	147. 1.7( )	142. 1.4( )	35. .6( )	34. .6( )	14. .6( )	13. .8( )
		7. .3( )	0. .1( )	101. 1.0( )	5. .3( )	2. .1( )	92. 1.1( )	86. 1.2( )	212. .0( )	174. .0( )	147. .0( )
		142. .0( )	34. .0( )	14. .0( )	7. .0( )	97. .0( )	5. .0( )	2. .0( )	86. .0( )	5. .5(S)	34. 6.3(S)
		13. 10.4(S)	7. 1.0(S)								
3	55.	201. 2.6( )	165. 1.7( )	5. .5( )	154. 1.8( )	140. 1.7( )	135. 1.3( )	34. .6( )	34. .6( )	13. .6( )	12. .8( )
		7. .3( )	0. .1( )	95. 1.0( )	5. .3( )	2. .1( )	87. 1.1( )	81. 1.1( )	201. .0( )	165. .0( )	140. .0( )
		135. .0( )	34. .0( )	13. .0( )	7. .0( )	92. .0( )	5. .0( )	2. .0( )	81. .0( )	5. .4(S)	33. 6.2(S)
		12. 10.4(S)	6. 1.0(S)								
4	0.	191. 2.5( )	157. 1.7( )	5. .5( )	147. 1.8( )	134. 1.6( )	129. 1.3( )	34. .6( )	34. .6( )	12. .6( )	11. .8( )
		7. .3( )	0. .1( )	89. 1.0( )	4. .3( )	2. .1( )	82. 1.0( )	76. 1.1( )	191. .0( )	157. .0( )	134. .0( )
		129. .0( )	34. .0( )	12. .0( )	7. .0( )	86. .0( )	4. .0( )	2. .0( )	76. .0( )	5. .4(S)	33. 6.1(S)
		11. 10.4(S)	6. .9(S)								

```
  4    5.   182.     149.      4.    140.    128.    123.     33.     33.     11.     11.
              2.5( )   1.6( )   .5( )   1.7( )  1.6( )  1.2( )   .6( )   .6( )   .5( )   .7( )

              6.       0.     84.      4.      2.     77.     72.    182.    149.    128.
               .3( )    .1( )   .9( )   .3( )   .1( )  1.0( )  1.1( )   .0( )   .0( )   .0( )

            123.      33.     11.      6.     81.      4.      2.     72.      4.     32.
               .0( )    .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .4(S)  5.9(S)

             11.       6.
            10.3(S)    .9(S)

  4   10.   173.     142.      4.    134.    122.    117.     33.     33.     10.     10.
              2.4( )   1.6( )   .5( )   1.7( )  1.5( )  1.2( )   .6( )   .6( )   .5( )   .7( )

              6.       0.     79.      4.      2.     73.     68.    173.    142.    122.
               .2( )    .0( )   .9( )   .2( )   .1( )  1.0( )  1.0( )   .0( )   .0( )   .0( )

            117.      33.     10.      6.     76.      4.      2.     68.      4.     32.
               .0( )    .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .3(S)  5.8(S)

             10.       6.
            10.3(S)    .8(S)
1
```

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
EXISTING HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 100 YR STORM

*** PEAK FLOWS, STAGES AND STORAGES OF GUTTERS AND DETENSION DAMS ***

CONVEYANCE ELEMENT	PEAK (CFS)	STAGE (FT)	STORAGE (AC-FT)	TIME (HR/MIN)
203	10.	.1	2.7	1 10.
11	10.	.3		1 25.
106	146.	(DIRECT FLOW)		1 0.
202	53.	.1	12.0	2 10.
10	53.	1.7		2 10.
22	192.	1.7		1 5.
9	53.	1.3		2 10.
31	460.	3.0		1 20.
122	331.	(DIRECT FLOW)		1 0.
105	216.	(DIRECT FLOW)		0 30.
130	535.	(DIRECT FLOW)		1 10.
21	314.	2.9		1 10.
201	41.	.1	7.1	2 50.
30	533.	3.0		1 15.
121	407.	(DIRECT FLOW)		1 5.
8	39.	.6		3 0.
120	920.	(DIRECT FLOW)		1 10.
104	524.	(DIRECT FLOW)		0 35.
20	917.	3.5		1 15.
7	521.	3.0		0 35.
12	134.	3.0		0 45.
6	1112.	4.3		1 10.
103	1240.	(DIRECT FLOW)		1 10.
5	1241.	5.1		1 10.
200	61.	.1	4.0	1 5.
102	1381.	(DIRECT FLOW)		0 50.
3	61.	1.7		1 10.
4	1359.	5.4		1 5.
2	1421.	5.6		1 10.
101	1604.	(DIRECT FLOW)		1 5.
1	1453.	6.3		1 20.
100	1587.	(DIRECT FLOW)		1 20.
99	1587.	(DIRECT FLOW)		1 20.

1

ENDPROGRAM PROGRAM CALLED

□

APPENDIX D

FUTURE LAND USE AND EXISTING HYDRAULIC CONDITIONS

COMPUTER PRINTOUTS

This appendix contains UDSWM2 computer printouts existing hydraulic conditions with fully developed future land use conditions. Only the 100 year run is included.

Note: Computer printouts are dated Dec. 1993 rather than Dec. 1994 due to time lag between dates of final analysis (Dec. 1993) and City approval (Dec. 1994).

CAUTION STATEMENT

The user is advised to use caution when using flow conveyance element (channels and pipes) peak flows and hydrographs given in this report. The UDSWM2-PC model assumes that all adjacent sub-basin flow enters the flow conveyance element at the sub-basin design point or the downstream end of the element. The flow conveyance element is simply routing the upstream incoming flow and ignoring the possibility that additional flow may be entering from the adjacent sub-basin. Due to this model limitation flow used for channel or pipe design should be increased appropriately using engineering judgment to reflect incoming sub-basin flow.

```
   2   1   1   2
   3   4
WATERSHED    1
ROBBINSDALE DRAINAGE BASIN DESIGN PLAN    FMG INC.   DECEMBER 1993
FUTURE HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS    100 YR STORM
        50   0 0  5.0                                                      1
        01  100
        02  101
        03  200
        04  102
        05  103
        06  104
        07  105
        08  106
        09  203
        10   12
        20  121
        21  122
        22   22
        30  130
        31   31

   0  203    11  9 2     0.1      1.     .01                    .016      .1
        0           0        .1       2.        .4        3.       .7        6.
      1.3           7         2        8       2.8        11       3.7       12
      4.8          12
  0   11   106      1    20.0    1100    .024      10.      10.    .075     10.0
  0  106   202      3             1.
  0  202    10   9  2    0.1      1.     .01                       .016      .1
        0           0        .2      1.0       1.1       4.0       2.8       5.0
      5.2         6.0       8.3      7.0      10.2       7.0      12.3       60.
     14.5       150.0
  0   10     9      2     3.5     300    .019       0.       0.    .016      3.5
  0    9   105      1     5.0     700    .033       3.       3.    .050      5.0
  0  105   201      3             1.
  0  201     8   6  2     0.1     1.      .1                      .016      .1
        0           0       0.5       6.       2.4        20       4.6       28
      7.1          36       8.4     190.
  0    8   104      1    20.0    2800    .020       5.       5.   .050      10.0
  0  104     7      3             1.
  0    7     6      1    25.0     200   .0100       3.       3.    .050     10.0
  0    6   103      1    30.0    1350   .0085       3.       3.    .050     10.0
  0   12   103      1     2.0    1300     .01       4.       4.    .063      5.0
  0  103     5      3             1.
  0    5   102      1    20.0    1000    .008       4.       4.    .050     10.0
  0  102     4      3             1.
  0    4     2      1    20.0    2300    .010       5.       5.    .063     10.0
  0  200     3   4  2     0.1     1.
        0           0       1.2        14      2.8        28       4.8       85
  0    3     2      1     3.0     350    .020       3.       3.    .050      5.0
  0    2   101      1    30.0     800    .016       3.       3.    .088     10.0
  0  101     1      3             1.
  0    1   100      4    20.0    3700    .007       4.       4.    .075      5.0
                         50.0    3700    .007      20.      20.    .063     10.0
  0  100    99      3             1.
  0   22   122      1    20.0    3750    .031       5.       5.    .075     10.0
  0  122    21      3             1.
  0   21   121      1    15.0    2600    .012       4.       4.    .063      5.0
  0  121   120      3             1.
  0  120    20      3             1.
  0   20     6      1    30.0     700    .010       5.       5.    .050      5.0
  0   31   130      1    20.0    3100    .017       3.       3.    .063     10.0
  0  130    30      3             1.
  0   30   120      1     25.    1500    .010       3.       3.    .050     10.0

  0
 32
  1    2    3    4    5    6    7    8    9   10   11   12   20   21   22   30
 31  100  101  102  103  104  105  106  120  121  122  130  200  201  202  203
ENDPROGRAM□□
```

1

ENVIRONMENTAL PROTECTION AGENCY - STORM WATER MANAGEMENT MODEL - VERSION PC.1

DEVELOPED BY METCALF + EDDY, INC.
UNIVERSITY OF FLORIDA
WATER RESOURCES ENGINEEERS, INC. (SEPTEMBER 1970)

UPDATED BY UNIVERSITY OF FLORIDA (JUNE 1973)
HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS
MISSOURI RIVER DIVISION, CORPS OF ENGINEERS (SEPTEMBER 1974)
BOYLE ENGINEERING CORPORATION (MARCH 1985, JULY 1985)

OTAPE OR DISK ASSIGNMENTS

JIN(1)	JIN(2)	JIN(3)	JIN(4)	JIN(5)	JIN(6)	JIN(7)	JIN(8)	JIN(9)	JIN(10)
2	1	0	0	0	0	0	0	0	0

JOUT(1)	JOUT(2)	JOUT(3)	JOUT(4)	JOUT(5)	JOUT(6)	JOUT(7)	JOUT(8)	JOUT(9)	JOUT(10)
1	2	0	0	0	0	0	0	0	0

NSCRAT(1)	NSCRAT(2)	NSCRAT(3)	NSCRAT(4)	NSCRAT(5)
3	4	0	0	0

1

WATERSHED PROGRAM CALLED

*** ENTRY MADE TO RUNOFF MODEL ***

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
FUTURE HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 100 YR STORM

ONUMBER OF TIME STEPS 50
OINTEGRATION TIME INTERVAL (MINUTES), 5.00

25.0 PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DEPTH
1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
FUTURE HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 100 YR STORM

HYDROGRAPHS FROM CUHPE/PC ARE LISTED FOR THE FOLLOWING 15 SUBCATCHMENTS

TIME(HR/MIN)		1	2	3	4	5	6	7	8	9	10
		20	21	22	30	31					
0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.					
0	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.					
0	10.	1.	1.	2.	6.	3.	5.	5.	1.	2.	2.
		1.	2.	1.	1.	1.					
0	15.	12.	11.	7.	21.	12.	25.	15.	3.	4.	9.
		8.	9.	4.	9.	3.					
0	20.	54.	32.	15.	45.	26.	58.	29.	7.	8.	20.
		26.	22.	11.	27.	11.					
0	25.	130.	73.	37.	120.	62.	144.	78.	16.	33.	50.
		61.	49.	27.	68.	29.					
0	30.	259.	211.	94.	315.	145.	380.	218.	66.	114.	129.
		145.	164.	137.	185.	103.					
0	35.	437.	357.	138.	416.	169.	564.	229.	130.	98.	193.
		246.	265.	246.	286.	240.					
0	40.	512.	377.	135.	370.	141.	526.	182.	167.	68.	192.
		259.	283.	280.	285.	396.					
0	45.	457.	343.	119.	303.	109.	434.	140.	174.	49.	171.

		230.	265.	282.	250.	529.					
0	50.	378.	300.	103.	245.	84.	353.	108.	174.	33.	149.
		197.	239.	271.	215.	619.					
0	55.	310.	257.	88.	196.	63.	284.	81.	171.	24.	128.
		166.	211.	250.	182.	665.					
1	0.	254.	221.	75.	161.	48.	233.	63.	164.	21.	110.
		139.	187.	230.	155.	677.					
1	5.	214.	195.	66.	140.	42.	201.	55.	156.	20.	97.
		121.	168.	214.	136.	671.					
1	10.	184.	166.	55.	110.	32.	163.	39.	146.	11.	82.
		103.	145.	191.	113.	659.					
1	15.	150.	133.	42.	80.	23.	121.	28.	133.	8.	65.
		81.	120.	166.	89.	638.					
1	20.	117.	105.	29.	56.	16.	89.	18.	119.	4.	50.
		62.	97.	142.	69.	609.					
1	25.	88.	81.	21.	38.	12.	60.	12.	107.	2.	34.
		44.	78.	120.	51.	573.					
1	30.	68.	62.	16.	29.	9.	44.	9.	95.	2.	25.
		33.	63.	101.	36.	532.					
1	35.	56.	45.	12.	23.	8.	35.	8.	85.	2.	19.
		26.	51.	86.	27.	491.					
1	40.	49.	35.	10.	19.	7.	29.	7.	75.	2.	15.
		22.	41.	73.	22.	453.					
1	45.	45.	29.	9.	17.	7.	26.	7.	67.	2.	13.
		19.	30.	62.	19.	418.					
1	50.	43.	25.	8.	16.	7.	24.	7.	60.	2.	11.
		17.	24.	53.	16.	387.					
1	55.	41.	22.	7.	15.	7.	23.	7.	54.	2.	10.
		16.	20.	46.	15.	358.					
2	0.	40.	20.	7.	15.	7.	22.	7.	49.	2.	9.
		15.	17.	39.	14.	332.					
2	5.	38.	17.	5.	11.	5.	18.	4.	44.	0.	8.
		13.	14.	33.	11.	307.					
2	10.	28.	12.	4.	7.	2.	11.	2.	39.	0.	5.
		9.	10.	27.	8.	283.					
2	15.	18.	8.	3.	4.	0.	7.	0.	34.	0.	4.
		6.	7.	18.	5.	261.					
2	20.	11.	6.	2.	3.	0.	4.	0.	30.	0.	3.
		4.	5.	13.	4.	240.					
2	25.	7.	4.	0.	2.	0.	3.	0.	26.	0.	2.
		3.	4.	9.	2.	220.					
2	30.	4.	3.	0.	0.	0.	2.	0.	22.	0.	0.
		2.	3.	7.	2.	202.					
2	35.	2.	2.	0.	0.	0.	0.	0.	15.	0.	0.
		0.	2.	5.	0.	185.					
2	40.	0.	0.	0.	0.	0.	0.	0.	10.	0.	0.
		0.	1.	4.	0.	170.					
2	45.	0.	0.	0.	0.	0.	0.	0.	8.	0.	0.
		0.	0.	3.	0.	156.					
2	50.	0.	0.	0.	0.	0.	0.	0.	6.	0.	0.
		0.	0.	2.	0.	143.					
2	55.	0.	0.	0.	0.	0.	0.	0.	4.	0.	0.
		0.	0.	0.	0.	131.					
3	0.	0.	0.	0.	0.	0.	0.	0.	3.	0.	0.
		0.	0.	0.	0.	120.					
3	5.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.
		0.	0.	0.	0.	110.					
3	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	101.					
3	15.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	93.					
3	20.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	85.					

3	25.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	78.					
3	30.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	71.					
3	35.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	66.					
3	40.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	60.					
3	45.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	55.					
3	50.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	51.					
3	55.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	46.					
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	43.					
4	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	39.					
4	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	36.					

1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
FUTURE HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 100 YR STORM

GUTTER NUMBER	GUTTER CONNECTION	NDP	NP		WIDTH OR DIAM (FT)	LENGTH (FT)	INVERT SLOPE (FT/FT)	SIDE SLOPES HORIZ TO VERT L	R	MANNING N	OVERBANK/SURCHARGE DEPTH (FT)	JK
203	11	9	2	PIPE	.1	1.	.0100	.0	.0	.016	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0	.0	.1 2.0	.4	3.0	.7	6.0	1.3	7.0	2.0	8.0
		2.8	11.0	3.7 12.0	4.8	12.0						
11	106	0	1	CHANNEL	20.0	1100.	.0240	10.0	10.0	.075	10.00	0
106	202	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
202	10	9	2	PIPE	.1	1.	.0100	.0	.0	.016	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0	.0	.2 1.0	1.1	4.0	2.8	5.0	5.2	6.0	8.3	7.0
		10.2	7.0	12.3 60.0	14.5	150.0						
10	9	0	2	PIPE	3.5	300.	.0190	.0	.0	.016	3.50	0
9	105	0	1	CHANNEL	5.0	700.	.0330	3.0	3.0	.050	5.00	0
105	201	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
201	8	6	2	PIPE	.1	1.	.1000	.0	.0	.016	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0	.0	.5 6.0	2.4	20.0	4.6	28.0	7.1	36.0	8.4	190.0
8	104	0	1	CHANNEL	20.0	2800.	.0200	5.0	5.0	.050	10.00	0
104	7	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
7	6	0	1	CHANNEL	25.0	200.	.0100	3.0	3.0	.050	10.00	0
6	103	0	1	CHANNEL	30.0	1350.	.0085	3.0	3.0	.050	10.00	0
12	103	0	1	CHANNEL	2.0	1300.	.0100	4.0	4.0	.063	5.00	0
103	5	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
5	102	0	1	CHANNEL	20.0	1000.	.0080	4.0	4.0	.050	10.00	0
102	4	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
4	2	0	1	CHANNEL	20.0	2300.	.0100	5.0	5.0	.063	10.00	0
200	3	4	2	PIPE	.1	1.	.0010	.0	.0	.001	.10	0
		RESERVOIR STORAGE IN ACRE-FEET VS SPILLWAY OUTFLOW										
		.0	.0	1.2 14.0	2.8	28.0	4.8	85.0				
3	2	0	1	CHANNEL	3.0	350.	.0200	3.0	3.0	.050	5.00	0
2	101	0	1	CHANNEL	30.0	800.	.0160	3.0	3.0	.088	10.00	0
101	1	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
1	100	0	4	CHANNEL	20.0	3700.	.0070	4.0	4.0	.075	5.00	0
				OVERFLOW	50.0	3700.	.0070	20.0	20.0	.063	10.00	
100	99	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
22	122	0	1	CHANNEL	20.0	3750.	.0310	5.0	5.0	.075	10.00	0
122	21	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
21	121	0	1	CHANNEL	15.0	2600.	.0120	4.0	4.0	.063	5.00	0
121	120	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
120	20	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
20	6	0	1	CHANNEL	30.0	700.	.0100	5.0	5.0	.050	5.00	0
31	130	0	1	CHANNEL	20.0	3100.	.0170	3.0	3.0	.063	10.00	0
130	30	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
30	120	0	1	CHANNEL	25.0	1500.	.0100	3.0	3.0	.050	10.00	0

OTOTAL NUMBER OF GUTTERS/PIPES, 32
1

ROBBINSDALE DRAINAGE BASIN DESIGN PLAN FMG INC. DECEMBER 1993
FUTURE HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS 100 YR STORM

ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES

GUTTER	TRIBUTARY GUTTER/PIPE										TRIBUTARY SUBAREA										D.A.(AC)
1	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1528.3
2	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1415.0
3	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37.1
4	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1377.9
5	103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1283.2
6	7	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1194.9
7	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	299.5
8	201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167.7
9	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
10	202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
11	203	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20.5
12	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	54.4
20	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	895.4
21	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	227.8
22	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0	130.6
30	130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600.3
31	0	0	0	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	0	520.3
100	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1638.4
101	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1528.3
102	5	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1377.9
103	6	12	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	1283.2
104	8	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	299.5
105	9	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	167.7
106	11	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	120.3
120	121	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	895.4
121	21	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	295.0
122	22	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	227.8
130	31	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	600.3
200	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	37.1
201	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167.7
202	106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120.3
203	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	20.5

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ROBBINSDALE DRAINAGE BASIN DESIGN PLAN    FMG INC.  DECEMBER 1993
FUTURE HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS    100 YR STORM


HYDROGRAPHS ARE LISTED FOR THE FOLLOWING  32 CONVEYANCE ELEMENTS


         THE UPPER NUMBER IS DISCHARGE IN CFS
         THE LOWER NUMBER IS ONE OF THE FOLLOWING CASES:
                   ( ) DENOTES DEPTH ABOVE INVERT IN FEET
                   (S) DENOTES STORAGE IN AC-FT FOR DETENSION DAM.  DISCHARGE INCLUDES SPILLWAY OUTFLOW.
                   (I) DENOTES GUTTER INFLOW IN CFS FROM SPECIFIED INFLOW HYDROGRAPH
                   (D) DENOTES DISCHARGE IN CFS DIVERTED FROM THIS GUTTER
                   (O) DENOTES STORAGE IN AC-FT FOR SURCHARGED GUTTER

TIME(HR/MIN)    1         2         3         4         5         6         7         8         9        10
               11        12        20        21        22        30        31       100       101       102
              103       104       105       106       120       121       122       130       200       201
              202       203

  0    5.      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
                .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )

               0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
                .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )     .0( )
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		0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0(S)	0. .0(S)
		0. .0(S)	0. .0(S)								
0	10.	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	2. .1( )	0. .0( )	0. .0( )	0. .0( )
		0. .0( )	0. .1( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	1. .0( )	1. .0( )	6. .0( )
		3. .0( )	5. .0( )	5. .0( )	1. .0( )	1. .0( )	1. .0( )	2. .0( )	1. .0( )	0. .0(S)	0. .0(S)
		0. .0(S)	0. .0(S)								
0	15.	0. .0( )	0. .0( )	0. .1( )	1. .1( )	2. .1( )	1. .1( )	17. .4( )	0. .0( )	0. .0( )	0. .1( )
		0. .0( )	1. .4( )	1. .1( )	0. .0( )	0. .0( )	0. .0( )	0. .0( )	12. .0( )	11. .0( )	23. .0( )
		14. .0( )	25. .0( )	15. .0( )	3. .0( )	8. .0( )	8. .0( )	9. .0( )	9. .0( )	0. .0(S)	1. .1(S)
		0. .0(S)	0. .0(S)								
0	20.	1. .1( )	1. .1( )	1. .2( )	7. .3( )	13. .4( )	12. .3( )	51. .8( )	0. .0( )	0. .0( )	0. .1( )
		0. .0( )	5. .8( )	10. .3( )	2. .2( )	0. .0( )	4. .2( )	0. .0( )	55. .0( )	33. .0( )	58. .0( )
		43. .0( )	58. .0( )	29. .0( )	7. .0( )	32. .0( )	28. .0( )	22. .0( )	27. .0( )	1. .1(S)	3. .2(S)
		0. .0(S)	1. .1(S)								
0	25.	5. .3( )	8. .3( )	2. .3( )	37. .8( )	63. 1.1( )	63. .8( )	128. 1.3( )	0. .0( )	0. .0( )	0. .2( )
		0. .0( )	18. 1.3( )	46. .7( )	7. .4( )	2. .1( )	19. .4( )	2. .1( )	135. .0( )	81. .0( )	183. .0( )
		143. .0( )	144. .0( )	78. .0( )	16. .0( )	88. .0( )	68. .0( )	50. .0( )	70. .0( )	3. .3(S)	6. .6(S)
		1. .1(S)	2. .2(S)								
0	30.	27. .9( )	69. 1.0( )	6. .6( )	166. 1.9( )	258. 2.3( )	258. 1.9( )	348. 2.4( )	1. .1( )	0. .1( )	1. .3( )
		1. .1( )	55. 2.1( )	167. 1.4( )	35. .9( )	14. .4( )	80. 1.0( )	13. .4( )	286. .0( )	280. .0( )	573. .0( )
		458. .0( )	381. .0( )	219. .0( )	66. .0( )	260. .0( )	181. .0( )	177. .0( )	199. .0( )	8. .7(S)	13. 1.5(S)
		2. .4(S)	6. .7(S)								
0	35.	113. 1.9( )	310. 2.4( )	13. .8( )	499. 3.3( )	702. 3.9( )	682. 3.3( )	562. 3.1( )	4. .2( )	2. .2( )	4. .4( )
		2. .1( )	119. 2.9( )	438. 2.4( )	113. 1.7( )	58. .8( )	209. 1.8( )	58. .9( )	550. .0( )	667. .0( )	1117. .0( )
		971. .0( )	568. .0( )	231. .0( )	133. .0( )	568. .0( )	359. .0( )	323. .0( )	344. .0( )	16. 1.4(S)	22. 2.9(S)
		4. 1.1(S)	7. 1.4(S)								
0	40.	317. 3.3( )	783. 4.1( )	21. 1.1( )	994. 4.7( )	1233. 5.1( )	1120. 4.3( )	544. 3.0( )	8. .2( )	4. .3( )	5. .5( )
		4. .2( )	168. 3.3( )	749. 3.1( )	221. 2.4( )	123. 1.3( )	351. 2.4( )	158. 1.7( )	829. .0( )	1159. .0( )	1603. .0( )
		1429. .0( )	534. .0( )	186. .0( )	171. .0( )	831. .0( )	480. .0( )	406. .0( )	443. .0( )	23. 2.2(S)	27. 4.2(S)
		5. 2.1(S)	8. 1.9(S)								
0	45.	652. 4.7( )	1314. 5.4( )	29. 1.2( )	1461. 5.6( )	1568. 5.8( )	1353. 4.8( )	454. 2.8( )	13. .3( )	5. .3( )	5. .5( )
		6.	177.	966.	318.	180.	470.	298.	1109.	1657.	1871.

.2( ) 3.4( ) 3.6( ) 2.9( ) 1.6( ) 2.8( ) 2.4( ) .0( ) .0( ) .0( )

1639. 447. 145. 180. 1018. 548. 445. 548. 31. 30.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 2.9(S) 5.1(S)

5. 9.
3.3(S) 2.2(S)

0 50. 980. 1700. 41. 1752. 1689. 1462. 379. 19. 5. 6.
5.5( ) 6.2( ) 1.5( ) 6.1( ) 6.0( ) 5.0( ) 2.5( ) .4( ) .4( ) .5( )

7. 165. 1123. 384. 217. 582. 438. 1358. 2000. 1934.
.3( ) 3.3( ) 3.9( ) 3.2( ) 1.8( ) 3.2( ) 2.9( ) .0( ) .0( ) .0( )

1711. 372. 113. 181. 1163. 581. 456. 653. 45. 32.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 3.4(S) 5.8(S)

6. 10.
4.5(S) 2.4(S)

0 55. 1299. 1891. 53. 1871. 1729. 1527. 313. 23. 6. 6.
6.1( ) 6.5( ) 1.6( ) 6.3( ) 6.0( ) 5.1( ) 2.2( ) .4( ) .4( ) .6( )

8. 147. 1237. 418. 234. 678. 548. 1609. 2148. 1925.
.3( ) 3.1( ) 4.1( ) 3.3( ) 1.8( ) 3.4( ) 3.3( ) .0( ) .0( ) .0( )

1737. 307. 87. 179. 1262. 584. 445. 730. 54. 33.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 3.7(S) 6.3(S)

6. 10.
5.7(S) 2.6(S)

1 0. 1565. 1951. 58. 1898. 1737. 1557. 264. 27. 6. 7.
6.4( ) 6.6( ) 1.7( ) 6.3( ) 6.0( ) 5.2( ) 2.0( ) .5( ) .4( ) .6( )

9. 128. 1299. 426. 236. 743. 616. 1819. 2172. 1898.
.3( ) 2.9( ) 4.2( ) 3.4( ) 1.9( ) 3.6( ) 3.5( ) .0( ) .0( ) .0( )

1734. 259. 69. 173. 1309. 566. 423. 771. 59. 34.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 3.9(S) 6.6(S)

7. 10.
6.8(S) 2.7(S)

1 5. 1755. 1951. 61. 1885. 1719. 1555. 232. 29. 7. 7.
6.7( ) 6.6( ) 1.7( ) 6.3( ) 6.0( ) 5.2( ) 1.9( ) .5( ) .4( ) .6( )

10. 112. 1315. 418. 231. 775. 649. 1969. 2146. 1859.
.3( ) 2.8( ) 4.2( ) 3.3( ) 1.8( ) 3.7( ) 3.6( ) .0( ) .0( ) .0( )

1709. 230. 62. 166. 1313. 539. 398. 785. 61. 35.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 4.0(S) 6.8(S)

7. 11.
7.9(S) 2.7(S)

1 10. 1872. 1919. 61. 1842. 1673. 1518. 200. 31. 7. 7.
6.8( ) 6.6( ) 1.7( ) 6.2( ) 5.9( ) 5.1( ) 1.7( ) .5( ) .4( ) .6( )

10. 98. 1291. 399. 219. 778. 658. 2056. 2084. 1783.
.3( ) 2.6( ) 4.2( ) 3.3( ) 1.8( ) 3.7( ) 3.6( ) .0( ) .0( ) .0( )

1648. 194. 45. 156. 1280. 502. 364. 772. 61. 35.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 4.0(S) 6.9(S)

7. 11.
9.0(S) 2.8(S)

1 15. 1925. 1851. 59. 1763. 1587. 1440. 159. 33. 7. 7.
6.9( ) 6.4( ) 1.7( ) 6.1( ) 5.8( ) 5.0( ) 1.5( ) .6( ) .4( ) .6( )

10. 83. 1232. 371. 204. 759. 653. 2076. 1984. 1667.
.3( ) 2.5( ) 4.1( ) 3.1( ) 1.7( ) 3.6( ) 3.6( ) .0( ) .0( ) .0( )

1546. 154. 35. 143. 1211. 452. 323. 742. 59. 36.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 3.9(S) 7.0(S)

7. 11.
10.0(S) 2.7(S)

1 20. 1923. 1748. 56. 1652. 1469. 1333. 126. 34. 13. 20.
6.9( ) 6.3( ) 1.7( ) 5.9( ) 5.6( ) 4.8( ) 1.3( ) .6( ) .6( ) 1.0( )

11. 67. 1151. 337. 185. 727. 636. 2040. 1853. 1524.
.3( ) 2.3( ) 3.9( ) 3.0( ) 1.6( ) 3.6( ) 3.6( ) .0( ) .0( ) .0( )

1417. 122. 31. 130. 1126. 399. 282. 705. 55. 36.
.0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) .0( ) 3.7(S) 6.9(S)

23. 11.
10.8(S) 2.7(S)

1 25. 1874. 1617. 51. 1519. 1337. 1219. 99. 34. 30. 39.
6.8( ) 6.0( ) 1.6( ) 5.7( ) 5.3( ) 4.5( ) 1.2( ) .6( ) .9( ) 1.4( )

```
          11.      53.   1060.    300.    165.    688.    611.   1962.   1698.   1375.
           .3( )   2.0( )  3.8( )  2.8( )  1.5( )  3.5( )  3.5( )   .0( )   .0( )   .0( )

        1283.      95.     43.    117.   1032.    344.    243.    662.     49.     36.
           .0( )    .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )  3.6(S)  7.0(S)

          39.      10.
        11.5(S)   2.7(S)

 1  30.  1791.   1476.     45.   1381.   1207.   1106.     81.     35.     46.     49.
          6.7( )   5.7( )  1.5( )  5.5( )  5.1( )  4.3( )  1.0( )   .6( )  1.2( )  1.6( )

          10.      40.    968.    264.    145.    644.    578.   1859.   1538.   1236.
           .3( )   1.8( )  3.6( )  2.7( )  1.4( )  3.3( )  3.4( )   .0( )   .0( )   .0( )

        1155.      79.     55.    105.    941.    297.    208.    614.     44.     36.
           .0( )    .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )  3.4(S)  7.0(S)

          50.      10.
        11.9(S)   2.6(S)

 1  35.  1684.   1337.     40.   1249.   1089.   1004.     73.     37.     55.     58.
          6.6( )   5.4( )  1.4( )  5.2( )  4.8( )  4.1( )  1.0( )   .6( )  1.3( )  1.8( )

          10.      31.    880.    231.    127.    598.    541.   1740.   1382.   1112.
           .3( )   1.6( )  3.4( )  2.5( )  1.3( )  3.2( )  3.3( )   .0( )   .0( )   .0( )

        1043.      72.     63.     95.    855.    257.    178.    569.     39.     45.
           .0( )    .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )  3.2(S)  7.2(S)

          58.      10.
        12.2(S)   2.5(S)

 1  40.  1566.   1210.     35.   1130.    988.    916.     71.     42.     63.     65.
          6.4( )   5.2( )  1.3( )  5.0( )  4.6( )  3.9( )  1.0( )   .6( )  1.4( )  1.9( )

          10.      24.    800.    201.    111.    554.    503.   1616.   1244.   1007.
           .3( )   1.5( )  3.3( )  2.3( )  1.2( )  3.1( )  3.2( )   .0( )   .0( )   .0( )

         948.      72.     70.     86.    776.    222.    152.    525.     34.     57.
           .0( )    .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )  3.0(S)  7.3(S)

          65.      10.
        12.4(S)   2.5(S)

 1  45.  1447.   1097.     30.   1028.    903.    841.     75.     50.     68.     70.
          6.3( )   4.9( )  1.3( )  4.7( )  4.4( )  3.7( )  1.0( )   .7( )  1.4( )  2.0( )

          10.      19.    727.    174.     96.    512.    467.   1492.   1126.    920.
           .3( )   1.3( )  3.1( )  2.1( )  1.1( )  2.9( )  3.0( )   .0( )   .0( )   .0( )

         868.      76.     75.     77.    705.    192.    127.    486.     29.     66.
           .0( )    .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )  2.8(S)  7.4(S)

          69.      10.
        12.5(S)   2.4(S)

 1  50.  1333.   1001.     28.    940.    830.    777.     80.     57.     70.     70.
          6.1( )   4.7( )  1.2( )  4.6( )  4.2( )  3.6( )  1.0( )   .8( )  1.4( )  2.0( )

          10.      16.    661.    149.     84.    474.    433.   1376.   1026.    846.
           .3( )   1.2( )  2.9( )  2.0( )  1.1( )  2.8( )  2.9( )   .0( )   .0( )   .0( )

         800.      81.     77.     70.    641.    166.    108.    449.     27.     72.
           .0( )    .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )  2.7(S)  7.4(S)

          70.       9.
        12.6(S)   2.4(S)

 1  55.  1228.    921.     26.    865.    768.    720.     86.     64.     70.     70.
          6.0( )   4.5( )  1.2( )  4.4( )  4.1( )  3.4( )  1.1( )   .8( )  1.4( )  2.0( )

          10.      14.    603.    129.     73.    440.    402.   1269.    942.    783.
           .3( )   1.2( )  2.8( )  1.8( )  1.0( )  2.7( )  2.8( )   .0( )   .0( )   .0( )

         741.      87.     77.     64.    584.    145.     93.    416.     26.     75.
           .0( )    .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )  2.6(S)  7.4(S)

          70.       9.
        12.5(S)   2.3(S)

 2   0.  1134.    852.     25.    801.    713.    670.     90.     69.     68.     67.
          5.8( )   4.3( )  1.2( )  4.2( )  3.9( )  3.3( )  1.1( )   .8( )  1.4( )  2.0( )

           9.      12.    551.    112.     64.    408.    372.   1174.    872.    728.
           .3( )   1.1( )  2.7( )  1.7( )   .9( )  2.6( )  2.7( )   .0( )   .0( )   .0( )

         689.      91.     75.     58.    535.    127.     81.    386.     25.     76.
           .0( )    .0( )   .0( )   .0( )   .0( )   .0( )   .0( )   .0( )  2.4(S)  7.4(S)

          67.       9.
        12.5(S)   2.3(S)

 2   5.  1049.    791.     24.    743.    663.    623.     90.     71.     66.     65.
          5.7( )   4.1( )  1.1( )  4.1( )  3.8( )  3.1( )  1.1( )   .9( )  1.4( )  1.9( )
```

		9. .3( )	11. 1.0( )	505. 2.5( )	98. 1.6( )	56. .8( )	378. 2.5( )	346. 2.6( )	1086. .0( )	807. .0( )	674. .0( )
		638. .0( )	89. .0( )	70. .0( )	53. .0( )	489. .0( )	111. .0( )	70. .0( )	357. .0( )	24. 2.3(S)	74. 7.4(S)
		64. 12.4(S)	9. 2.2(S)								
2	10.	971. 5.5( )	734. 3.9( )	23. 1.1( )	687. 3.9( )	612. 3.6( )	575. 3.0( )	83. 1.0( )	72. .9( )	62. 1.4( )	61. 1.8( )
		9. .3( )	9. 1.0( )	460. 2.4( )	85. 1.5( )	49. .8( )	349. 2.4( )	321. 2.5( )	1000. .0( )	745. .0( )	618. .0( )
		586. .0( )	82. .0( )	64. .0( )	48. .0( )	443. .0( )	94. .0( )	59. .0( )	328. .0( )	23. 2.2(S)	70. 7.4(S)
		61. 12.3(S)	9. 2.2(S)								
2	15.	901. 5.4( )	678. 3.8( )	22. 1.1( )	633. 3.8( )	559. 3.5( )	525. 2.9( )	77. 1.0( )	70. .9( )	59. 1.3( )	58. 1.8( )
		9. .3( )	7. .9( )	417. 2.3( )	73. 1.3( )	42. .7( )	322. 2.3( )	297. 2.4( )	918. .0( )	686. .0( )	563. .0( )
		533. .0( )	77. .0( )	59. .0( )	43. .0( )	402. .0( )	80. .0( )	49. .0( )	302. .0( )	22. 2.1(S)	65. 7.3(S)
		58. 12.2(S)	8. 2.1(S)								
2	20.	835. 5.3( )	624. 3.6( )	21. 1.0( )	580. 3.6( )	509. 3.3( )	479. 2.7( )	72. 1.0( )	67. .8( )	56. 1.3( )	55. 1.7( )
		9. .3( )	6. .8( )	378. 2.2( )	63. 1.2( )	35. .6( )	297. 2.2( )	274. 2.3( )	846. .0( )	630. .0( )	512. .0( )
		485. .0( )	71. .0( )	56. .0( )	38. .0( )	364. .0( )	67. .0( )	40. .0( )	278. .0( )	20. 1.9(S)	61. 7.3(S)
		55. 12.1(S)	8. 2.0(S)								
2	25.	775. 5.1( )	572. 3.4( )	20. 1.0( )	530. 3.4( )	464. 3.1( )	437. 2.6( )	67. .9( )	64. .8( )	53. 1.3( )	52. 1.7( )
		8. .3( )	4. .7( )	343. 2.1( )	54. 1.1( )	29. .6( )	274. 2.1( )	253. 2.2( )	782. .0( )	576. .0( )	466. .0( )
		442. .0( )	66. .0( )	53. .0( )	34. .0( )	330. .0( )	57. .0( )	33. .0( )	256. .0( )	19. 1.8(S)	57. 7.3(S)
		52. 12.0(S)	8. 2.0(S)								
2	30.	716. 5.0( )	524. 3.3( )	18. 1.0( )	484. 3.3( )	424. 3.0( )	400. 2.4( )	63. .9( )	60. .8( )	50. 1.2( )	49. 1.6( )
		8. .3( )	3. .6( )	312. 2.0( )	46. 1.0( )	24. .5( )	252. 2.0( )	234. 2.1( )	720. .0( )	527. .0( )	424. .0( )
		403. .0( )	62. .0( )	50. .0( )	30. .0( )	300. .0( )	48. .0( )	27. .0( )	235. .0( )	18. 1.7(S)	54. 7.3(S)
		49. 11.9(S)	8. 1.9(S)								
2	35.	646. 4.7( )	480. 3.1( )	17. 1.0( )	442. 3.1( )	387. 2.9( )	365. 2.3( )	58. .8( )	57. .8( )	47. 1.2( )	46. 1.6( )
		8. .3( )	2. .5( )	283. 1.9( )	39. .9( )	20. .5( )	232. 1.9( )	215. 2.0( )	648. .0( )	482. .0( )	387. .0( )
		367. .0( )	57. .0( )	47. .0( )	23. .0( )	271. .0( )	39. .0( )	22. .0( )	215. .0( )	17. 1.6(S)	51. 7.2(S)
		45. 11.7(S)	8. 1.9(S)								
2	40.	586. 4.5( )	439. 3.0( )	16. .9( )	405. 3.0( )	353. 2.7( )	333. 2.2( )	54. .8( )	54. .7( )	43. 1.1( )	42. 1.5( )
		8. .3( )	2. .4( )	257. 1.8( )	33. .9( )	17. .4( )	213. 1.8( )	198. 1.9( )	586. .0( )	439. .0( )	353. .0( )
		335. .0( )	54. .0( )	43. .0( )	18. .0( )	246. .0( )	33. .0( )	18. .0( )	198. .0( )	16. 1.4(S)	48. 7.2(S)
		41. 11.6(S)	8. 1.8(S)								
2	45.	533.	403.	15.	370.	323.	305.	51.	51.	39.	38.

		4.3( )	2.8( )	.9( )	2.9( )	2.6( )	2.1( )	.8( )	.7( )	1.1( )	1.4( )
		8.	1.	234.	28.	14.	197.	182.	533.	403.	323.
		.3( )	.4( )	1.7( )	.8( )	.4( )	1.7( )	1.8( )	.0( )	.0( )	.0( )
		306.	51.	39.	16.	225.	28.	14.	182.	15.	44.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	1.3(S)	7.2(S)
		38.	8.								
		11.4(S)	1.8(S)								
2	50.	487.	370.	15.	340.	296.	280.	48.	47.	36.	34.
		4.1( )	2.7( )	.9( )	2.8( )	2.5( )	2.0( )	.8( )	.7( )	1.0( )	1.3( )
		8.	1.	214.	24.	12.	181.	168.	487.	370.	296.
		.3( )	.3( )	1.6( )	.7( )	.3( )	1.6( )	1.7( )	.0( )	.0( )	.0( )
		281.	47.	36.	14.	205.	24.	12.	168.	14.	40.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	1.2(S)	7.1(S)
		34.	8.								
		11.3(S)	1.7(S)								
2	55.	447.	340.	14.	312.	272.	257.	45.	44.	32.	31.
		3.9( )	2.6( )	.9( )	2.6( )	2.4( )	1.9( )	.7( )	.7( )	1.0( )	1.2( )
		8.	1.	195.	20.	10.	167.	155.	447.	340.	272.
		.3( )	.3( )	1.5( )	.7( )	.3( )	1.6( )	1.6( )	.0( )	.0( )	.0( )
		258.	44.	32.	12.	187.	20.	10.	155.	13.	36.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	1.1(S)	7.1(S)
		30.	8.								
		11.1(S)	1.7(S)								
3	0.	411.	313.	13.	287.	250.	236.	41.	41.	29.	28.
		3.8( )	2.5( )	.8( )	2.5( )	2.3( )	1.8( )	.7( )	.6( )	.9( )	1.2( )
		8.	1.	179.	17.	8.	154.	142.	411.	313.	250.
		.3( )	.2( )	1.4( )	.6( )	.3( )	1.5( )	1.6( )	.0( )	.0( )	.0( )
		237.	41.	29.	11.	172.	17.	8.	142.	12.	36.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	1.0(S)	7.1(S)
		27.	7.								
		11.0(S)	1.6(S)								
3	5.	378.	289.	12.	265.	230.	218.	39.	39.	26.	25.
		3.6( )	2.3( )	.8( )	2.4( )	2.2( )	1.7( )	.7( )	.6( )	.9( )	1.1( )
		8.	0.	164.	15.	7.	142.	131.	378.	289.	230.
		.3( )	.2( )	1.4( )	.5( )	.2( )	1.4( )	1.5( )	.0( )	.0( )	.0( )
		218.	39.	26.	10.	157.	15.	7.	131.	11.	36.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	1.0(S)	7.0(S)
		25.	7.								
		10.9(S)	1.6(S)								
3	10.	349.	267.	11.	244.	212.	202.	38.	38.	23.	22.
		3.5( )	2.2( )	.8( )	2.3( )	2.1( )	1.7( )	.7( )	.6( )	.8( )	1.1( )
		7.	0.	150.	13.	6.	131.	121.	349.	267.	212.
		.3( )	.2( )	1.3( )	.5( )	.2( )	1.4( )	1.4( )	.0( )	.0( )	.0( )
		202.	38.	23.	7.	144.	13.	6.	121.	10.	35.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.9(S)	6.9(S)
		22.	7.								
		10.8(S)	1.5(S)								
3	15.	323.	247.	10.	226.	197.	187.	37.	37.	21.	20.
		3.3( )	2.1( )	.7( )	2.2( )	2.0( )	1.6( )	.6( )	.6( )	.8( )	1.0( )
		7.	0.	138.	11.	5.	121.	111.	323.	247.	197.
		.3( )	.2( )	1.2( )	.5( )	.2( )	1.3( )	1.4( )	.0( )	.0( )	.0( )
		187.	37.	21.	7.	132.	11.	5.	111.	10.	35.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.8(S)	6.8(S)
		20.	7.								
		10.7(S)	1.5(S)								
3	20.	299.	229.	9.	210.	183.	174.	36.	36.	19.	18.
		3.2( )	2.1( )	.7( )	2.1( )	1.9( )	1.5( )	.6( )	.6( )	.7( )	.9( )
		7.	0.	127.	10.	4.	112.	103.	299.	229.	183.
		.3( )	.1( )	1.2( )	.4( )	.2( )	1.2( )	1.3( )	.0( )	.0( )	.0( )
		174.	36.	19.	7.	122.	10.	4.	103.	9.	35.
		.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.0( )	.8(S)	6.7(S)
		18.	7.								
		10.6(S)	1.4(S)								

3	25.	277. 3.1( )	212. 2.0( )	8. .7( )	195. 2.1( )	171. 1.8( )	163. 1.5( )	36. .6( )	36. .6( )	17. .7( )	16. .9( )
		7. .3( )	0. .1( )	117. 1.1( )	8. .4( )	4. .2( )	103. 1.2( )	94. 1.2( )	277. .0( )	212. .0( )	171. .0( )
		163. .0( )	36. .0( )	17. .0( )	7. .0( )	112. .0( )	8. .0( )	4. .0( )	94. .0( )	8. .7(S)	34. 6.6(S)
		16. 10.6(S)	7. 1.4(S)								
3	30.	258. 3.0( )	198. 1.9( )	8. .6( )	182. 2.0( )	160. 1.8( )	152. 1.4( )	35. .6( )	35. .6( )	15. .7( )	15. .9( )
		7. .3( )	0. .1( )	108. 1.1( )	7. .4( )	3. .2( )	95. 1.1( )	87. 1.2( )	258. .0( )	198. .0( )	160. .0( )
		152. .0( )	35. .0( )	15. .0( )	7. .0( )	103. .0( )	7. .0( )	3. .0( )	87. .0( )	8. .6(S)	34. 6.5(S)
		15. 10.5(S)	7. 1.3(S)								
3	35.	240. 2.9( )	185. 1.8( )	7. .6( )	170. 1.9( )	150. 1.7( )	143. 1.4( )	35. .6( )	35. .6( )	14. .6( )	14. .8( )
		7. .3( )	0. .1( )	99. 1.0( )	7. .3( )	3. .1( )	88. 1.1( )	80. 1.1( )	240. .0( )	185. .0( )	150. .0( )
		143. .0( )	35. .0( )	14. .0( )	7. .0( )	95. .0( )	7. .0( )	3. .0( )	80. .0( )	7. .6(S)	34. 6.4(S)
		13. 10.5(S)	7. 1.3(S)								
3	40.	224. 2.7( )	173. 1.8( )	7. .6( )	159. 1.9( )	140. 1.7( )	134. 1.3( )	34. .6( )	34. .6( )	13. .6( )	13. .8( )
		7. .3( )	0. .1( )	92. 1.0( )	6. .3( )	3. .1( )	81. 1.0( )	74. 1.1( )	224. .0( )	173. .0( )	140. .0( )
		134. .0( )	34. .0( )	13. .0( )	7. .0( )	87. .0( )	6. .0( )	3. .0( )	74. .0( )	6. .5(S)	33. 6.2(S)
		12. 10.4(S)	7. 1.2(S)								
3	45.	209. 2.7( )	162. 1.7( )	6. .6( )	149. 1.8( )	132. 1.6( )	126. 1.3( )	34. .6( )	34. .6( )	12. .6( )	12. .8( )
		7. .3( )	0. .1( )	84. .9( )	5. .3( )	2. .1( )	75. 1.0( )	68. 1.0( )	209. .0( )	162. .0( )	132. .0( )
		126. .0( )	34. .0( )	12. .0( )	7. .0( )	80. .0( )	5. .0( )	2. .0( )	68. .0( )	6. .5(S)	33. 6.1(S)
		12. 10.4(S)	7. 1.2(S)								
3	50.	196. 2.6( )	152. 1.6( )	6. .5( )	140. 1.7( )	124. 1.5( )	119. 1.2( )	33. .6( )	33. .6( )	11. .6( )	11. .7( )
		7. .3( )	0. .1( )	78. .9( )	5. .3( )	2. .1( )	70. .9( )	63. 1.0( )	196. .0( )	152. .0( )	124. .0( )
		119. .0( )	33. .0( )	11. .0( )	7. .0( )	74. .0( )	5. .0( )	2. .0( )	63. .0( )	5. .5(S)	32. 5.9(S)
		11. 10.4(S)	7. 1.1(S)								
3	55.	184. 2.5( )	143. 1.6( )	5. .5( )	132. 1.7( )	117. 1.5( )	112. 1.2( )	33. .6( )	33. .6( )	11. .5( )	10. .7( )
		7. .3( )	0. .1( )	72. .9( )	4. .3( )	2. .1( )	64. .9( )	58. .9( )	184. .0( )	143. .0( )	117. .0( )
		112. .0( )	33. .0( )	11. .0( )	7. .0( )	69. .0( )	4. .0( )	2. .0( )	58. .0( )	5. .4(S)	32. 5.8(S)
		10. 10.3(S)	7. 1.1(S)								
4	0.	173. 2.4( )	135. 1.5( )	5. .5( )	125. 1.6( )	110. 1.4( )	105. 1.1( )	33. .6( )	32. .5( )	10. .5( )	10. .7( )
		7. .3( )	0. .1( )	67. .8( )	4. .2( )	2. .1( )	59. .9( )	54. .9( )	173. .0( )	135. .0( )	110. .0( )
		106. .0( )	32. .0( )	10. .0( )	7. .0( )	63. .0( )	4. .0( )	2. .0( )	54. .0( )	5. .4(S)	31. 5.7(S)
		10. 10.3(S)	7. 1.0(S)								

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 4    5.    163.     127.      4.     118.     104.     100.      32.      32.       9.       9.
              2.3( )   1.5( )    .5( )   1.6( )   1.4( )   1.1( )    .6( )    .5( )    .5( )    .7( )

              7.       0.       62.       3.       2.      55.      49.     163.     127.     104.
               .3( )    .1( )    .8( )    .2( )    .1( )    .8( )    .9( )    .0( )    .0( )    .0( )

            100.      32.        9.       7.      58.       3.       2.      49.       4.      31.
               .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .4(S)   5.5(S)

              9.       6.
             10.3(S)   1.0(S)

 4   10.    153.     120.      4.     111.      99.      94.      32.      32.       9.       9.
              2.2( )   1.4( )    .5( )   1.5( )   1.4( )   1.1( )    .6( )    .5( )    .5( )    .7( )

              7.       0.       57.       3.       1.      51.      46.     153.     120.      99.
               .3( )    .1( )    .7( )    .2( )    .1( )    .8( )    .8( )    .0( )    .0( )    .0( )

             94.      32.        9.       7.      54.       3.       1.      46.       4.      30.
               .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .0( )    .3(S)   5.4(S)

              9.       6.
             10.3(S)    .9(S)
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ROBBINSDALE DRAINAGE BASIN DESIGN PLAN   FMG INC.   DECEMBER 1993
FUTURE HYDROLOGIC AND EXISTING HYDRAULIC CONDITIONS   100 YR STORM

*** PEAK FLOWS, STAGES AND STORAGES OF GUTTERS AND DETENSION DAMS ***

CONVEYANCE ELEMENT	PEAK (CFS)	STAGE (FT)	STORAGE (AC-FT)	TIME (HR/MIN)
203	11.	.1	2.8	1 10.
11	11.	.3		1 25.
106	181.	(DIRECT FLOW)		0 50.
202	70.	.1	12.6	1 50.
10	70.	2.0		1 50.
22	236.	1.9		1 0.
9	70.	1.4		1 50.
31	658.	3.6		1 10.
122	456.	(DIRECT FLOW)		0 50.
105	231.	(DIRECT FLOW)		0 35.
130	785.	(DIRECT FLOW)		1 5.
21	426.	3.4		1 0.
201	76.	.1	7.4	2 0.
30	778.	3.7		1 10.
121	584.	(DIRECT FLOW)		0 55.
8	72.	.9		2 10.
120	1313.	(DIRECT FLOW)		1 5.
104	568.	(DIRECT FLOW)		0 35.
20	1315.	4.2		1 5.
7	562.	3.1		0 35.
12	177.	3.4		0 45.
6	1557.	5.2		1 0.
103	1737.	(DIRECT FLOW)		0 55.
5	1737.	6.0		1 0.
200	61.	.1	4.0	1 5.
102	1934.	(DIRECT FLOW)		0 50.
3	61.	1.7		1 10.
4	1898.	6.3		1 0.
2	1951.	6.6		1 5.
101	2172.	(DIRECT FLOW)		1 0.
1	1925.	6.9		1 15.
100	2076.	(DIRECT FLOW)		1 15.
99	2076.	(DIRECT FLOW)		1 15.

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ENDPROGRAM   PROGRAM CALLED

□

APPENDIX E

HY8 ANALYSIS OF ELM STREET BRIDGE

CURRENT DATE: 10-28-1993 FILE DATE: 10-07-1993
CURRENT TIME: 08:54:04 FILE NAME: ROBBELM

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	100.00	99.75	48.00	1 RCB	24.00	5.70	.013	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: ROBBELM DATE: 10-07-1993

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
100.00	0	0	0	0	0	0	0	0	1
101.41	120	120	0	0	0	0	0	0	1
102.23	240	240	0	0	0	0	0	0	1
102.93	360	360	0	0	0	0	0	0	1
103.56	480	480	0	0	0	0	0	0	1
104.14	600	600	0	0	0	0	0	0	1
104.68	720	720	0	0	0	0	0	0	1
105.21	840	840	0	0	0	0	0	0	1
105.69	950	950	0	0	0	0	0	0	1
106.27	1080	1080	0	0	0	0	0	0	1
106.84	1200	1200	0	0	0	0	0	0	1
107.90	1402	1402	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: ROBBELM DATE: 10-07-1993

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
100.00	0.00	0	0	0.00
101.41	0.00	120	0	0.00
102.23	0.00	240	0	0.00
102.93	0.00	360	0	0.00
103.56	0.00	480	0	0.00
104.14	0.00	600	0	0.00
104.68	0.00	720	0	0.00
105.21	0.00	840	0	0.00
105.69	0.00	950	0	0.00
106.27	0.00	1080	0	0.00
106.84	0.00	1200	0	0.00

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

CURRENT DATE: 10-28-1993 FILE DATE: 10-07-1993
CURRENT TIME: 08:54:04 FILE NAME: ROBBELM

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PERFORMANCE CURVE FOR CULVERT # 1 - 1 (24 BY 5.7) RCB

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	100.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
120	101.41	1.41	1.41	1-S2n	0.73	0.92	6.46	0.77	4.82	0.79
240	102.23	2.23	2.23	1-S2n	1.16	1.46	8.14	1.23	6.23	1.19
360	102.93	2.93	2.93	1-S2n	1.48	1.92	9.25	1.62	7.21	1.51
480	103.56	3.56	3.56	1-S2n	1.79	2.32	10.10	1.98	7.98	1.79
600	104.14	4.14	4.14	1-S2n	2.06	2.69	10.80	2.31	8.62	2.04
720	104.68	4.68	4.68	1-S2n	2.32	3.04	11.42	2.63	9.18	2.27
840	105.21	5.21	5.21	1-S2n	2.56	3.37	11.96	2.93	9.67	2.48
950	105.69	5.69	5.69	1-S2n	2.78	3.66	12.41	3.19	10.08	2.67
1080	106.27	6.27	6.27	5-S2n	3.02	3.99	12.89	3.49	10.52	2.87
1200	106.84	6.84	6.84	5-S2n	3.23	4.28	13.31	3.76	10.89	3.05

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El. inlet face invert 100.00 ft El. outlet invert 99.75 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

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

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	100.00
OUTLET STATION (FT)	48.00
OUTLET ELEVATION (FT)	99.75
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0052
CULVERT LENGTH ALONG SLOPE (FT)	48.00

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

BARREL SHAPE	BOX
BARREL SPAN	24.00 FT
BARREL RISE	5.70 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (30-75 DEG. FLARE)
INLET DEPRESSION	NONE

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CURRENT DATE: 10-28-1993
CURRENT TIME: 08:54:04

FILE DATE: 10-07-1993
FILE NAME: ROBBELM

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDD TAILWATER DDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

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

BOTTOM WIDTH (FT)	30.00
SIDE SLOPE H/V (X:1)	2.0
CHANNEL SLOPE V/H (FT/FT)	0.025
MANNING'S N (.01-0.1)	0.040
CHANNEL INVERT ELEVATION (FT)	99.75
CULVERT NO.1 OUTLET INVERT ELEVATION	99.75 FT

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

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	99.75	0.000	0.00	0.00	0.00
120.00	100.54	0.956	0.79	4.82	1.23
240.00	100.94	1.006	1.19	6.23	1.86
360.00	101.26	1.033	1.51	7.21	2.36
480.00	101.54	1.050	1.79	7.98	2.79
600.00	101.79	1.063	2.04	8.62	3.19
720.00	102.02	1.073	2.27	9.18	3.54
840.00	102.23	1.081	2.48	9.67	3.88
960.00	102.42	1.087	2.67	10.08	4.16
1080.00	102.62	1.093	2.87	10.52	4.48
1200.00	102.80	1.098	3.05	10.89	4.76

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DDDDDDDDDDDDDDDDDDDDDDDDDD ROADWAY OVERTOPPING DATA DDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

WEIR COEFFICIENT	3.00
EMBANKMENT TOP WIDTH (FT)	3.00
CREST LENGTH (FT)	100.00
OVERTOPPING CREST ELEVATION (FT)	107.90

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