RIDGEVIEW SUB. MDDP – EASTERLY PORTION
– PDR. N.E. PORTION
– PHASE II SAND CREEK CHANNEL IMP'S

MASTER DEVELOPMENT DRAINAGE PLAN
AMENDMENT NO. II
FOR THE EASTERLY PORTION OF
RIDGEVIEW SUBDIVISION AND
PRELIMINARY DRAINAGE REPORT FOR
THE NORTHEASTERLY PORTION OF
RIDGEVIEW SUBDIVISION AND
PHASE II SAND CREEK CHANNEL
IMPROVEMENTS

J·R ENGINEERING
A Subsidiary of Westrian

J·R ENGINEERING
A Westrian Company

MASTER DEVELOPMENT DRAINAGE PLAN AMENDMENT NO. II FOR THE EASTERLY PORTION OF RIDGEVIEW SUBDIVISION AND PRELIMINARY DRAINAGE REPORT FOR THE NORTHEASTERLY PORTION OF RIDGEVIEW SUBDIVISION AND PHASE II SAND CREEK CHANNEL IMPROVEMENTS

February 2003
Revised February 2004
Revised August 2004
Revised September 2004

Prepared For:

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Job No. 9104.89

MASTER DEVELOPMENT DRAINAGE PLAN AMENDMENT NO. II
FOR THE EASTERLY PORTION OF RIDGEVIEW SUBDIVISION
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AND PHASE II SAND CREEK CHANNEL IMPROVEMENTS

J R ENGINEERING
A Westrian Company

DRAINAGE REPORT STATEMENT

ENGINEER'S STATEMENT:
The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

Mike A. Bramlett, Colorado P.E. # 32314
For and On Behalf of JR Engineering, LLC

10.6.04
Date

DEVELOPER'S STATEMENT:
I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

Business Name: Ridgeview Development

By:

Title: DEV. MNGR

Address: 102 South Tejon, Ste. 1100

Colorado Springs, CO 80905

CITY OF COLORADO SPRINGS ONLY:
Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

City Engineer

10.12.04
Date

Conditions: Approval of this M.D.D.P. is subject to Development Plan approval and the Stream Side Overlay Ordinance.

4310 ArrowsWest Drive, Colorado Springs, CO 80907
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MASTER DEVELOPMENT DRAINAGE PLAN AMENDMENT NO. II FOR THE EASTERLY PORTION OF RIDGEVIEW SUBDIVISION AND PRELIMINARY DRAINAGE REPORT FOR THE NORTHEASTERLY PORTION OF RIDGEVIEW SUBDIVISION AND PHASE II SAND CREEK CHANNEL IMPROVEMENTS

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BY KIOWA ENGINEERING CORPORATION, FEBRUARY 2002.

PRELIMINARY DESIGN OF DBPS BASIN 2 SAND CREEK DETENTION BASIN PLAN AND PROFILE BY KIOWA ENGINEERING CORPORATION, JULY 2004.

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INCLUDED SEPARATE:

M.D.D.P. – PRELIMINARY CONSTRUCTION PLANS,
PHASE II SAND CREEK CHANNEL IMPROVEMENTS
SHEETS 1 THROUGH 12

MASTER DEVELOPMENT DRAINAGE PLAN AMENDMENT NO. II FOR THE EASTERLY PORTION OF RIDGEVIEW SUBDIVISION AND PRELIMINARY DRAINAGE REPORT FOR THE NORTHEASTERLY PORTION OF RIDGEVIEW SUBDIVISION AND PHASE II SAND CREEK CHANNEL IMPROVEMENTS

PURPOSE

The purpose of this Master Development Drainage Plan (M.D.D.P.), Amendment No. II and Preliminary Drainage Report is to update portions of the previous M.D.D.P. titled "Master Development and Drainage Plan Amendment for the Easterly Portion of Ridgeview Subdivision and Preliminary Drainage Report for Ridgeview Assisted Living Development", approved December 27, 1999. This updated report identifies major drainage facilities in areas where little landuse and planning data was previously available, and estimates peak rates of stormwater runoff from on-site and off-site sources, and outlines, in concept, the necessary drainage improvements to safely convey stormwater runoff to adequate outfall facilities. This report also presents the latest design data and concepts for improvements to Sand Creek Phase II. Included in this report is updated construction cost data for the required major facilities. The concepts presented herein are intended to build on hydrology of the previous reports titled:

1) "Sand Creek Drainage Basin Planning Study, Preliminary Design Report, City of Colorado Springs, El Paso County," prepared by Kiowa Engineering Corporation, date of last revision March 1996.

2) "Master Development Drainage Plan for Ridgeview Subdivision," prepared by URS Greiner, Inc., October 23, 1998, (Ridgeview M.D.D.P.)

3) "Master Development and Drainage Plan Amendment for the Easterly Portion of Ridgeview Subdivision and Preliminary Drainage report for Ridgeview Assisted Living Development", prepared by JR Engineering, approved December 27, 1999.

While revising the drainage concepts to meet current development plans and environmental considerations.

GENERAL DESCRIPTION

The easterly portion of Ridgeview Subdivision lies along Sand Creek Reach SC-6 as defined in the above-referenced D.B.P.S., north of planned Stetson Hills Boulevard and east of Powers Boulevard. This Amendment addresses only Sand Creek and the area west of Sand Creek as indicated on the various maps and plans included in the Appendix of this report. For the purposes of this report, the study area has been divided into north and south portions. The division line for the north and south areas is along the south boundary of the proposed Dublin Boulevard from the west to the intersection with Shimmering Creek Drive, south along Shimmering Creek Drive to the existing outfall swale, and along the south side of the outfall swale to the Sand Creek Channel.

The area east of Sand Creek and north of proposed Dublin Boulevard included in the Ridgeview M.D.D.P. is currently planned to be a park and not addressed in this report except as related to channel improvements.

The area east of Sand Creek and south of proposed Dublin Boulevard included in the previous M.D.D.P. is addressed in a report titled " Final Drainage Report for Indigo Ranch at Ridgeview Filing Nos. 1 & 2" prepared by Classic Consulting Engineers & Surveyors, LLC, dated August 2001.

The drainage facilities for the southerly portion of the study area are, for the most part, constructed or under construction at this time. Thus, that portion of this study is primarily an inventory of the various drainage reports, constructed facilities and construction cost summaries.

Although the drainage concepts remain as outlined in the previous M.D.D.P. Amendment for the north portion of the study area, a detailed study to analyze and define drainage facilities for the current landuse and to address off site flows impacting the proposed development was needed.

The third area requiring a detailed review was Sand Creek Phase II Channel Improvements. At the time of the preparation of the previous M.D.D.P. Amendment, the alignments of the major arterials to include Dublin Boulevard were unknown. In addition, there was not a definite plan for the portion of the development north of Dublin Boulevard. As these unknowns were revealed, the resulting grading and drainage requirements impacted the proposed Sand Creek Phase II Channel Plans, requiring the lowering of the channel to provide proper drainage and balance of the site earth volumes. The resulting channel analysis and preliminary improvement plans are included with this report.

The Ridgeview Development site is located in eastern Colorado Springs, within Range 65 West, Township 13 South, Sections 17 and 18, and Range 66 West, Township 13 South, Section 13.

Soils in the study area as mapped by S.C.S. in "Soil Survey of El Paso County Area" are Blakeland Soil (8) Hydrologic Group A, and Blendon Soil (10) Hydrologic Group B, and a small area of Stapleton-Bernal (85) Hydrologic Group B and D respectively. A soils map exhibit is included in the Appendix of this report. Hydrologic Group B soil was assumed in determination of storm water runoff coefficients. The study area is presently vegetated with native grasses. Willows and cottonwoods are present in the southerly portions of Sand Creek Channel; see wetlands delineation for additional information.

EXISTING DRAINAGE CONDITIONS

Sand Creek flows through the study area from north to south. The northerly one-third of Sand Creek in the study area has a relatively narrow sinuous channel path. A narrow channel has incised 2' – 4' deep in the historic wider bed of this reach. The incision gives the channel a triangular cross section at the more narrow locations. This portion of the channel has very little vegetation, except for the very north end.

The southerly two-thirds of the Sand Creek channel on-site is less sinuous than the northerly portion and in general has a relatively flat wide trapezoidal section. The southerly one-third of the channel has considerable willow growth. Preliminary grading for Stetson Hills Boulevard created a pond and wetland area upstream of the Stetson Hills Boulevard crossing of Sand Creek. Since the previous M.D.D.P. Amendment, construction plans titled "Ridgeview-Sand Creek Channel Improvements, Construction Drawing-Phase I" have been prepared and approved by the City of Colorado Springs. Portions of the channel improvements near Stetson Hills Boulevard are under construction at this time.

A tributary finger projects northwest from the pond to the confluence of two tributaries, one flowing from off-site through the northwest corner of the site, the second paralleling the main Sand Creek channel on the west. This finger area contains wetlands. Development surrounding this area is near completion; note that the peninsula area between the tributary finger and the main channel is currently proposed to be a park area. Runoff discharge rates have been limited to this area as outlined in the previous M.D.D.P. Amendment.

Two significant drainages discharge to Sand Creek from the east, D.B.P.S. Basins 139 and 140. These areas are addressed in the above-referenced report titled "Final Drainage Report for Indigo Ranch at Ridgeview Filing Nos. 1 & 2" and are not discussed further in this report.

Portions of the Sand Creek Channel and the above-described tributary finger have been delineated as wetlands by a wetland biologist. Other portions of the Sand Creek Channel have been identified as "waters of the U.S." Waters of the U.S., including wetlands, comes under the jurisdiction of the U.S. Army Corps of Engineers (U.S. C.O.E.). A field verification of these U.S. Army Corps of Engineers jurisdictional areas has been done by Van Truan of the U.S. Army Corps of Engineers. Permit applications for development in the jurisdictional areas is an ongoing process with the U.S. Army Corps of Engineers.

PROPOSED DRAINAGE CHARACTERISTICS

As previously noted, Sand Creek has two distinct channel types in the study area. The north portion has little vegetation is narrow and sinuous. The south portion is a wide flat channel, with vegetation density increasing from the north transition to the southerly pond location. The issues with the southerly portion of the channel have been addressed in the referenced approved plans and improvements on the south end of the channel are under construction.

The different types of channel require different methods of treatment. The previously proposed treatment measures for the northerly portion included:

1) Regrading and stabilizing the existing channel with 4' high drop structures. The intent being to approximate the channel section prior to the incision of the historic bed with drop structures to reduce the channel gradient to between 0.5% and 1.0%. Selective bank treatment is also proposed.
2) New alignment and excavation of a new segment of channel to eliminate a segment containing two 90 degrees ± bends to standards outlined in (1) above.

Item 1) now includes the use of 2 foot vertical drop structures, sloping grouted boulder drop structures, a baffle chute drop structure, a check structure and selective bank treatment.

Item 2) is as previously stated.

M.D.D.P. Amendment No. II and the previous Amendment both vary from the referenced Ridgeview M.D.D.P. and Sand Creek D.B.P.S. in the manner that flows from the tributary reach segments 142 and 143 are treated. The M.D.D.P. Amendments are consistent with the previous M.D.D.P. with the proposed diversion of Reach 142 at Tributary Design Point 147 to Design Point 148 of the main channel. The D.B.P.S. proposes construction of new channels for Tributary Reach segments 142 and 143 at their existing locations. The previous M.D.D.P. proposes new channel sections for Reach 143.

Both the Ridgeview M.D.D.P. and D.B.P.S. directed flow from constructed channels through the Tributary Finger Reach Segment 136. However, with the increased significance of the wetlands contained in Reach 136 and the desire to maintain the wetlands area in present condition, it was determined that Q_{100} flows to the existing tributary channel should be limited to 300 cfs. As previously stated, this has been done.

The differences in drainage concepts between M.D.D.P. Amendment No. I and previous D.B.P.S. can be summarized as follows:

1) Open channel diversion of Tributary Design Point 147 to main Sand Creek channel Design Point 148 (consistent with referenced M.D.D.P.).
2) Diversion of off-site flows from Basin 142 to main channel Design Point 148.
3) Basin 146 divided, west portion flowing Basin 145 to Design Point 145, east portion added to Basin 142.
4) Collection of flows from Basin 145, Basin 146, and Basin 121 at Design Point 145 and conveyance to Design Point 142 main channel via reinforced concrete box culvert and open channel.
5) Basin 123 diverted to same channel noted in (4) above.
6) Basin 143 diverted to main channel by pipe storm drain through the proposed subdivision.
7) Basin 127 conveyed to the main channel pond by pipe storm drain through the proposed subdivision.
8) Basin 140 off-site from the east conveyed through the proposed subdivision by pipe storm drain to the main channel.
9) Basin 139 off-site, from the east conveyed through the proposed subdivision by pipe storm drain to the main channel. This drainage was omitted in the D.B.P.S.
10) Elimination of tributary channel reach segments 142 and 143 and related improvements, to be replaced with pipe storm drains and open channel diversions.

The proposed Sand Creek alignment and excavation of a new segment of channel, to eliminate a segment containing two 90°± bends, will create an oxbow. This oxbow channel is to remain in the natural/present condition. Some frequent flow subdivision runoff shall be directed to the oxbow to maintain/promote vegetative growth in the channel bottom.

Except for minor changes in the locations of proposed facilities these concepts have been applied in designed facilities and apply to the facilities presented in this Amendment except for minor changes in sub-basin boundaries, which have been accounted in the Rational Analysis presented in this report.

More specifically, for the purpose of estimating the required facilities to implement the above concepts, the drainage basins were divided into sub-basins and the means required to convey runoff from the sub-basins to the appropriate outfalls were outlined.

A land use map and hydrologic summary are included in the Appendix of this report. Note that the lot layouts indicated on the attached drainage maps are preliminary; therefore only major facilities are addressed herein. Final drainage reports shall address the final design of drainage swales, inlets, and storm drains.

DRAINAGE BASINS DESCRIPTIONS

For analysis, Basin 145 was divided into Off-Site Sub-Basins, OS 145-1 through OS 145-4 and on-site Sub-Basins 145-5, 145-6 and D1 through D3.

Sub-Basin OS145-1

Sub-Basin OS 145-1, 12.3 acres, Q_5 = 20 cfs, Q_{100} = 41 cfs, lies to the west of Ridgeview development. The developed condition land use is assumed to be single family residential. 3.6 DU/Ac. No site-specific grading plan is available for this basin. For the purpose of this report, it is assumed that the developed condition flows will be routed down a riprap rundown and captured in a proposed 30" R.C.P. storm drain and conveyed to DP-N2.

Sub-Basin OS145-2

Sub-Basin OS 145-2, 27.1 acres, Q_5 = 38 cfs, Q_{100} = 81 cfs, lies to the west of Ridgeview development. The developed condition land use is assumed to be single family residential and school site. The single-family residential density is assumed to be 2 DU/Ac, as the 5 to 10% existing ground slope is not conducive to higher density. It is assumed that runoff from this basin will be gathered in proposed Swale #3 and routed through the proposed subdivision in a 42" R.C.P. to DP-N2.

Sub-Basin OS145-3

Sub-Basin OS 145-3, 67.6 acres, Q_5 = 140 cfs, Q_{100} = 258 cfs, lies to the northwest of Ridgeview development. The assumed land uses are single family residential, 2 DU/Ac., commercial, and school site. It is assumed that runoff from the basin will be gathered in proposed Swale #1 and routed to DP-N1, the proposed 12' x 6' R.C.B. along Black Forest Road.

Sub-Basin OS145-4

Sub-Basin OS 145-4, 6 acres, Q_5 = 13 cfs, Q_{100} = 27 cfs, is a small off-site drainage basin directly north of the proposed Ridgeview Development. The assumed land use is a school site. For the purpose of this report, it was assumed that runoff from the basin will be collected in proposed Swale #1 and conveyed to DP-N1, the proposed 12' x 6' R.C.B. along Black Forest Road.

Sub-Basin 145-5

Sub-Basin 145-5, 15.2 acres, Q_5 = 25 cfs, Q_{100} = 51 cfs, is an on-site basin on the west side of the proposed development. The land use is single family residential, assumed 3.6 DU/Ac. It is assumed that runoff will be routed to sump inlets at DP-N2. The adjacent high point shall be only high enough to create a sump condition and allow overflow to continue east as indicated in the attached Drainage Plans. Note that plugged condition overflow easements shall be provided as shown on the Drainage Plans.

Sub-Basin 145-6

Sub-Basin 145-6, 26.2acres, $Q_5 = 42$ cfs, $Q_{100} = 84$ cfs, is an on-site basin east of proposed Black Forest Road. The land use is single family residential 3.6 DU/Ac. It is assumed that runoff will be routed to internal at-grade inlets and storm drains not addressed in this report and sump inlet(s) at DP-N3. Note that a plugged condition overflow to Black Forest Road shall be provided. Final grading shall reflect this requirement.

Sub-Basin OS146-1

Sub-Basin OS 146-1, 102.9 acres, $Q_5 = 149$ cfs, $Q_{100} = 279$ cfs, is an off-site basin north of the proposed development. Runoff from this basin currently flows in a natural drainage way to the intersection of proposed Black Forest Road and the northerly boundary of Ridgeview Subdivision. Interim grading shall be required to direct this flow into the proposed 9' wide by 6' high R.C.B. at DP-N1. The assumed land use for the developed basin is school site, ranchette, commercial and arterial street. For the purposes of this report, it is assumed that runoff from the basin will be conveyed to DP-N1, $Q_5 = 290$ cfs, $Q_{100} = 537$ cfs

Sub-Basin 146-2

Sub-Basin 146-2, 7.2 acres, $Q_5 = 20$ cfs, $Q_{100} = 39$ cfs, is an on-site basin consisting of the Black Forest Road (arterial) and adjacent open space. For the purpose of this report it is assumed that runoff from this basin will be conveyed in the street gutter to sump inlets near the intersection of proposed Dublin Boulevard.

Sub-Basin D-1

Sub-Basin D-1, 2.0 acres, $Q_5 = 4$ cfs, $Q_{100} = 7$ cfs, lies west of the proposed Ridgeview development and north of the proposed Dublin Boulevard right-of-way. The assumed land use is single family residential, 3.6 DU/Ac. For the purposes of this report, it is assumed that flow from this basin will be routed in the north flowline of proposed Dublin Boulevard.

Sub-Basin D-2

Sub-Basin D-2, 4.5 acres, $Q_5 = 14$ cfs, $Q_{100} = 27$ cfs, is the northerly one half of the proposed Dublin Boulevard west of the intersection with proposed Black Forest Road. The runoff from this sub-basin will be gathered in the north flow line of proposed Dublin Boulevard and conveyed from the proposed high point west of the proposed development east to proposed inlet(s) near the intersection with proposed Black Forest Road (DP-N13).

Sub-Basin D-3

Sub-Basin D-3, 3.3 acres, $Q_5 = 12$ cfs, $Q_{100} = 22$ cfs, is the southerly one half of the proposed Dublin Boulevard west of the intersection with Black Forest Road. Runoff will be conveyed from west to east in the street gutter to proposed inlets at DP-N14 near the intersection with proposed Black Forest Road.

Sub-Basin D-4

Sub-Basin D-4, 2.7 acres, $Q_5 = 9$ cfs, $Q_{100} = 17$ cfs, is the northerly one half of the proposed Dublin Boulevard east of Black Forest Road. It is proposed that runoff be routed to a sump inlet at DP-11. Note that a plugged flow condition overflow shall be provided south on Shimmering Creek Drive as indicated on the attached Drainage Plans.

Sub-Basin D-5

Sub-Basin D-5, 2.5 acres, $Q_5 = 8$ cfs, $Q_{100} = 16$ cfs, is the southerly one half of the proposed Dublin Boulevard right-of-way east of proposed Black Forest Road. It is proposed that runoff be routed to a sump inlet at DP-N12. Note that the same plugged condition overflow path as for Sub-Basin D-4 shall be provided.

Basin 121

Basin 121, 15.2 acres, $Q_5 = 26$ cfs, $Q_{100} = 52$ cfs, is an on-site basin east of Black Forest Road. Land use is single family residential 3.6 DU/Ac. Runoff is to be routed to sump inlets at DP-N4 and DP-N10. Note that high points indicated are intended to create sump inlets, while allowing plugged

condition flow to travel east in the street right-of-way and outfall to Sand Creek as indicated on the Drainage Plans.

Basin 122

Basin 122, 20.6 acres, $Q_5 = 34$ cfs, $Q_{100} = 69$ cfs, is an on-site basin west of Sand Creek. Land use is single family residential 3.6 DU/Ac. It is proposed that runoff from this basin be routed to the low point and sump inlets indicated on the drainage plans and that the plugged condition flows path be provided as shown. Note that the design of the proposed 42" outfall storm drain is critical based on the 100-year W.S.E. in Sand Creek; calculations are included in the Appendix of this report.

Basin 123

Basin 123, 13.8 acres, $Q_5 = 27$ cfs, $Q_{100} = 55$ cfs, is an on-site basin bounded by Sand Creek on the east, Dublin Boulevard on the north and Shimmering Creek Drive on the west. Note, a protective berm is proposed on the northwest corner of the site to direct plugged flow condition flows to Shimmering Creek Drive. This basin shall have its own outfall to the existing swale on the south side of the site, to be addressed in a Final Drainage Report.

PROPOSED ROUTING DESCRIPTION

Drainage Basins 145, 146, 121 And Sub-Basins D-1 Through D-5

It is proposed that on and off-site runoff from Drainage Basins 145 and 146, located in the area west of the study area, be collected and conveyed in proposed facilities to D.B.P.S. Design 145 in accordance with the concepts previously presented. For analysis, Basin 145 was divided into Off-site Sub-Basins OS 145-1 through OS 145-4 and On-site Sub-Basins 145-5, 145-6 and D1 through D3. Basin 146 was divided into Sub-Basins OS 146-1 and on-site Sub-Basin 146-2. These sub-basins are tributary to the proposed Black Forest R.C.B. The Rational Method was used to analyze the sub-basins and the results were compared to the previous TR20 basin analysis. All data sheets are included in the Appendix of this report.

It is proposed that runoff from Sub-Basin OS 145-1, 12.3 acres, Q_5 = 20 cfs, Q_{100} = 41 cfs be collected and conveyed in a proposed riprap run down to a proposed 30" R.C.P. storm drain in Sub-Basin 145-5, then conveyed to DP-N2 in the proposed 30" R.C.P. Design data sheets are included in the Appendix of this report. Note that a plugged condition flow path shall be provided as indicated on the Drainage Plans.

It is proposed that runoff from Sub-Basin OS 145-2, 27.1 acres, Q_5 = 38 cfs, Q_{100} = 81 cfs be collected in a proposed stone lined and earthen swale, Swale #3, along the westerly property boundary to the proposed 42" R.C.P. storm drain and conveyed in the proposed 42" R.C.P. to the junction with the proposed 30" R.C.P. storm drain in Sub-Basin 145-5 at DP-N2. The combined flow at DP-N2 is conveyed to DP-N3 in proposed 54" and 60" RCP. Design data sheets for the swale and storm drains are included in the Appendix of this report.

Note that plugged condition runoff overflow paths shall be provided for the off-site interception points. These paths shall be addressed in detail in Final Drainage Reports and Grading Plans.

At DP-N2 runoff from the proposed residential Sub-Basin 145-5, 15.2 acres, Q_5 = 25 cfs, Q_{100} = 51 cfs, is intercepted in proposed sump inlet(s) and combined with the flow in the proposed storm drain, the total flow at DP-N2, Q_5 = 82 cfs, Q_{100} = 170 cfs is then conveyed to DP-N3 in proposed 54" and 60" R.C.P. storm drain. Note that the intended high point is only high enough to create a sump condition, allowing plugged condition flow to overtop the high point and continue down the street right-of-way to DP-N3 as indicated on the attached drainage plans, final grading plans shall reflect this requirement.

At DP-N3 runoff from the proposed residential Sub-Basin 145-6, 26.2 acres, Q_5 = 42 cfs, Q_{100} = 84 cfs, is intercepted in proposed sump inlet(s), and lesser storm drains and combined with the flow in the proposed storm drain, the total flow at DP-N3, Q_5 = 115 cfs, Q_{100} = 235 cfs is then conveyed in a proposed 66" R.C.P. storm drain to DP-N6, the proposed 12' wide by 6' high R.C.B. Note that a plugged flow path is proposed from the DP-N3 location to proposed Black Forest Road, to be addressed in the Final Drainage Report and Grading Plans.

It is proposed that runoff from Sub-Basins OS 145-3, 67.6 acres, $Q_5 = 140$ cfs, $Q_{100} = 258$ cfs, OS 145-4, 6 acres, $Q_5 = 13$ cfs, $Q_{100} = 27$ cfs, and OS 146-1, 102.9 acres, $Q_5 = 149$ cfs, $Q_{100} = 279$ cfs, be collected in an earthen swale, Swale #1, and conveyed to DP-N1, $Q_5 = 290$ cfs, $Q_{100} = 537$ cfs, the proposed 9'x 6' R.C.B. The combined flow is then conveyed in the proposed R.C.B. south along proposed Black Forest Road to DP-N5. Design data sheets for the swale sections and R.C.B. storm drain are included in the Appendix of this report.

Note that the interim and final inlet condition at the proposed 12' x 6' R.C.B. shall be addressed in the Final Drainage Report based on both water quality and capacity. Provision shall be made in the final design of the R.C.B. for extension of a proposed large diameter storm drain north along proposed Black Forest Road.

Detailed storm drainage for the section of Black Forest Road in the study area shall be addressed in future Final Drainage Report(s) when the intersection locations, types and street design are known. The analysis shall address drainage of the super-elevation of the road surfaces and drainage at intersections. The intercepted flow from the required inlets shall be conveyed to the proposed RCB along Black Forest Road.

Storm water flow is conveyed from DP-N1 to DP-N5 where a proposed 30" R.C.P. outfall conveys runoff from DP-N4, one half of Sub-Basin 121, 15.2 acres, $Q_5 = 26$ cfs, $Q_{100} = 52$ cfs, to the proposed 12' x 6'R.C.B. Note that the intended high point DP-N4 is only high enough to create a sump condition, allowing plugged condition flow to overtop the high point and continue down the street right-of-way as indicated on the attached drainage plans, final grading plans shall reflect this requirement.

The proposed 12' x 6' R.C.B. conveys the combined flow to DP-N6 the junction with the proposed 66" R.C.P. from DP-N3. The combined flow is conveyed in the proposed 12' x 6' R.C.B. to DP-N7.

It should be noted that a portion of the runoff from the Black Forest Road Basin shall be intercepted by drainage inlets at intersections and transitions in super-elevation to be addressed in a future drainage report(s). For the purposes of this MDDP it is assumed that the total basin flow will enter the proposed storm drainage system at DP-N7. At DP-N7 runoff from the proposed from Black Forest Road Sub-Basin 146-2, 7.2 acres, $Q_5 = 20$ cfs, $Q_{100} = 39$ cfs, is intercepted in proposed sump inlets and conveyed to the proposed 12' x 6' R.C.B. in a proposed 30" R.C.P. storm drain, the total flow at DP-N7, $Q_5 = 408$ cfs, $Q_{100} = 774$ cfs is then conveyed to DP-N8.

At DP-N8 storm drains from the east and west along proposed Dublin Boulevard enter the proposed 12' x 6' high R.C.B. From the west it is assumed that the majority of runoff from Sub-Basins D-1, 2.0 acres, $Q_5 = 4$ cfs, $Q_{100} = 7$ cfs, and Sub-Basin D-2, 4.5 acres, $Q_5 = 14$cfs, $Q_{100} = 27$ cfs, and is intercepted by proposed at-grade inlet(s) at DP-N13, $Q_5 = 18$ cfs, $Q_{100} = 34$ cfs, and conveyed in a proposed 30" R.C.P. to DP-N14. Flow-by shall be conveyed to the proposed sump inlets in the Black Forest Road intersection in the street flowline. At DP-N14 it is proposed that the majority of runoff from Sub-Basin D-3, 3.3 acres, $Q_5 = 12$cfs, $Q_{100} = 22$ cfs, is intercepted by proposed at-grade inlet(s) and combined with the flow in the proposed 30" R.C.P. from DP-N13. The combined flow at DP-N14, $Q_5 = 29$cfs, $Q_{100} = 55$ cfs, is conveyed to DP-N8 in a proposed 36" R.C.P. The flow-by from DP-N14 will turn the corner into the westerly flow line of Shimmering Creek Road. Flow-by shall be kept to a minimum as no allowance was made for it in the drainage report for Shimmering Creek Drive. This shall be addressed in the Final Drainage Report for Dublin Boulevard.

It is proposed that runoff from Basin 121 and Sub-Basins D-4 and D-5 will enter the proposed RCB along Black Forest Road from the East. Final lot layouts and grading plans are not available at this time. For the purposes of this report it is assumed that approximately one half of the Basin 121 runoff will enter the proposed storm drainage system at DP-N4, DP-N5 as previously stated and the remaining portion shall inter the system at DP-N10, DP-N8. The final conditions shall be analyzed in future drainage reports.

More specifically, runoff from Sub-Basins D-4, D-5 and one half of Basin 121 enter the proposed 12' x 6' R.C.B. at DP-N8. The runoff from one half of Sub-Basin 121, 15.2 acres, $Q_5 = 26$ cfs,

Q_{100} = 52 cfs is proposed to be intercepted by proposed sump inlets at DP-N10. Note that the intended high point is only high enough to create a sump condition, allowing plugged condition flow to overtop the high point and continue down the street right-of-way as indicated on the attached drainage plans, final grading plans shall reflect this requirement. It is proposed that the intercepted flow at DP-N10 be conveyed to DP-N11 in a proposed 30" R.C.P. At DP-N11, it is proposed that runoff from Sub-Basin D-4, 2.7 acres, Q_5 = 9 cfs, Q_{100} = 17 cfs is intercepted by a sump-inlet and combined with the flow from DP-N10. The combined flow Q_5 = 20 cfs, Q_{100} = 39 cfs is conveyed to DP-N12 in a proposed 36" R.C.P. At DP-N12, it is proposed that runoff from Sub-Basin D-5, 2.5 acres, Q_5 = 8 cfs, Q_{100} = 16 cfs is intercepted by a sump-inlet and combined with the flow from DP-N11. The combined flow Q_5 = 27 cfs, Q_{100} = 50 cfs is conveyed to DP-N8, the proposed 12' x 6' R.C.B., in a proposed 36" R.C.P. These drainage issues shall be addressed in detail in final drainage report(s) for Black Forest Road and Dublin Boulevard to include inlet flow-bys and emergency overflow paths.

The combined flow at DP-N8, Q_5 = 450 cfs, Q_{100} = 851 cfs is conveyed in the proposed 12' x 6' R.C.B. to a proposed riprap splash pool and existing swale outfall to Sand Creek as shown on the Drainage Plans included in the appendix of this report.

HYDROLOGIC CALCULATIONS

TR-20 Sand Creek Basin Analysis

The following TR-20 analysis is presented from the previous M.D.D.P. Amendment No. I with comments added in parenthesis:

In order to analyze the effects that the proposed drainage concept will have on the peak flow rates in Sand Creek, a copy of the TR-20 models that were prepared for the 1996 Revision of Sand Creek D.B.P.S. were obtained and revised to reflect the current proposed conditions. The models for the "fully developed" and "existing" conditions were obtained through the City of Colorado Springs Engineering Division. The computer file for the existing condition model was found to be missing some data when obtained. This data was recreated for the upstream watershed, to the extent

possible, using a hard copy of the model as revised and published in the M.D.D.P. for Ridgeview Subdivision, by URS Greiner. The Sand Creek D.B.P.S. Technical Addendum does not contain a copy of the existing condition model.

The above-described "existing" condition model was revised to model the on-site area of this plan in the proposed "fully developed" condition. All other areas in the model were left in the "existing condition" as modeled for the D.B.P.S. The model was cut off at proposed Stetson Hills Boulevard as development has occurred downstream, thus the existing condition model does not reflect the current conditions there. Very little has changed in the watershed upstream of Stetson Hills Boulevard since the D.B.P.S. model was prepared. The purpose of including this model was to demonstrate the minimal effect that development of the on-site area will have on the peak flow rates in Sand Creek.

The D.B.P.S. developed condition model was also revised to model the on-site area of this plan in the proposed fully developed condition. As described earlier in this report, the most significant difference between the current on-site drainage plan and the plan for the on-site area as proposed in the D.B.P.S. is the location of runoff routing to Sand Creek.

Runoff curve numbers (R.C.N.), basin areas, time of concentration, and conveyance factors were adjusted to reflect the current proposed plan for the on-site area.

The proposed plan calls for the existing pond located north of proposed Stetson Hills Boulevard to remain with its pre-project water surface elevation. The routing effects of this pond were included in the models prepared for this report.

The modified existing and developed condition models were run to simulate both the 10-year and 100-year 24-hour rainfall events consistent with the D.B.P.S. modeling. Rainfall depths of 3.0" and 4.4" respectively were utilized for the 10-year and 100-year events.

A copy of the model input data files and summary tables generated by the models are included in the Appendix of this report. Also included in the Appendix are copies of spreadsheets used to calculate times of concentration, and runoff curve numbers, along with summary tables containing sub-basin data and data pertaining to the major analysis points of interest. Some hydrographs pertaining to major analysis points of interest along Sand Creek are also contained in the Appendix.

The above-mentioned summary tables and hydrographs contain flow data generated by both the original D.B.P.S. model and the current modified model for the developed condition. As one might expect the predicted peak flow rates in Sand Creek through the on-site area for the proposed developed condition are up to 25 percent higher than the flow rate predicted by the D.B.P.S. for the same condition. This is due to the elimination of the parallel channel located west of Sand Creek, and the addition of the flow from that channel further upstream than was previously proposed. The tables and graphs will demonstrate that the current predicted developed condition peak flow rate is only slightly (3.5%) above the D.B.P.S. predicted peak rate at Stetson Hills Boulevard. Downstream of this point the current predicted developed condition peak flow rate is less than the D.B.P.S. predicted peak rates due to changes in the timing of the peak brought about by the onsite changes and the modeling of the small Stetson Hills Pond as a detention Basin. (Although the net area of the pond flooding decreased slightly with the construction of the drop structures upstream of Stetson Hills Boulevard the effect on peak flow rates is insignificant, and far less than the margin of error in the analysis.)

The lack of data for the "existing condition" D.B.P.S. model throughout the on-site area prohibits comparison with the revised model. The predicted 100-year peak rate in Sand Creek at Stetson Hills Boulevard in the existing condition was reported in the D.B.P.S. as 3,230cfs. The revised model predicts 100-year flow rate at this location of 3,380cfs. The revised model condition is fully developed onsite, and the D.B.P.S. "existing condition" upstream. This increase is insignificant in a channel of this size.

It should be noted that the D.B.P.S. requires four (4) detention basins to be constructed in the upstream watershed near Woodmen Road to regulate flows as future development occurs. (These

basins are part of the assumed developed condition and thus are part of the developed condition model.)

Rational Method Basin Analysis

The individual basins were divided into sub-basins and analyzed using the rational method. It is noted that some of the basins and routed flows represented tributary areas larger than 100 acres, the normal limit for Rational Analysis. The purpose of the Rational Analysis is to estimate the sizes of the smaller facilities and bridge the gaps between the TR-20 data points. Since the results compared well with the TR-20 Analysis results, they are more than adequate for the level of design and estimating required for this report, particularly when the number of unknowns in the study area is considered.

Composite C values were estimated for each sub-basin based on land use, density, the City of Colorado Springs Drainage Criteria Manual and previous studies. Composite C value computation spread sheets are included in the Appendix of this report.

Storm water routings were done by the Rational Method using weighted "CA" coefficients of the sub-basins identified above and on the enclosed drainage map. Analysis spreadsheets and a summary of the stormwater routing flows are included in the Appendix of this report.

HYDRAULIC CALCULATIONS

Pipe diameters, reinforce concrete box culvert dimensions, and channel sections were estimated with Haestad Methods, Inc. FlowMaster v5.10 software using the Manning's Formula, pertinent data sheets are included in the Appendix of this report.

Street capacities were estimated using the City of Colorado Drainage Criteria manual graph of Discharge vs. Street Slope for residential ramp curb (34' flowline to flowline), and Flow Master v5.10 for irregular sections.

It should be noted that the information in this report is preliminary in nature and shall be analyzed thoroughly in future drainage reports, based on final grading and street plans, etc.

FLOODPLAIN STATEMENT

After approval of the Amendment No. 1 study, a Conditional Letter of Map Revision (CLOMR) application was prepared and submitted to FEMA for adjustment of the floodplain delineation in accordance with Sand Creek Channel Improvement Plans prepared at that time. The CLOMR request was approved based on the submittal information, FEMA Case No.: 00-08-2 dated September 21, 2000. Phase I Sand Creek improvement plans are within the intent of the CLOMR submittal, the minor changes will be documented in Letter of Map Revision submittal. The changes in the Phase II Sand Creek Channel improvement plans are significant to include the Dublin Boulevard crossing, considerable lowering of the proposed channel, minor changes in alignment, and reduction in the limit of upstream disturbance to lessen the impact on wetlands.

Preliminary Phase II Sand Creek Channel Improvement Plans have been included with this report to include preliminary 10, 100, 500 year floodplain limits. The floodplain limits are based on HEC-RAS analysis of the proposed channel using flow data from the above noted CLOMR submittal. The flow data closely matches both the FEMA, FIS flow data and the TR-20 analysis data. A copy of the preliminary HEC- RAS analysis and flow data summary sheet titled "Sand Creek Project Flow Rates" are included in the Appendix of this report.

These changes are being coordinated with the local flood plain administrator even through the original concepts have been followed. The end result shall be revision of the F.E.M.A. floodplain, as determined by Flood Insurance Rate Map Community Panel Number 80841C0537, effective March 17, 1997. Additional analysis of Sand Creek Channel is proposed to further define the channel improvements previously discussed and indicated on the preliminary plans included with this report.

CONSTRUCTION COST OPINION

Reimbursable Costs

The following are total reimbursable costs defined in the referenced Sand Creek D.B.P.S.

This data is from the D.B.P.S. Table XIII-2, "Drainage Conveyance Cost Estimate with Selected Alternatives," page 63.

MAIN CHANNEL SEGMENT NO.		TOTAL REIMBURSABLE COST
137	6 Grade Controls/ Selective Linings	$ 638,250
185	2 Grade Controls/ Selective Linings	$ 87,650
141	4 Grade Controls/ Selective Linings	$ 436,800
Partial 148-1		$ 30,700
	TOTAL	**$ 1,193,400**

The following data is from the D.B.P.S. Table VIII-3, "Tributary Drainage Conveyance Cost Estimate Sand Creek, Center Tributary and West Fork Sand Creek," page 72.

UPPER SAND CREEK TRIBUTARY SEGMENT NO.		TOTAL REIMBURSABLE COST
136 West Tributary	3 Grade Controls/ 100-YR Riprap Channel	$ 436,500
142 West Tributary	8 Grade Controls/ 100-YR Riprap Channel	$ 1,123,200
143 West Tributary	8 Grade Controls/ 100-YR Riprap Channel	$ 682,000
145 West Tributary	4 Grade Controls/ 100-YR Riprap Channel	$ 265,200
140 East Tributary	1 Grade Control / 100-YR Riprap Channel	$ 85,400
		$ 2,592,300
	TOTAL	**$ 3,785,700**

The following data is from the D.B.P.S. Table VIII-4, "Roadway Culvert Crossing Cost Estimate Sand Creek Basins," page 76.

REACH ROADWAY	DRAINAGEWAY NUMBER	CROSSING SEGMENT	REIMBURSABLE TYPE	COST
Jedediah Smith Rd.	SC-6	136	2-8'Hx10'W CBC	$ 90,000
Peterson Road	SC-6	140	6'Hx7'W CBC	$ 27,000
Dublin Boulevard	SC-6	142	6'Hx9'W CBC	$ 36,000
Jedediah Smith Rd.	SC-6	143	6'Hx10'W CBC	$ 31,200
Dublin Boulevard	SC-6	145	6'Hx10'W CBC	$ 46,800
			TOTAL	**$ 231,000**

The following data is from D.B.P.S. Table VIII-9, "Sand Creek Drainage Basin Planning Study, City Bridge Fee Calculation".

ROADWAY	CROSSING TYPE	1995 DBPS EST TOTAL COST	TOTAL CITY COST (1)	TOTAL REIMBURSABLE COST
Stetson Hills	3-8'HX10'W CBC	$ 222,000	$ 84,360	$ 137,640
Jedediah Smith Rd.	3-8'Hx10'W CBC	$ 66,600	$ 9,990	$ 56,610
Peterson Road	80' Clear Span Bridge	$ 512,000	$ 194,560	$ 317,440
Dublin Boulevard	80' Clear Span Bridge	$ 512,000	$ 194,560	$ 317,440
		$ 1,312,600	**$ 483,470**	**$ 829,130**

An exhibit map of the D.B.P.S. proposed improvement locations is included in the appendix of this report.

As previously discussed in the section "Proposed Drainage Characteristics," of this M.D.D.P., conceptual changes of drainage patterns from the previous D.B.P.S. are proposed. In addition, there are changes in the routing of both Jedediah Smith Road and Peterson Road that will require adjustments in fee calculations. The following estimates of probable construction costs have been prepared for the reimbursable improvements outlined in this M.D.D.P.

PROPOSED REIMBURSABLE IMPROVEMENTS AND ESTIMATED PROBABLE PROJECT COST

The probable project costs presented in the following analysis are based on year 2002 construction costs plus 15% for engineering and contingencies.

Sand Creek Main Channel Improvements

The proposed improvements include:

1) South portion of channel, Phase I Improvement, construction of grade control structures, selective bank treatment, low flow channel redirection, minor regrading, and a combination level control drop structure at the existing pond outlet. (See estimate of Probable Construction Cost in Appendix)

Total Estimated Probable Project Cost: $ 1,765,083

2) North end of main channel, Phase II Improvements, construction of drop structures, baffle chute drop structure check structure, widening of the channel bottom, placing of selective bank treatments, excavation of channel realignment, and lowering of the channel slope to between 0.5% and 1%. (See estimate of Probable Construction Cost in Appendix)

Total Estimated Probable Project Cost: $ 1,317,500

Main Channel Total Estimated Probable Project Cost $ 3,082,583

Note that the previous D.B.P.S. allotted $1,193,400 for the Phase I and II channel improvements The increase can be attributed to more extensive treatment proposed for the northerly (Phase II) section of the channel, which is sparsely vegetated, and in need of drop structures and grade stabilization, and in Phase I, the required level control/drop structure at the existing channel pond outlet.

Sand Creek Tributary Channel Improvements

1) Proposed open channel, north diversion, from TR20 Design Point 147 to main channel TR20 Design Point 148. Proposed channel bottom width is 18', with 3:1 side slopes.

Approximately 550 linear feet of channel, excavation, drop structure(s) and transition to the existing channel.

This concept is not included in the D.B.P.S. However, this improvement eliminates the need for channel improvements for tributary channel segment 142 indicated in the D.B.P.S. (See estimate of Probable Construction Cost in Appendix, Sheet PC#4, 1.)

Total Estimated Probable Project Cost: **$ 237,982**

2) Drainage Basin 142 proposed Swale#2 to collect and convey runoff from off-site Basin 142 to the Sand Creek Main channel via the proposed north diversion channel in 1) above.

This concept is not included in the D.B.P.S. However, as with Item 1 above this improvement helps eliminate the need for channel improvements to poorly defined tributary channel segments 142 and 143 outlined indicated in the D.B.P.S. (See estimate of Probable Construction Cost in Appendix)

Total Estimated Probable Project Cost: **$ 9,560**

3) Construction of facilities to intercept runoff at the perimeter of the proposed development and convey flows through TR20 Design Point 145 to the Sand Creek main channel estimated as follows:

Storm drainage Facilities, Basin 145, to include Swale #3, storm drain, riprap run down, 54", 60" and 66" R.C.P. storm drains. (See estimate of Probable Construction Cost in Appendix.)

Sub-Total Estimated Probable Project Cost: **$ 341,300**

Storm drainage Facilities, to include R.C.B. along Black Forest Road and Shimmering Creek Drive, wing walls, headwalls, riprap, excavation and backfill. (See estimate of Probable Construction Cost in Appendix.)

Sub-Total Estimated Probable Project Cost: **$ 1,335,323**

Construction of Swale #1 to divert flows to the proposed 12' x 6' R.C.B. along Black Forest Road. (See estimate of Probable Construction Cost in Appendix.)

Sub-Total Estimated Probable Project Cost: **$ 230,045**

This concept is not included in the D.B.P.S. However, as with Item 1 and 2 above, this improvement also diverts flow from the lower reaches of channel segments 142 and 143 outlined in the D.B.P.S.

Total Estimated Probable Project Cost: **$ 1,906,668**

4) Previously constructed southerly swale to divert flows in the west branch tributary to the main channel of Sand Creek. The swale was designed in conjunction with the temporary detention pond constructed with Filings 31 through 33. Estimated construction costs per the "Preliminary/Final Drainage Report For Ridgeview at Stetson Hills, Filings 31 Through 33" is $87,000 plus 15% for engineering and contingencies yields a probable project cost of $100,050.

Total Estimated Probable Project Cost: **$ 100,050**

5) Phase I, previously designed/constructed storm drain outfalls south of Dublin Boulevard to convey flows from M.D.D.P. Basins 124, 125, 126, 127, 128, and 143 to main and west branches of Sand Creek. These facilities are as designed in the approved final drainage reports for the various Filings. Reimbursable storm facilities were determined using the following criteria:

- Designed for 100-year event
- Regional facilities which provide outfall for multiple filings
- 48" diameter or larger

Total Estimated Probable Project Cost: **$ 829,391**

Tributary Channel Improvements:

Total Estimated Probable Project Cost: **$ 3,083,651**

In summary, the total reimbursable construction costs for the study area outlined in the D.B.P.S. are:

- **Sand Creek Main Channel: (Excludes box crossing at Dublin Boulevard) $ 3,082,583**
- **Tributary Improvements: $ 3,083,651**
- **Total Estimated Reimbursable Project Cost: $ 6,166,234**

Those facilities not included in the D.B.P.S. must be brought before the Drainage Board for consideration of cost reimbursement.

The construction cost estimates are based average construction costs for the 2002 construction season. JR Engineering, LLC cannot and does not guarantee that the construction cost will not vary from these opinions of probable construction costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular.

Sand Creek Bridge Reimbursable Construction Costs

As noted previously a 3-cell R.C.B. crossing is currently planned for the proposed Dublin Boulevard crossing of Sand Creek. An eighty-foot long clear span bridge was planned in the D.B.P.S.

It should be noted that the Jedediah Smith Road crossing of Sand Creek and Peterson Road Bridge have been eliminated from the D.B.P.S. original concept.

Proposed Dublin Crossing of Sand Creek

Proposed Dublin Boulevard crossing of Sand Creek, to include 3-cell R.C.B., headwalls, wing walls, retaining walls, and riprap splash pool. Note this replaces the proposed 80' clear span bridge included in the D.B.P.S. (See estimate of Probable Construction Cost in Appendix, sheets.)

Total Estimated Probable Project Cost: **$ 1,127,862**

Note that the D.B.P.S. allotted $512,000 of which $317,440 was considered reimbursable for this crossing.

The above differences in drainage facilities and associated construction costs should be brought before the Drainage Board for consideration of cost reimbursement and adjustment of basin fees.

JR Engineering, LLC cannot and does not guarantee that the construction cost will not vary from these opinions of probable construction costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular.

SAND CREEK D.B.P.S. DETENTION BASIN #2 AT SKYSOX STADIUM

Sand Creek Detention Basin number 2 is the northerly of the two ponds within the Springs Ranch development identified in the Sand Creek Drainage Basin Planning Study (D.B.P.S.). The detention basins are intended to decrease peak discharges to lower portions of Sand Creek. Sand Creek Pond #1 construction was completed in 2003 and construction of Pond #2 will be based upon reaching identified hydraulic milestones within the affected portions of the basin. An overview of previous analyses of the timing estimates for the construction of Sand Creek Detention Basin No. 2 as related to proposed development has been provided. Additionally, a revised cost estimate for the proposed land acquisition and construction of Pond #2 has been provided based upon a comparative analysis of the actual construction cost for Pond #1 and a preliminary design of Pond #2 provided by Kiowa Engineering (see appendix). Kiowa Engineering is currently updating both the hydrology and hydraulics of Pond #2 and intends to provide a preliminary design report detailing both anticipated timing and assumed construction cost.

Based upon the hydrology analysis prepared for the City of Colorado Springs by Kiowa Engineering Corporation, revised March 14, 2002, the condition triggering the need for the development of Pond #2 is reaching the bank full capacity for the channel into Detention Basin #1. An additional hydrologic model was compiled specifically to determine the development criteria meeting this condition. Portions of the basin development determined to be critical are located within the Ridgeview Subdivision. The report by Kiowa Engineering Corporation specifically identified D.B.P.S. basins 40 through 44, and 85, as "Threshold Development Basins"(see Threshold

Development Basins Map in appendix). These basins are located within northerly portions of the Ridgeview and Indigo Ranch Subdivisions. Currently these basins range from completely developed to master planned, but undeveloped (see appendix). Based upon the current level of development in the threshold basins, the five to seven year timeframe to full development noted in the Kiowa study appears reasonable. Construction of Pond #2 is likely to be required by the end of 2007.

The initial estimates in the D.B.P.S., which set the pond land and pond facilities fees, are based upon the generalization that the total cost for the pond, land acquisition and construction, would be equal to $10,000.00 per acre-ft of storage. Pond #2 as delineated in the D.B.P.S. is designed to detain 243 acre-ft, with a preliminary cost basis of $2,430,000.00. An update to the initial cost estimate for the purpose of establishing the Pond #2 surcharge, was provided in the original "Ridgeview Master Development Drainage Plan (M.D.D.P)", by URS Greiner in September 1998. This cost estimate based upon a contractor's preliminary bid determined the pond cost to be $2,273,423.00, and determined the original required surcharge to be $693.00 based upon a theoretical construction year of 2010 for Pond #2.

This report has provided an updated cost estimate for Pond #2 based upon newly available information; an updated Pond location and preliminary sketches of Pond #2, and actual construction costs for Pond #1 (constructed in 2003). The preliminary construction cost estimate for Pond #2 is $2,756,790.00 (see appendix). The preliminary land acquisition cost for Pond #2 is $784,591.00.

The basis for funding of Pond #2 was established in the URS Greiner M.D.D.P, dated October 23, 1998. The calculations provided in the M.D.D.P are based on assumptive rates of development both within the Ridgeview Development and general Sand Creek Basin for generating adequate fees for land acquisition and construction of Pond #2. The calculations also assumes that general basin pond land and pond facilities fees outside of the Ridgeview development are utilized for construction of Pond #1 prior to 2004, year 6 of the funding analysis, and are unavailable for construction of Pond #2. General pond land and pond facilities fees collected within the Ridgeview Subdivision were assumed held for construction of Pond #2 when required. This analysis was prepared in order to determine the "Additional Surcharge Fee for Pond #2" which has been collected on platted land within the Ridgeview Subdivision since Drainage Board acceptance.

The initial funding basis assumed that development within the Ridgeview Subdivision would be at a rate of approximately 47 acres per year through the year 2010, the target year for pond construction.

the appendix. Calculations within the appendix show that funding for pond construction would be available for the proposed 2007 construction based upon the following the URS Greiner M.D.D.P assumptions:

- General Pond Land and Facilities Fees collected from Ridgeview Subdivisions slated for Pond #2 construction were set-aside for that purpose.
- The Pond Surcharge proposed in the URS M.D.D.P was collected on land platted within the Ridgeview Subdivision from 1999 to the present.
- General Pond Land and Facilities Fees collected outside of the Ridgeview Subdivision would be available for Pond #2 construction starting in 2004.
- The provided cost estimate for both land acquisition and construction of Pond #2 as detailed in the appendix is viable.
- Projected development rates both inside the Ridgeview Subdivision and in the overall Sand Creek Basin are realized.

However, the assumption that general pond land and facilities fees paid within Ridgeview for the years 1999 through 2004 was not realized creating a projected shortfall of approximately $1,342,002 in the proposed construction year of 2007.

Currently Kiowa Engineering is updating the Drainage Basin Planning Study for Sand Creek and providing a more detailed design for pond #2. This proposed study will more accurately define the construction cost estimate for pond #2 and the required construction timeline. Based upon current development the 2002 Kiowa analysis theorizing construction of Pond #2 in 2007 appears reasonable. Pond #2 is likely to be required in 2007 and projected collected fees will not meet the projected construction cost at that time.

DRAINAGE, BRIDGE, AND POND FEES

The area within Sand Creek Basin is subject to the drainage, bridge, and pond fees. The following July 27, 2004 Revision to the 2004 Fee Schedule rates apply. Fees shall be posted prior to plat recordation.

Drainage Fees:	$7,448/acre
Bridge Fees:	$468/acre
Pond Fees:	

Actual platting within the Ridgeview Subdivision has exceeded the original estimation as detailed in the appendix. Calculations within the appendix show that funding for pond construction would be available for the proposed 2007 construction based upon the following the URS Greiner M.D.D.P assumptions:

- General Pond Land and Facilities Fees collected from Ridgeview Subdivisions slated for Pond #2 construction were set-aside for that purpose.
- The Pond Surcharge proposed in the URS M.D.D.P was collected on land platted within the Ridgeview Subdivision from 1999 to the present.
- General Pond Land and Facilities Fees collected outside of the Ridgeview Subdivision would be available for Pond #2 construction starting in 2004.
- The provided cost estimate for both land acquisition and construction of Pond #2 as detailed in the appendix is viable.
- Projected development rates both inside the Ridgeview Subdivision and in the overall Sand Creek Basin are realized.

However, the assumption that general pond land and facilities fees paid within Ridgeview for the years 1999 through 2004 was not realized creating a projected shortfall of approximately $1,329,910 in the proposed construction year of 2007.

Currently Kiowa Engineering is updating the Drainage Basin Planning Study for Sand Creek and providing a more detailed design for pond #2. This proposed study will more accurately define the construction cost estimate for pond #2 and the required construction timeline. Based upon current development the 2002 Kiowa analysis theorizing construction of Pond #2 in 2007 appears reasonable. Pond #2 is likely to be required in 2007 and projected collected fees will not meet the projected construction cost at that time.

DRAINAGE, BRIDGE, AND POND FEES

The area within Sand Creek Basin is subject to the drainage, bridge, and pond fees. The following July 27, 2004 Revision to the 2004 Fee Schedule rates apply. Fees shall be posted prior to plat recordation.

Drainage Fees:	$7,448/acre
Bridge Fees:	$454/acre
Pond Fees:	

Land:	$589/acre
Facilities:	$1,637/acre
Surcharge:	$820/acre

SUMMARY

Proper implementation of the concepts presented in this M.D.D.P. Amendment No. II will provide for the development of the proposed site without undue impacts to the receiving watercourse and surrounding developments.

The final location/routing of all stormwater conveyances shall result from final drainage reports. At that time, the necessary drainage easements, tracts or rights of way shall be defined.

The implementation and maintenance of the plugged flow drainage paths as outlined is of utmost importance for protecting of property in the case of either storm intensities greater than the design storm or plugged inlet(s). This shall be addressed in final drainage reports and plans.

The TR-20 analysis of Sand Creek modeling of the proposed drainage concepts presented in this M.D.D.P. predicted only a 3.5% increase over the D.B.P.S. model for the peak flow rate developed condition at Stetson Hills Boulevard. Sand Creek flow rates through the site will be increased due to diversion of the westerly tributaries upstream of their present confluence. The increased rates are reflected in the flow data used for the final design of proposed Sand Creek Channel improvements. The design flow rates are tabulated in the appendix of this report.

PREPARED BY:

JR Engineering

David L. Mijares, E.I.T.
Project Manager

/dlm/9104.89/reports/MDDP feb2003 rev aug 2004.doc

Land:	$586/acre
Facilities:	$1,637/acre
Surcharge:	$820/acre

SUMMARY

Proper implementation of the concepts presented in this M.D.D.P. Amendment No. II will provide for the development of the proposed site without undue impacts to the receiving watercourse and surrounding developments.

The final location/routing of all stormwater conveyances shall result from final drainage reports. At that time, the necessary drainage easements, tracts or rights of way shall be defined.

The implementation and maintenance of the plugged flow drainage paths as outlined is of utmost importance for protecting of property in the case of either storm intensities greater than the design storm or plugged inlet(s). This shall be addressed in final drainage reports and plans.

The TR-20 analysis of Sand Creek modeling of the proposed drainage concepts presented in this M.D.D.P. predicted only a 3.5% increase over the D.B.P.S. model for the peak flow rate developed condition at Stetson Hills Boulevard. Sand Creek flow rates through the site will be increased due to diversion of the westerly tributaries upstream of their present confluence. The increased rates are reflected in the flow data used for the final design of proposed Sand Creek Channel improvements. The design flow rates are tabulated in the appendix of this report.

PREPARED BY:

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David L. Mijares, E.I.T.
Project Manager

/dlm/9104.89/reports/MDDP feb2003 rev aug 2004.doc

REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual dated November 1991.

2. Soils Survey of El Paso County Area, Colorado Soil Conservation Service.

3. "Sand Creek Drainage Basin Planning Study Preliminary Design Report," KIOWA Engineering Corporation, dated March 1996.

4. "Master Development Drainage Plan For Ridgeveiw Subdivision," URS Greiner, Inc., dated October 23, 1998.

5. "Master Development and Drainage Plan Amendment for the Easterly Portion of Ridgeview Subdivision and Preliminary Drainage report for Ridgeview Assisted Living Development", prepared by JR Engineering, approved December 27, 1999.

6. CLOMR Application for a Portion of Sand Creek, (Sand Creek 2000 CLOMR/LOMR) and Submittal Plans and Data, prepared by JR Engineering, CLOMR approved by FEMA September 2002.

7. "Final Drainage Report For A Portion Of Ridgeview Sand Creek" prepared by JR Engineering, approved May 15, 2002.

8. Construction Plans Titled "Ridgeview-Sand Creek, Inline Pond Grade Control", sheets 1 thru 4, prepared by JR Engineering, approved May 3, 2002.

9. Construction Plans Titled "Ridgeview-Sand Creek, Channel Improvements, Phase 1", Sheets 1 thru 14, prepared by JR Engineering, approved May 20, 2002.

10. "Preliminary/Final Drainage Report for Ridgeview at Stetson Hills Filing No. 30" prepared by JR Engineering, approved March 22, 2001.

11. "Preliminary/Final Drainage Report for Ridgeview at Stetson Hills Filings 31 through 33" prepared by JR Engineering, approved October 31, 2001.

12. "Addendum to Preliminary/Final Drainage Report for Ridgeview at Stetson Hills Filings 31 through 33" prepared by JR Engineering, approved March 04, 2002.

13. "Preliminary/Final Drainage Report for Ridgeview at Stetson Hills Filing 34" prepared by JR Engineering, approved November 07, 2002.

14. "Preliminary Drainage Report for Ridgeview North Phase 1 (Villages A, B, and C)" prepared by JR Engineering, approved May 20, 2002.

15. "Final Drainage Report for Ridgeview at Stetson Hills Filings Nos. 21 and 22" prepared by JR Engineering, approved July 23, 2002.

16. "Final Drainage Report for Ridgeview North, Filing No. 20" prepared by JR Engineering, approved August, 2001.

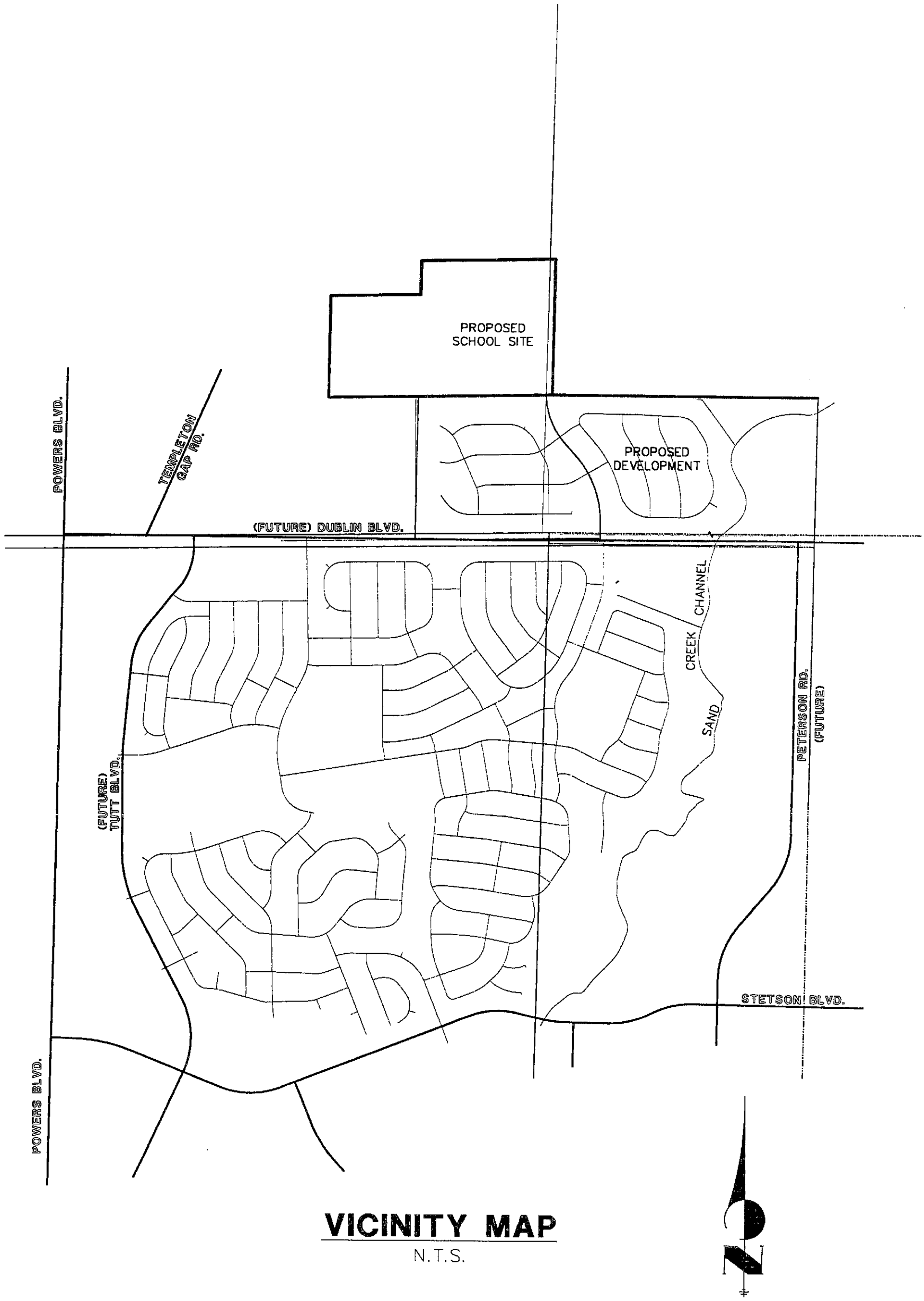
17. "Final Drainage Report for Indigo Ranch at Ridgeview Filing Nos. 1 & 2" prepared by Classic Consulting Engineers and Surveyors, dated August 2001.

18. "Sand Creek Hydrology Analysis Upper Sand Creek Basin Sand Creek Detention Basin No. 2", prepared by Kiowa Engineering Corporation, revised March 14, 2002.

19. "Sand Creek Detention Basin No. 1 Colorado Springs, CO", by Mallon Development Company, dated April 2, 2003.

APPENDIX

VICINITY MAP



VICINITY MAP

N.T.S.

JOB NO. 29104.90
12/23/02
SHEET 1 OF 1

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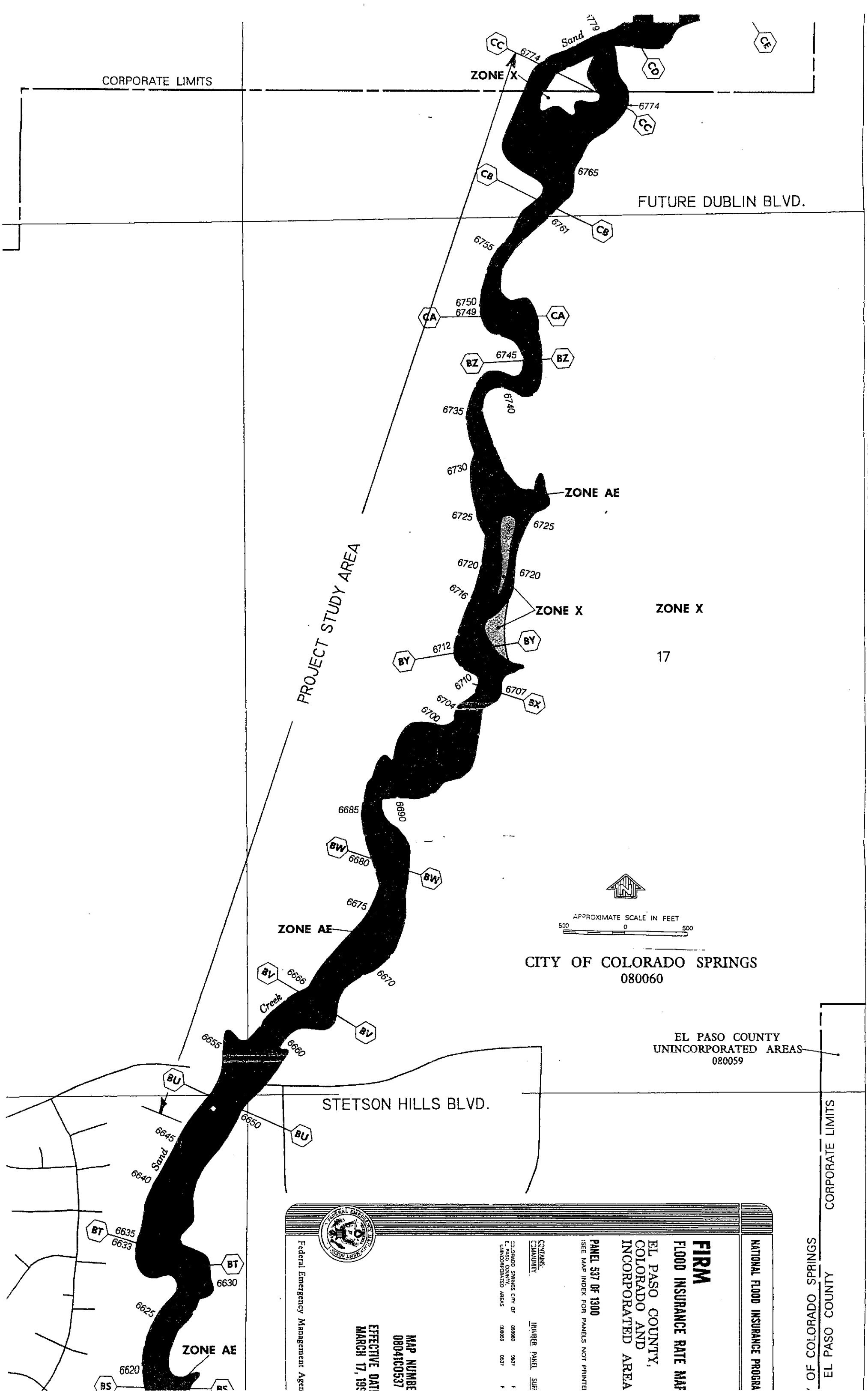
F. E. M. A. FLOODPLAIN MAP


CORPORATE LIMITS
FUTURE DUBLIN BLVD.
PROJECT STUDY AREA
STETSON HILLS BLVD.
Sand Creek
ZONE X
ZONE AE
ZONE X
ZONE X
ZONE AE
6779
6774
6774
6765
6761
6755
6750
6749
6745
6740
6735
6730
6725
6725
6720
6720
6716
6712
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6704
6700
6690
6685
6680
6675
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6666
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6655
6650
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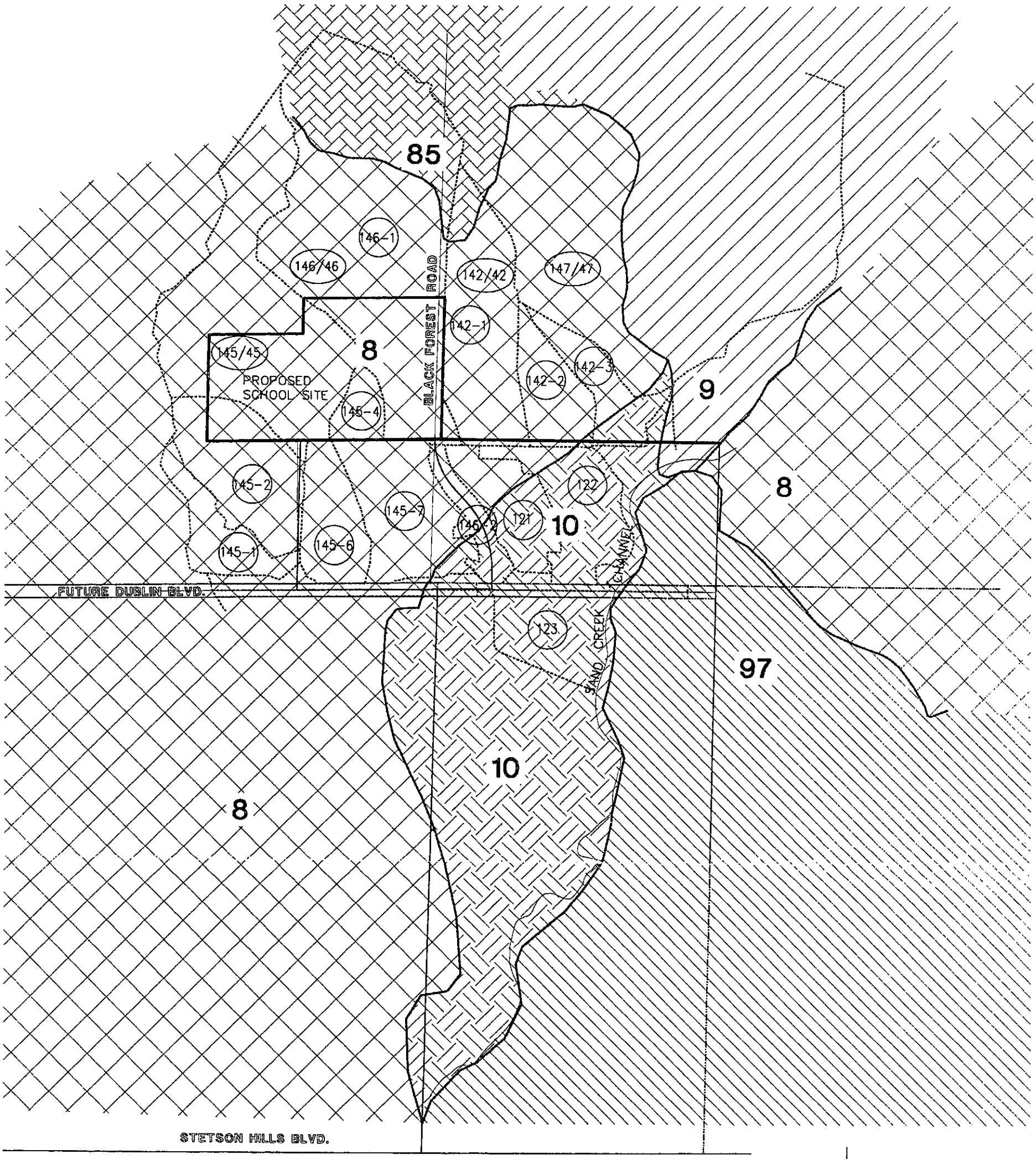
6640
6635
6633
6630
6625
6620
CA
CB
CC
CD
CE
BW
BX
BY
BZ
BS
BT
BU
BV
APPROXIMATE SCALE IN FEET
500 0 500
CITY OF COLORADO SPRINGS
080060
EL PASO COUNTY
UNINCORPORATED AREAS
080059
JOINS PANEL 0545
CORPORATE LIMITS
CITY OF COLORADO SPRINGS
EL PASO COUNTY
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS
PANEL 537 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
COLORADO SPRINGS, CITY OF 080060 0537 F
EL PASO COUNTY, UNINCORPORATED AREAS 080059 0537 F
MAP NUMBER
08041C0537 F
EFFECTIVE DATE
MARCH 17, 1997
Federal Emergency Management Agency
17

SOIL MAP



LEGEND:

8	BLAKELAND LOAMY SAND "A"
9	BLAKELAND COMPLEX "A"
10	BLENDON SANDY LOAM "B"
85	STAPLETON– "B", BERNAL SANDY LOAM "D"
97	TRUCKTON SANDY LOAM "B"
----------	DRAINAGE BASIN BOUNDARY
————	SOIL TYPE BOUNDARY
145-6	DRAINAGE BASIN LABELS

1000 500 0 1000 2000

SCALE: 1" = 1000'

SOURCE:

"SHEET NO. 9 OF 37
EL PASO COUNTY, AREA
COLORADO," USDA, SOIL
CONSERVATION SERVICE.

SOILS TYPES
RIDGEVIEW MDDP
AMENDMENT NO. II
JOB NO. 29104.90
12/23/02
SHEET 1 OF 1

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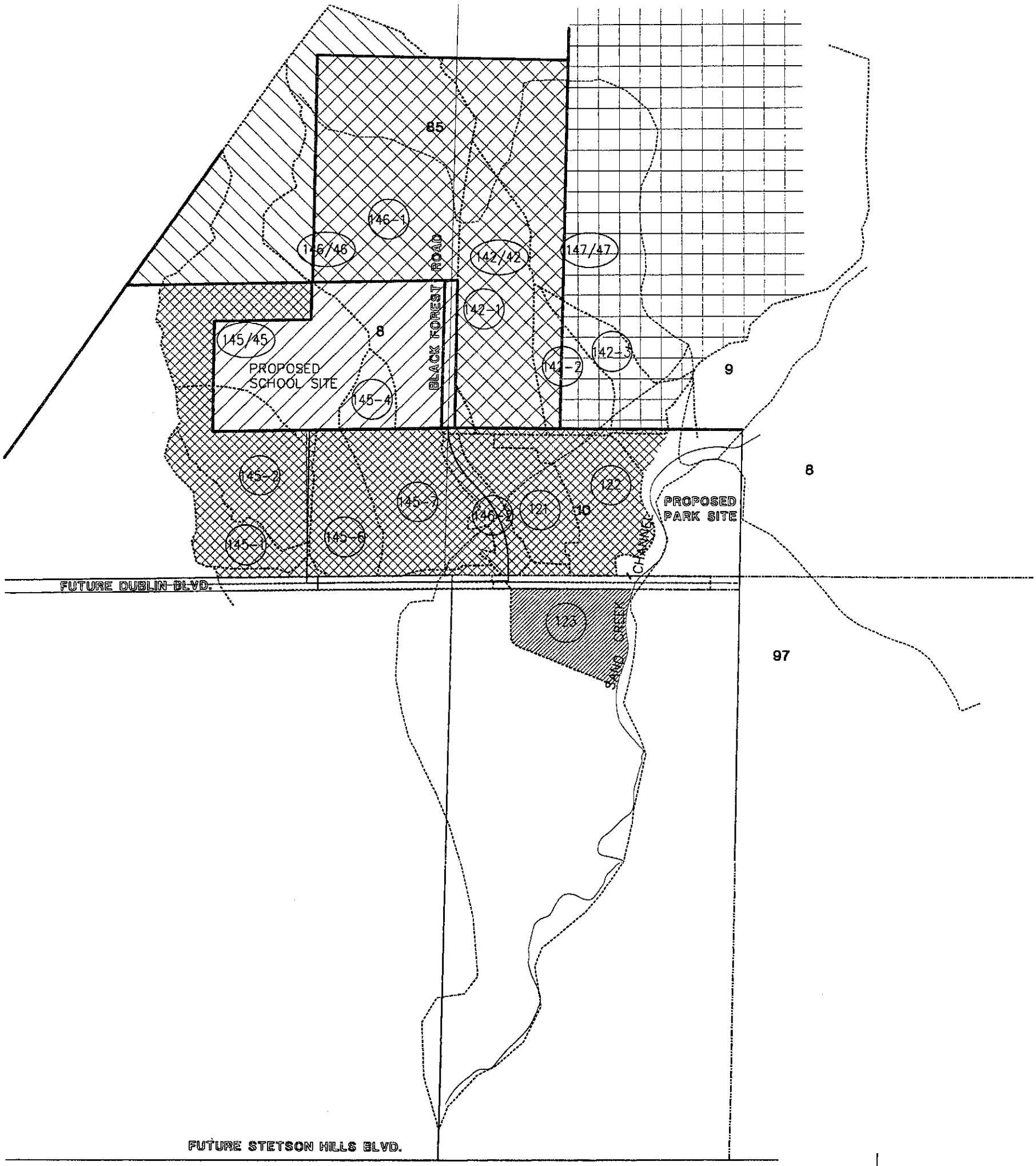
LAND USE MAP



LEGEND:

8	BLAKELAND LOAMY SAND "A"
9	BLAKELAND COMPLEX "A"
10	BLENDON SANDY LOAM "B"
85	STAPLETON– "B", BERNAL SANDY LOAM "D"
97	TRUCKTON SANDY LOAM "B"
----------	DRAINAGE BASIN BOUNDARY
----------	SOIL TYPE BOUNDARY
(145-6)	DRAINAGE BASIN LABELS
	LARGE LOT RESIDENTIAL
	SINGLE FAMILY RESIDENTIAL
	SCHOOL SITE
	RANCHETTE
	MULTI FAMILY RESIDENTIAL

SOURCE:

(1) FIG. II–3, SAND CREEK BASIN PLANNING STUDY PREPARED BY KIOWA ENGINEERING CORPORATION.

(1) SCHOOL SITE, BASIN 123 MULTI–FAMILY RESIDENTIAL UPDATED BY JR ENGINEERING

1000 500 0 1000 2000

SCALE: 1" = 1000'

LAND USE
RIDGEVIEW MDDP
AMENDMENT NO II
JOB NO. 29104.90
12/23/02
SHEET 1 OF 1

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HYDROLOGIC CALCULATIONS
TR-20 SAND CREEK BASIN ANALYSIS

TABLE – MAJOR DESIGN POINT DATA SUMMARY
DEVELOPED CONDITION D.B.P.S. MODEL
ON-SITE DEVELOPED CONDITION

TABLE – MAJOR DESIGN POINT DATA SUMMARY
EXISTING CONDITION D.B.P.S. MODEL
ON-SITE DEVELOPED CONDITION

TABLE – SUB-BASIN DATA SUMMARY
DEVELOPED CONDITION D.B.P.S. MODEL
ON-SITE DEVELOPED CONDITION

TABLE – SUB-BASIN DATA SUMMARY
EXISTING CONDITION D.B.P.S. MODEL
ON-SITE DEVELOPED CONDITION

TABLE – TR-20 TIME OF CONCENTRATION ESTIMATE
HYDROGRAPH – D.B.P.S. SECTION 37
HYDROGRAPH – D.B.P.S. SECTION 48
HYDROGRAPH – D.B.P.S. SECTION 20
TR-20 ROUTING SECTION 143
TR-20 ROUTING SECTION 141
TR-20 ROUTING SECTION 137, 185, 186
TR-20 INPUT & OUTPUT DATA FILES

EAST PORTION OF RIDGEVIEW

TR-20 ANALYSIS

UPPER SAND CREEK DEVELOPED CONDITION DBPS MODEL
REVISED TO REFLECT PROPOSED ONSITE CONDITION

MAJOR DESIGN POINT DATA SUMMARY

5/25/99

DESIGN POINT		DRAINAGE AREA (mi^2)		100 YEAR TIME OF PEAK (hrs)		100 YEAR PEAK FLOW (cfs)	
DBPS	CURRENT	DBPS	CURRENT	DBPS	CURRENT	DBPS	CURRENT
45	145	0.47	0.47	6.09	6.08	841	853****
47	147	1.55	1.62	6.2	6.19	539	644
48	148	6.75	8.37	7.18	7.17	2477	2633
	142		8.96		7.24		2698
41	141	7.13	9.31	7.27	7.23	2524	2759
85	185	7.33	9.74	7.26	6.18	2545	3381
37	137	9.98	10.04	6.2	6.27	3268	3600
	91*		10.04		6.37		3384
29	29**	10.86	10.89	6.29	6.5	3710	3690
30	30**	12.19	12.16	6.22	6.37	6105	5251
25	25**	12.61	12.58	6.16	6.17	6654	5439
20	20**	13.51	13.48	6.09	6.08	8536	7367
98	98**	13.51	13.48	6.53	6.64	4883	4577
13	13**	14.5	14.47	6.63	6.75	5070	4722
99	99** ***	16.04	16.01	6.24	6.24	3666	3580

* This point represents the outflow from the small pond @ Stetson Hills Boulevard/ flow under Stetson Hills in the current model. It is equivalent in location to point 37 in the DBPS model.

** This analysis point is downstream of the site

*** Downstream limit of DBPS model for Upper Sand Creek

****This flow rate was calculated in the context of the overall Upper sand Creek Drainage Basin An independent runoff analysis of the watershed contributing to this point should be performed prior to the design of downstream conveyance facilities.

EAST PORTION OF RIDGEVIEW

TR-20 ANALYSIS

UPPER SAND CREEK EXISTING CONDITION DBPS MODEL
REVISED TO REFLECT DEVELOPED ONSITE CONDITION

MAJOR DESIGN POINT DATA SUMMARY

5/25/99

DESIGN POINT		DRAINAGE AREA (mi^2)		100 YR TIME OF PEAK (hrs)		100 YR PEAK FLOW (cfs)	
DBPS	CURRENT	DBPS	CURRENT	DBPS	CURRENT	DBPS	CURRENT
45	145	**	0.47	**	6.17	**	430
47	147	**	1.62	**	6.31	**	661
48	148	**	8.37	**	6.90	**	3134
42	142	**	8.96	**	6.89	**	3239
41	141	**	9.31	**	6.88	**	3303
85	185	**	9.74	**	6.87	**	3406
37	137	**	10.04	**	6.97	**	3430
	91*	10***	10.04	**	7.05	3230***	3380

* This point represents the outflow from the small pond @ Stetson Hills Boulevard/ flow under Stetson Hills in the current model. It is equivalent in location to point 37 in the DBPS model.

** Data not found. The existing condition model output is not included in the Sand Creek DBPS Technical Addendum. A copy of the computer model on disk was received but a portion of the data was corrupt.

*** Data taken from Sand Creek DBPS Table III-2

NOTE: The flow rates listed as "current" reflect a condition in which the offsite watershed is in the "existing condition" as analyzed for the Sand Creek DBPS and the on-site area is fully developed per the current plan.

EAST PORTION OF RIDGEVIEW

PRELIMINARY TR-20 ANALYSIS

UPPER SAND CREEK DEVELOPED CONDITION DBPS MODEL REVISED TO REFLECT PROPOSED ONSITE CONDITION

SUB-BASIN DATA SUMMARY

5/25/99

BASIN I.D.	AREA		TC *	RCN	PEAK RUNOFF (cfs)	
	(acres)	(sq-miles)	(hrs)		Q_{10}	Q_{100}
121	32	0.05	0.4	76	34	73
122	19	0.03	0.36	76	22	46
123	26	0.04	0.35	81	39	76
124	13	0.02	0.41	81	18	35
125	19	0.03	0.46	80	24	48
126	51	0.08	0.45	79	62	125
127	47	0.07	0.39	82	69	132
128	26	0.04	0.39	75	26	56
137	70	0.11	0.44	80	91	180
139	96	0.15	0.63	84	124	233
140	211	0.33	0.65	79	196	406
141	32	0.05	0.42	67	16	45
142	38	0.06	0.53	81	47	93
143	160	0.25	0.43	82	235	450
145	154	0.24	0.32	86	321	567
146	115	0.18	0.45	75	107	235

* The methodology used to calculate times of concentration (TC) for this analysis was utilized in order to produce TCs similar to those utilized in the Upper Sand Creek Drainage Basin Planning Study Model.

EAST PORTION OF RIDGEVIEW

PRELIMINARY TR-20 ANALYSIS

UPPER SAND CREEK EXISTING CONDITION DBPS MODEL REVISED TO REFLECT DEVELOPED ONSITE CONDITION

SUB-BASIN DATA SUMMARY

5/25/99

BASIN I.D.	AREA		TC *	RCN	PEAK RUNOFF (cfs)	
	(acres)	(sq-miles)	(hrs)		Q_{10}	Q_{100}
121	32	0.05	0.40	76	34	73
122	19	0.03	0.36	76	22	46
123	26	0.04	0.35	81	39	76
124	13	0.02	0.41	81	18	35
125	19	0.03	0.46	80	24	48
126	51	0.08	0.45	79	62	125
127	45	0.07	0.39	82	69	132
128	26	0.04	0.39	75	26	56
137	70	0.11	0.44	80	91	180
139**	96	0.15	0.63	76**	75	165
140**	211	0.33	0.65	64**	55	178
141	32	0.05	0.42	67	16	45
142**	38	0.06	0.53	60**	7	29
143	160	0.25	0.43	82	235	450
145**	154	0.24	0.50	72**	106	255
146**	115	0.18	0.48	62**	30	106

* The methodology used to calculate times of concentration (TC) for this analysis was utilized in order to produce TCs similar to those utilized in the Upper Sand Creek Drainage Basin Planning Study Model.

** Sub-basin is all or partially outside of the on-site area. RCN is based on a weighted average of the on-site developed area and the off-site undeveloped propoerty.

RIDGEVIEW
MASTER DEVELOPMENT DRAINAGE PLAN

FULLY DEVELOPED CONDITION TIME OF CONCENTRATION ESTIMATE

5/18/99

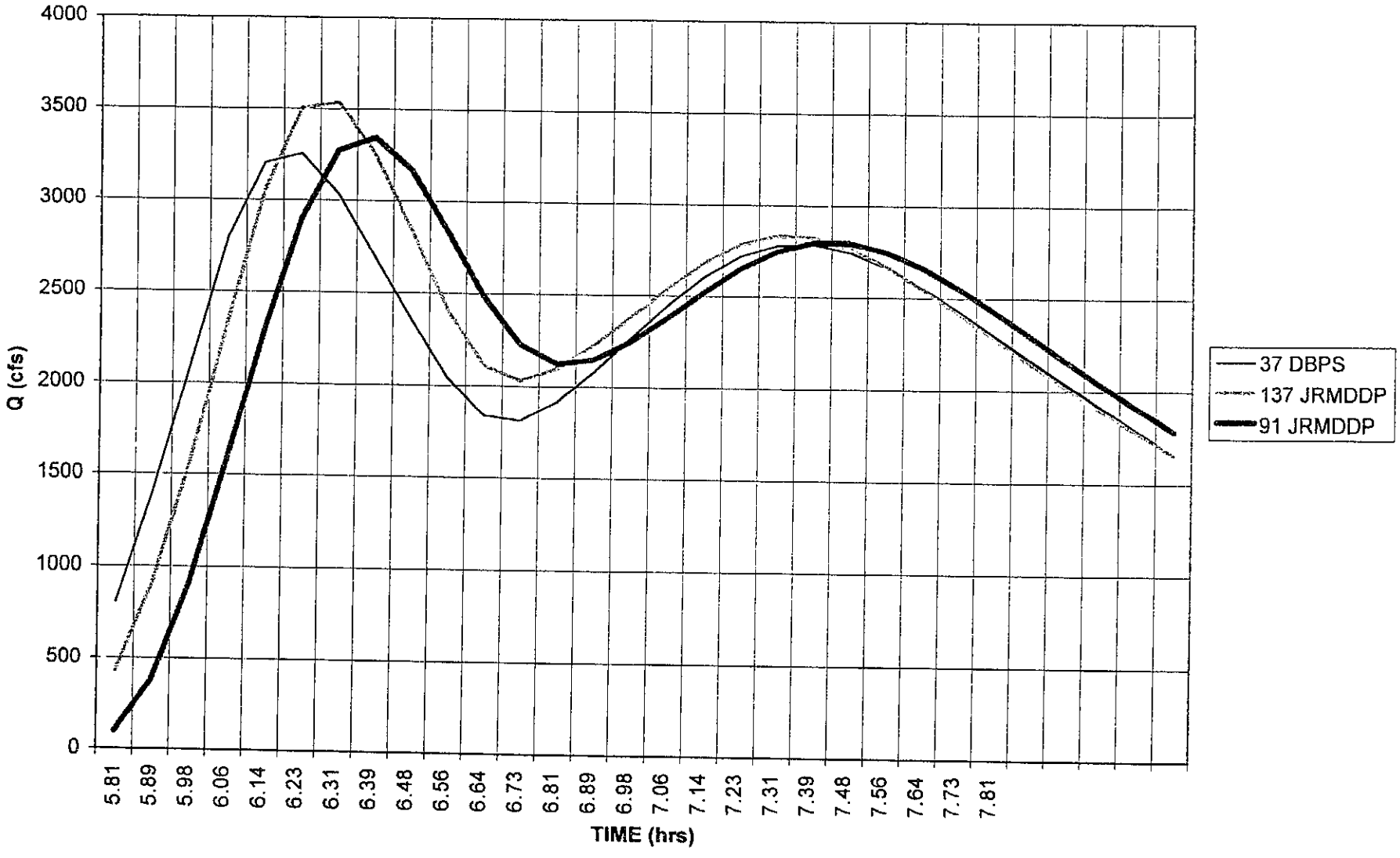
BASIN	OVERLAND FLOW					SWALE OR STREET FLOW					CHANNEL OR S.D. FLOW					TOTAL	TOTAL
ID.	L (ft)	P_2	n	S (ft/ft)	TC(min)	TYPE	L (ft)	S (%)	V (fps)	TC(min)	TYPE	L (ft)	S(%)	V (fps)	TC(min)	TC(min)	TC(hrs.)
121	90	2	0.24	0.02	16.59	ST	1300	2	2.9	7.47					0.00	24.06	0.40
122	90	2	0.24	0.02	16.59	ST	1000	2.5	3.2	5.21					0.00	21.80	0.36
123	90	2	0.24	0.02	16.59	ST	300	3	3.5	1.43	CH	1700	1	10	2.83	20.85	0.35
124	90	2	0.24	0.02	16.59	ST	950	1	2.1	7.54	SD	350	1	10	0.58	24.71	0.41
125	90	2	0.24	0.02	16.59	ST	1300	1	2.1	10.32	SD	300	1	10	0.50	27.41	0.46
126	90	2	0.24	0.02	16.59	ST	1850	2.2	3.0	10.28	SD	200	2	12	0.28	27.15	0.45
127	90	2	0.24	0.02	16.59	ST	1100	4.0	4.1	4.47	SD	1490	1	11.0	2.26	23.32	0.39
128	90	2	0.24	0.02	16.59	ST	1750	1.8	4.4	6.63	SD	250	1	11	0.38	23.60	0.39
137	90	2	0.24	0.02	16.59	ST	1200	1	2.1	9.52	SD	300	1	11	0.45	26.57	0.44
139	90	2	0.24	0.02	16.59	ST	2800	1.3	2.4	19.44	SD	1250	1	11	1.89	37.93	0.63
140	90	2	0.24	0.02	16.59	ST	2600	1	2.1	20.63	SD	1300	1	11	1.97	39.20	0.65
141	90	2	0.24	0.02	16.59	ST	1500	2	2.9	8.62					0.00	25.21	0.42
142	90	2	0.24	0.02	16.59	ST	3500	4	4.1	14.23	CH	700	1	10	1.17	31.99	0.53
143	90	2	0.24	0.02	16.59	ST	1600	4	4.1	6.50	SD	1800	1	10	3.00	26.10	0.43
145	50	2	0.24	0.02	10.37	ST	1400	4	4.1	5.69	SD	3300	4	18	3.06	19.11	0.32
146	90	2	0.24	0.02	16.59	ST	1500	3	3.5	7.14	SD	3500	4	18	3.24	26.98	0.45

SHEET FLOW $Tt=0.007(NL)^{0.8}/(P2)^{0.5}S^{0.4}$

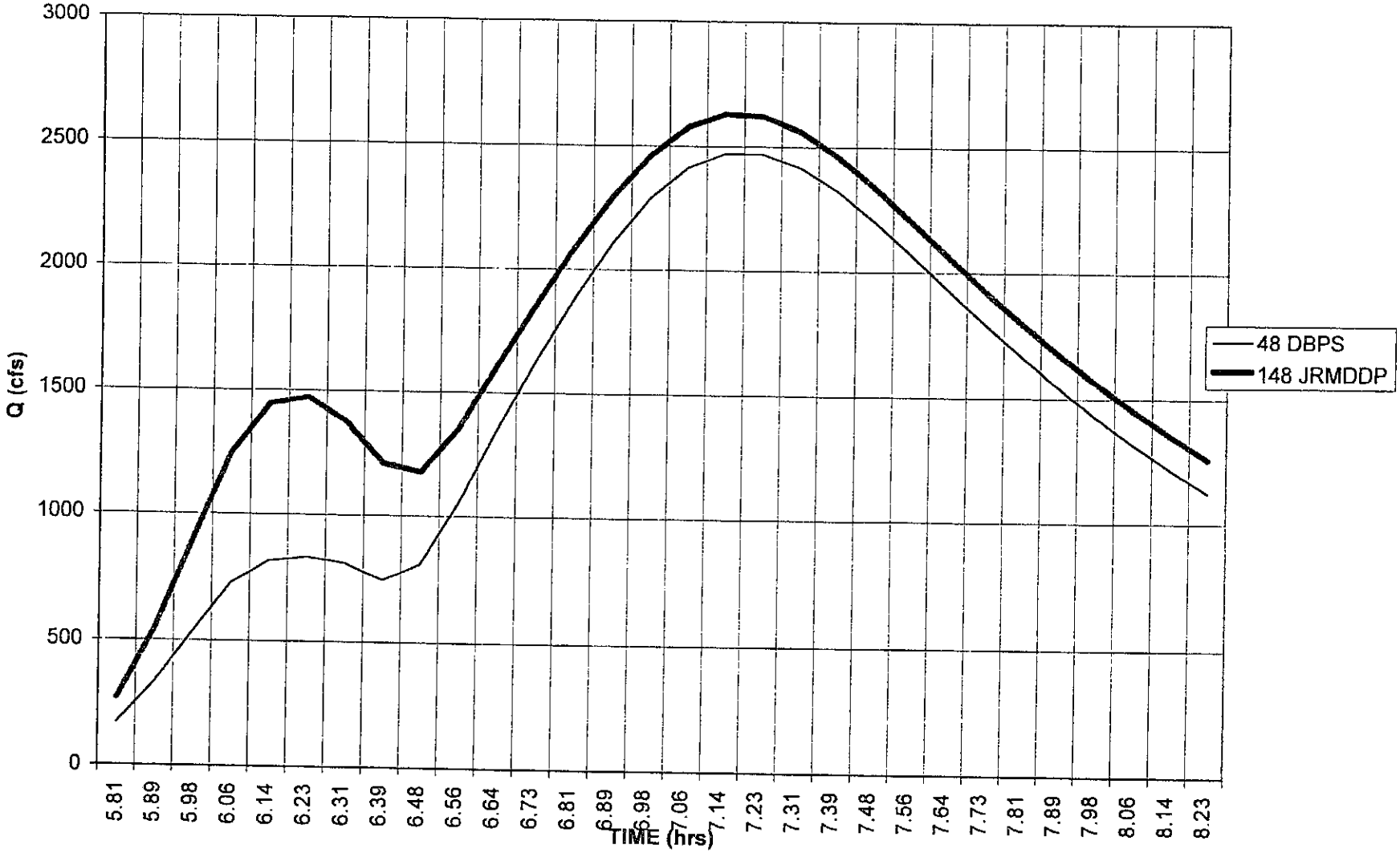
STREET AND SWALE VELOCITY PER TR-55, Figure 3-1 BASED ON A ESTIMATED AVERAGE SLOPE AND FLOW PATH

CHANNEL VELOCITY PER MANNINGS BASED ON APPROXMATE SECTION AND FLOW RATE
STORM DRAIN VELOCITY PER MANNINGS BASED ON AN ESTIMATED STORM DRAIN SIZE

DBPS SECTION 37



DBPS SECTION 48



DBPS SECTION 20

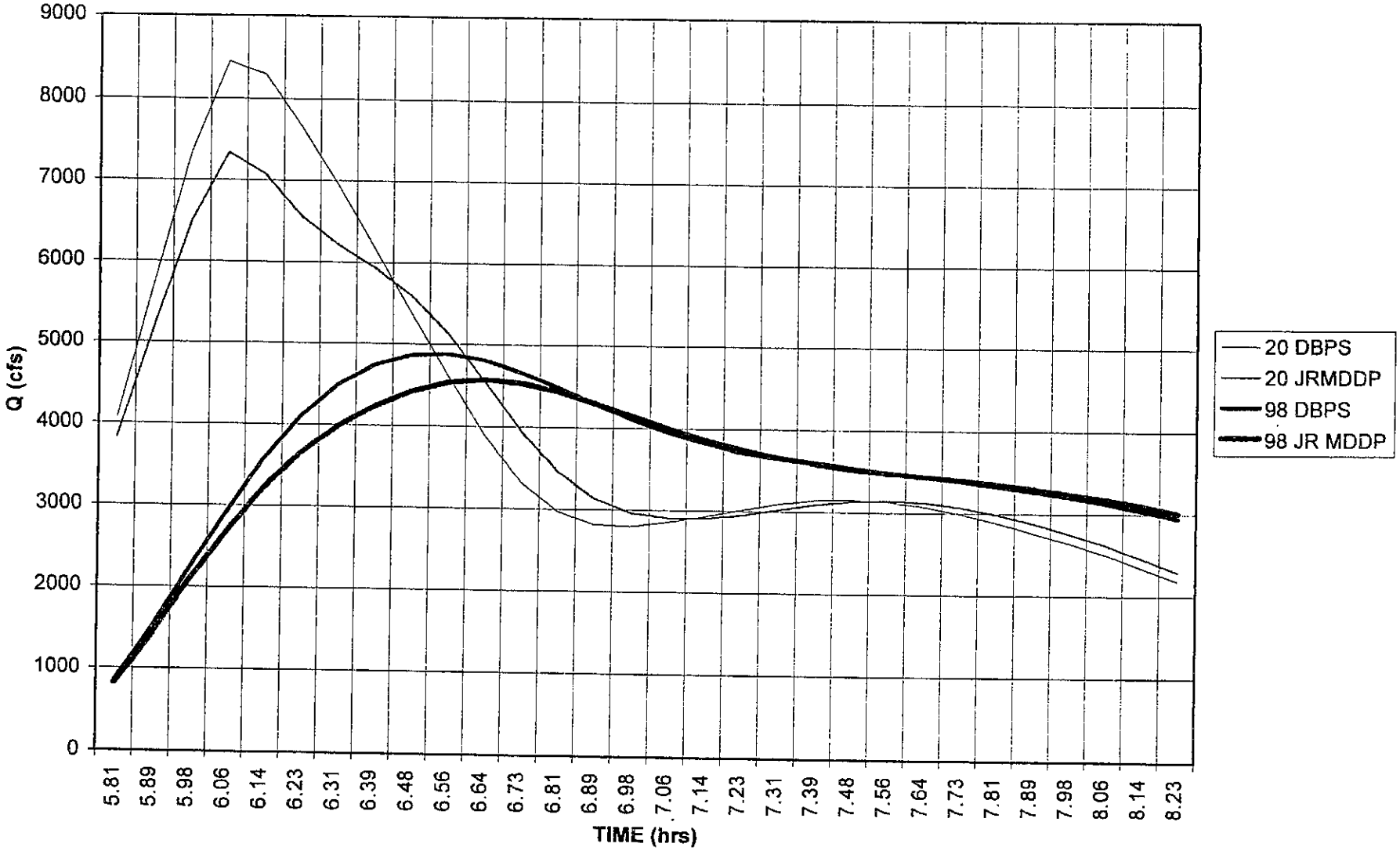


Table
Rating Table for Trapezoidal Channel

Project Description	
Project File	untitled.fm2
Worksheet	CHANNEL, 12' BOTTOM WIDTH
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.030
Channel Slope	0.010000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	12.00 ft

Input Data			
	Minimum	Maximum	Increment
Depth	1.00	5.00	0.50 ft

Rating Table

Depth (ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)
1.00	65.01	4.33	15
1.50	134.71	5.44	25
2.00	229.53	6.38	36
2.50	351.03	7.20	49
3.00	500.93	7.95	63
3.50	681.00	8.65	79
4.00	893.03	9.30	96
4.50	1,138.78	9.92	115
5.00	1,420.00	10.52	135

Table
Rating Table for Trapezoidal Channel

Project Description	
Project File	untitled.fm2
Worksheet	SAND CREEK UPPER REACH
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.035
Channel Slope	0.007500 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	50.00 ft

Input Data

	Minimum	Maximum	Increment
Depth	0.50	6.50	0.50 ft

Rating Table

Depth (ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)
0.50	58.39	2.27	26
1.00	187.12	3.53	53
1.50	371.53	4.54	82
2.00	606.57	5.42	112
2.50	889.75	6.19	144
3.00	1,219.81	6.89	177
3.50	1,596.11	7.54	211
4.00	2,018.46	8.14	248
4.50	2,486.95	8.70	285
5.00	3,001.85	9.24	325
5.50	3,563.57	9.74	366
6.00	4,172.63	10.23	408
6.50	4,829.61	10.69	

Table
Rating Table for Trapezoidal Channel

Project Description	
Project File	untitled.fm2
Worksheet	SAND CREEK LOWER REACH
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.060
Channel Slope	0.017000 ft/ft
Left Side Slope	1.000000 H : V
Right Side Slope	1.000000 H : V
Bottom Width	120.00 ft

Input Data			
	Minimum	Maximum	Increment
Depth	0.50	5.00	0.50 ft

Rating Table

Depth (ft)	Discharge (cfs)	Velocity (ft/s)	FLOW AREA (ft^2)
0.50	121.94	2.02	60
1.00	386.82	3.20	120
1.50	759.74	4.17	182
2.00	1,226.29	5.03	244
2.50	1,777.59	5.80	306
3.00	2,407.37	6.52	369
3.50	3,110.92	7.20	432
4.00	3,884.46	7.83	496
4.50	4,724.94	8.43	560
5.00	5,629.78	9.01	624

TR-20 ANALYSIS

SAND CREEK D.B.P.S. EXISTING CONDITION MODEL MODIFIED TO REFLECT FULLY DEVELOPED CONDITION IN ON-SITE AREA

INPUT DATA FILE

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JOB TR-20                                          SUMMARY   NOPLOTS
TITLE 001 UPPER SAND CREEK -DBPS U24EX.DAT MODEL CHANGED TO RELECT ONSITE AREA
 ITLE     IN DEVELOPED COND 24 HR TYPE IIA STRM (100&10-YR,AMC=2)FN:EXJRMDDP.DAT
 5 RAINFL 1                .50
 8                0.000      .0025      0.005      .0075      0.010
 8                0.015      0.020      0.025      0.030      0.050
 8                0.060      0.100      0.700      0.750      0.780
 8                0.798      0.820      0.830      0.840      0.850
 8                0.860      0.865      0.870      0.885      0.890
 8                0.900      0.905      0.910      0.915      0.921
 8                0.927      0.933      0.940      0.945      0.950
 8                0.955      0.960      0.965      0.970      0.975
 8                0.980      0.983      0.985      0.988      0.990
 8                0.993      0.995      0.998      1.000      1.000
 9 ENDTBL
 2 XSECTN   137        1.0
 3                     0.0          0.0        0.0
 8                     1.0        386.0      120.0
 8                     1.5        760.0      182.0
 8                     2.0       1226.0      244.0
 8                     2.5       1777.0      306.0
 8                     3.0       2407.0      369.0
 8                     3.5       3110.0      432.0
 8                     4.0       3884.0      496.0
 8                     4.5       4725.0      560.0
 8                     5.0       5630.0      624.0
 9 ENDTBL
 2 XSECTN   141        1.0
 8                     0.0          0.0        0.0
 8                     1.0        187.0       53.0
 8                     1.5        372.0       82.0
 8                     2.0        606.0      112.0
 8                     2.5        890.0      144.0
 8                     3.0       1220.0      177.0
 8                     3.5       1596.0      211.0
                       4.0       2018.0      248.0
                       4.5       2487.0      285.0
 8                     5.0       3001.0      325.0
                       5.5       3563.0      366.0
                       6.0       4173.0      408.0
 9 ENDTBL
 2 XSECTN   143        1.0
                       0.0          0.0        0.0
 8                     1.0         65.0       15.0
 8                     1.5        135.7       24.8
                       2.0        229.5       36.0
                       2.5        351.0       48.8
 8                     3.0        500.9       63.0
                       3.5        681.0       78.7
                       4.0        893.0       96.0
 8                     4.5       1138.8      114.8
                       5.0       1420.0      135.0
   ENDTBL
 2 XSECTN   185        1.0
 8                     0.0          0.0        0.0
                       1.0        386.0      120.0
                       1.5        760.0      182.0
 8                     2.0       1226.0      244.0
                       2.5       1777.0      306.0
                       3.0       2407.0      369.0
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8                    3.5         3110.0       432.0
8                    4.0         3884.0       496.0
8                    4.5         4725.0       560.0
8                    5.0         5630.0       624.0
9 ENDTBL
2 XSECTN   186       1.0
8                    0.0            0.0         0.0
8                    1.0          386.0       120.0
8                    1.5          760.0       182.0
8                    2.0         1226.0       244.0
8                    2.5         1777.0       306.0
8                    3.0         2407.0       369.0
8                    3.5         3110.0       432.0
8                    4.0         3884.0       496.0
8                    4.5         4725.0       560.0
8                    5.0         5630.0       624.0
9 ENDTBL
3 STRUCT      91
8                   57.            0.          0.
8                   58.          120.          2.6
8                   59.          460.          5.8
8                   60.          964.          9.6
8                   61.         1584.         14.1
8                   62.         2304.         19.4
8                   63.         3108.         25.6
8                   64.         3986.         32.8
9 ENDTBL
6 RUNOFF 1  82       1          0.19         67.0         0.19
6 REACH  3 174   1   2        2300.0          0.9         1.53
6 RUNOFF 1  74       1          0.18         67.0         0.48
6 ADDHYD 4    74 1 2 3
6 REACH  3 173   3   1        2800.0          0.7         1.53
6 RUNOFF 1  75       2          0.12         67.0          .70
6 ADDHYD 4    75 1 2 3
6 RUNOFF 1  73       1          0.12         67.0          .53
6 ADDHYD 4    75 1 3 2
6 RUNOFF 1  81       1          0.39         67.0         0.51
6 REACH  3 175   1   3        3850.0          0.6         1.56
6 ADDHYD 4    75 2 3 1
6 RUNOFF 1  80       2          0.22         67.0         0.39
6 REACH  3 176   2   3        4100.0          0.6         1.56
6 ADDHYD 4    75 3 1 2
6 RUNOFF 1  76       1          0.17         67.0         0.68
6 ADDHYD 4    75 1 2 3
6 REACH  3 172   3   2        1700.0          0.8         1.53
6 RUNOFF 1  88       1          0.10         67.0          .34
6 ADDHYD 4    77 1 2 3
6 RUNOFF 1  77       2          0.25         67.0          .56
6 ADDHYD 4    77 3 2 1
6 RUNOFF 1  79       2           .29         67.           .29
6 REACH  3 178   2   3        3000.           .6         1.56
6 RUNOFF 1  78       2           .88         67.0         0.44
6 ADDHYD 4    78 2 3 4
6 REACH  3 177   4   2        3350.           .6         1.56
6 ADDHYD 4    77 2 1 3
6 REACH  3 171   3   2        3850.           .2         1.63
6 RUNOFF 1  71       1           .36         70.           .30
6 ADDHYD 4    71 1 2 3
6 REACH  3 170   3   2        2500.           .3         1.63
6 RUNOFF 1  70       1           .31         70.           .35
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6 ADDHYD 4  70   1 2 3
6 REACH  3 187   3   2        1200.        .2       1.64
6 RUNOFF 1  87       3         .04        70.        .14
6 ADDHYD 4    87 3 2 4
6 RUNOFF 1  72       2         .25        70.        .23
6 REACH  3 169   2   3        3000.        .8       1.55
6 RUNOFF 1  69       1         .25        70.        .80
6 ADDHYD 4    69 3 1 2
6 REACH  3 186   2   1        1400.        .7       1.51
6 RUNOFF 1 086       2         .05        70.        .37
6 ADDHYD 4    87 1 2 3
6 ADDHYD 4    87 4 3 1
6 REACH  3 163   1   2        4400.        .2       1.64
6 RUNOFF 1  63       3         .16        66.        .43
6 ADDHYD 4    63 2 3 4
6 REACH  3 160   4   1        4400.        .2       1.65
6 RUNOFF 1  60       3         .15        66.        .41
6 ADDHYD 4    60 1 3 4
6 RUNOFF 1  59       3         .16        65.        .33
6 ADDHYD 4    60 4 3 5
6 RUNOFF 1  68       1         .22        60.        .65
6 REACH  3 167   1   3        3300.        .7       1.51
6 RUNOFF 1  67       1         .27       60.0       1.52
6 ADDHYD 4    67 3 1 2
6 REACH  3 164   2   3        2500.        .8       1.51
6 RUNOFF 1  64       2         .25        59.       1.12
6 ADDHYD 4    64 3 2 1
6 REACH  3 159   1   3        3300.        .5       1.62
6 ADDHYD 4  60   5 3 2
6 REACH  3 151   2   1        4000.        .1       1.65
6 RUNOFF 1  51       5         .15        59.        .39
6 ADDHYD 4    51 1 5 2
6 RUNOFF 1  49       1         .10        55.        .34
6 ADDHYD 4    51 1 2 5
6 RUNOFF 1  52       1         .19        55.        .60
6 ADDHYD 4    51 1 5 3
6 RUNOFF 1  65       1         .10        65.        .75
6 REACH  3 158   1   2        3600.        .4       1.63
6 RUNOFF 1  58       1         .17        84.        .43
6 ADDHYD 4    58 1 2 5
6 REACH  3 152   5   1        3500.        .3       1.63
6 ADDHYD 4  51   3 1 4
6 RUNOFF 1  62       3         .25        55.        .70
6 REACH  3 161   3   2        3400.        .7       1.51
6 RUNOFF 1  61       1         .13        66.        .62
5 ADDHYD 4    61 1 2 3
3 REACH  3 150   3   2        3950.        .6       1.53
6 RUNOFF 1  50       3         .13        54.        .63
5 ADDHYD 4    50 2 3 1
1 REACH  3 149   1   2        2400.        .3       1.63
6 ADDHYD 4    51 4 2 3
5 REACH  3 148   3   1        3300.        .3       1.62
  RUNOFF 1  48       2         .15        55.        .23
6 ADDHYD 4 148   1 2 4
6 RUNOFF 1  66       3        0.31       57.0        .80
  REACH  3 157   3   2      2300.0        0.8       1.53
  RUNOFF 1  57       3        0.16       60.0       0.53
6 ADDHYD 4    57 2 3 1
  REACH  3 154   1   2      3500.0        0.5       1.61
  RUNOFF 1  55       3        0.25       60.0        .58
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6 ADDHYD 4    54 2 3 1
6 RUNOFF 1  56       3        0.15        60.0        0.23
6 REACH  3 155   3   2      3450.0         0.6        1.53
6 ADDHYD 4    54 2 1 5
6 RUNOFF 1  54       7        0.25        60.0        0.33
6 ADDHYD 4    54 7 5 3
6 REACH  3 153   3   6      2050.0         0.5        1.61
6 RUNOFF 1  53       5        0.17        74.0        0.41
6 ADDHYD 4    53 6 5 1
6 REACH  3 147   1   3      2300.0         0.4        1.62
6 RUNOFF 1  47       2        0.27        60.0        0.45
6 ADDHYD 4 147   3 2 6
6 RUNOFF 1 142       1        0.06        60.0         .53
6 ADDHYD 4 147   1 6 2
6 ADDHYD 4 148   2 4 1
6 REACH  3 141   1   2      2100.0
6 RUNOFF 1 122       3        0.03        76.0         .36
6 ADDHYD 4 143   2 3 1
6 RUNOFF 1 141       3        0.05        67.0        0.42
6 ADDHYD 4 143   3 1 2
6 RUNOFF 1 145       1        0.24        72.0         .50
6 RUNOFF 1 146       3        0.18        62.0        0.48
6 ADDHYD 4 145   1 3 4
6 RUNOFF 1 121       1        0.05        76.0         .40
6 ADDHYD 4 145   1 4 3
6 REACH  3 143   3   1      1900.0
6 RUNOFF 1 123       3        0.04        81.0         .35
6 ADDHYD 4 142   3 1 5
6 ADDHYD 4 142   2 5 1
6 REACH  3 186   1   2       700.0
6 RUNOFF 1 124       1        0.02        81.0         .41
6 ADDHYD 4 141   2 1 3
6 RUNOFF 1 140       1        0.33        64.0         .65
6 ADDHYD 4 141   1 3 2
6 REACH  3 185   2   1      1100.0
6 RUNOFF 1 125       2        0.03        80.0        0.46
6 ADDHYD 4 185   1 2 3
6 RUNOFF 1 139       1        0.15        76.0        0.63
6 ADDHYD 4 185   3 1 4
6 RUNOFF 1 143       1        0.25        82.0         .43
6 ADDHYD 4 185   4 1 2
6 REACH  3 137   2   1      3300.0
6 RUNOFF 1 128       2        0.04        75.0         .39
6 ADDHYD 4 137   1 2 3
6 RUNOFF 1 137       2        0.11        80.0         .44
6 ADDHYD 4 137   3 2 1
6 RUNOFF 1 126       2        0.08        79.0         .45
6 RUNOFF 1 127       3        0.07        82.0        0.39
6 ADDHYD 4 137   2 3 4
6 ADDHYD 4 137   1 4 2
6 RESVOR 2    91 2   3                          1 1 1     1
  ENDATA
7 INCREM 6                .083
7 COMPUT 7  82      91        0.0         4.4         1.01 2  01  01 100-YR
  ENDCMP 1
7 COMPUT 7  82      91        0.0         3.0         1.01 2  01  02 10-YR
  ENDCMP 1
  ENDJOB 2
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TR-20 ANALYSIS

SAND CREEK D.B.P.S. FULLY DEVELOPED CONDITION MODEL MODIFIED TO REFLECT CURRENT PROPOSED FULLY DEVELOPED CONDITION IN ON-SITE AREA

MODEL OUTPUT

XSECTION 72	RUNOFF	.25	1	2	.08	.0	4.40	24.00	1.60	---	6.04	354.53	1418.1
XSECTION 169	REACH	.25	1	2	.08	.0	4.40	24.00	1.60	---	6.15	327.64	1310.6
XSECTION 69	RUNOFF	.25	1	2	.08	.0	4.40	24.00	1.60	---	6.38	168.01	672.0
STRUCTURE 69	ADDHYD	.50	1	2	.08	.0	4.40	24.00	1.60	---	6.17	448.49	897.0
XSECTION 186	REACH	.50	1	2	.08	.0	4.40	24.00	1.60	1.08	6.26	448.35	896.7
XSECTION 86	RUNOFF	.05	1	2	.08	.0	4.40	24.00	1.60	---	6.12	56.52	1130.3
STRUCTURE 87	ADDHYD	.55	1	2	.08	.0	4.40	24.00	1.60	---	6.25	491.03	892.8
STRUCTURE 87	ADDHYD	4.17	1	2	.08	.0	4.40	24.00	1.46	---	6.44	2655.49	636.8
XSECTION 163	REACH	4.17	1	2	.08	.0	4.40	24.00	1.46	---	6.56	2570.67	616.5
XSECTION 63	RUNOFF	.16	1	2	.08	.0	4.40	24.00	1.33	---	6.16	133.14	832.2
STRUCTURE 63	ADDHYD	4.33	1	2	.08	.0	4.40	24.00	1.45	---	6.56	2611.75	603.2
XSECTION 160	REACH	4.33	1	2	.08	.0	4.40	24.00	1.45	---	6.68	2539.50	586.5
XSECTION 60	RUNOFF	.15	1	2	.08	.0	4.40	24.00	1.33	---	6.15	128.14	854.2
STRUCTURE 60	ADDHYD	4.48	1	2	.08	.0	4.40	24.00	1.45	---	6.68	2566.56	572.9
XSECTION 59	RUNOFF	.16	1	2	.08	.0	4.40	24.00	1.27	---	6.11	144.66	904.1
STRUCTURE 60	ADDHYD	4.64	1	2	.08	.0	4.40	24.00	1.44	---	6.68	2589.30	558.0
XSECTION 68	RUNOFF	.22	1	2	.08	.0	4.40	24.00	.96	---	6.32	87.71	398.7
XSECTION 167	REACH	.22	1	2	.08	.0	4.40	24.00	.96	---	6.51	75.67	344.0
XSECTION 67	RUNOFF	.27	1	2	.08	.0	4.40	24.00	.96	---	6.98	55.40	205.2
STRUCTURE 67	ADDHYD	.49	1	2	.08	.0	4.40	24.00	.96	---	6.62	116.49	237.7
XSECTION 164	REACH	.49	1	2	.08	.0	4.40	24.00	.96	---	6.78	113.08	230.8
XSECTION 64	RUNOFF	.25	1	2	.08	.0	4.40	24.00	.91	---	6.68	60.27	241.1
STRUCTURE 64	ADDHYD	.74	1	2	.08	.0	4.40	24.00	.94	---	6.75	172.56	233.2
XSECTION 159	REACH	.74	1	2	.08	.0	4.40	24.00	.94	---	6.92	166.83	225.4
XSECTION 60	ADDHYD	5.38	1	2	.08	.0	4.40	24.00	1.37	---	6.69	2732.22	507.8
XSECTION 151	REACH	5.38	1	2	.08	.0	4.40	24.00	1.37	---	6.84	2606.44	484.5
XSECTION 51	RUNOFF	.15	1	2	.08	.0	4.40	24.00	.91	---	6.16	81.05	540.3
STRUCTURE 51	ADDHYD	5.53	1	2	.08	.0	4.40	24.00	1.36	---	6.84	2620.02	473.8
XSECTION 49	RUNOFF	.10	1	2	.08	.0	4.40	24.00	.70	---	6.14	40.52	405.2
STRUCTURE 51	ADDHYD	5.63	1	2	.08	.0	4.40	24.00	1.35	---	6.84	2626.55	466.5
XSECTION 52	RUNOFF	.19	1	2	.08	.0	4.40	24.00	.70	---	6.30	50.73	267.0

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ TRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
RUCTURE 51	ADDHYD	5.82	1	2	.08	.0	4.40	24.00	1.33	---	6.83	2646.38	454.7

XSECTION 173	REACH	.37	1	2	.08	.0	4.40	24.00	1.40	---	6.25	346.58	936.7
XSECTION 75	RUNOFF	.12	1	2	.08	.0	4.40	24.00	1.40	---	6.33	75.13	626.1
STRUCTURE 75	ADDHYD	.49	1	2	.08	.0	4.40	24.00	1.40	---	6.25	418.87	854.8
XSECTION 73	RUNOFF	.12	1	2	.08	.0	4.40	24.00	1.40	---	6.21	92.61	771.7
STRUCTURE 75	ADDHYD	.61	1	2	.08	.0	4.40	24.00	1.40	---	6.25	510.06	836.2
XSECTION 81	RUNOFF	.39	1	2	.08	.0	4.40	24.00	1.40	---	6.20	304.01	779.5
XSECTION 175	REACH	.39	1	2	.08	.0	4.40	24.00	1.40	---	6.36	271.28	695.6
STRUCTURE 75	ADDHYD	1.00	1	2	.08	.0	4.40	24.00	1.40	---	6.28	754.36	754.4
XSECTION 80	RUNOFF	.22	1	2	.08	.0	4.40	24.00	1.40	---	6.14	206.24	937.4
XSECTION 176	REACH	.22	1	2	.08	.0	4.40	24.00	1.40	---	6.29	168.33	765.2
STRUCTURE 75	ADDHYD	1.22	1	2	.08	.0	4.40	24.00	1.40	---	6.28	922.26	756.0
XSECTION 76	RUNOFF	.17	1	2	.08	.0	4.40	24.00	1.39	---	6.31	107.47	632.2
STRUCTURE 75	ADDHYD	1.39	1	2	.08	.0	4.40	24.00	1.40	---	6.28	1029.19	740.4
XSECTION 172	REACH	1.39	1	2	.08	.0	4.40	24.00	1.40	---	6.28	1029.19	740.4
XSECTION 88	RUNOFF	.10	1	2	.08	.0	4.40	24.00	1.40	---	6.11	100.20	1002.0
STRUCTURE 77	ADDHYD	1.49	1	2	.08	.0	4.40	24.00	1.40	---	6.27	1097.78	736.8
XSECTION 77	RUNOFF	.25	1	2	.08	.0	4.40	24.00	1.40	---	6.23	182.71	730.9
STRUCTURE 77	ADDHYD	1.74	1	2	.08	.0	4.40	24.00	1.40	---	6.26	1278.88	735.0
XSECTION 79	RUNOFF	.29	1	2	.08	.0	4.40	24.00	1.40	---	6.08	318.12	1097.0
XSECTION 178	REACH	.29	1	2	.08	.0	4.40	24.00	1.40	---	6.20	284.15	979.8
XSECTION 78	RUNOFF	.88	1	2	.08	.0	4.40	24.00	1.40	---	6.16	762.75	866.8
STRUCTURE 78	ADDHYD	1.17	1	2	.08	.0	4.40	24.00	1.40	---	6.17	1041.83	890.4
XSECTION 177	REACH	1.17	1	2	.08	.0	4.40	24.00	1.40	---	6.28	998.05	853.0
STRUCTURE 77	ADDHYD	2.91	1	2	.08	.0	4.40	24.00	1.40	---	6.27	2264.92	778.3
XSECTION 171	REACH	2.91	1	2	.08	.0	4.40	24.00	1.40	---	6.40	2132.94	733.0
XSECTION 71	RUNOFF	.36	1	2	.08	.0	4.40	24.00	1.60	---	6.08	455.82	1266.2
STRUCTURE 71	ADDHYD	3.27	1	2	.08	.0	4.40	24.00	1.42	---	6.39	2249.04	687.8
XSECTION 170	REACH	3.27	1	2	.08	.0	4.40	24.00	1.42	---	6.47	2242.92	685.9

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 70	RUNOFF	.31	1	2	.08	.0	4.40	24.00	1.60	---	6.11	360.53	1163.0
XSECTION 70	ADDHYD	3.58	1	2	.08	.0	4.40	24.00	1.43	---	6.47	2338.19	653.1
XSECTION 187	REACH	3.58	1	2	.08	.0	4.40	24.00	1.43	---	6.47	2338.19	653.1
XSECTION 87	RUNOFF	.04	1	2	.08	.0	4.40	24.00	1.61	---	6.00	61.57	1539.2
STRUCTURE 87	ADDHYD	3.62	1	2	.08	.0	4.40	24.00	1.44	---	6.47	2344.87	647.8

14.11	DISCHG	114.28	112.58	110.81	109.01	107.22	105.48	103.82	102.28	100.88	99.64
14.11	ELEV	57.95	57.94	57.92	57.91	57.89	57.88	57.87	57.85	57.84	57.83
14.94	DISCHG	98.57	97.65	96.90	96.32	95.89	95.61	95.47	95.48	95.62	95.90
14.94	ELEV	57.82	57.81	57.81	57.80	57.80	57.80	57.80	57.80	57.80	57.80
15.77	DISCHG	96.33	96.91	97.64	98.50	99.45	100.44	101.37	102.19	102.84	103.27
15.77	ELEV	57.80	57.81	57.81	57.82	57.83	57.84	57.84	57.85	57.86	57.86
16.60	DISCHG	103.50	103.53	103.40	103.15	102.83	102.48	102.13	101.80	101.47	101.14
16.60	ELEV	57.86	57.86	57.86	57.86	57.86	57.85	57.85	57.85	57.85	57.84
17.43	DISCHG	100.79	100.39	99.94	99.40	98.79	98.10	97.35	96.56	95.74	94.93
17.43	ELEV	57.84	57.84	57.83	57.83	57.82	57.82	57.81	57.80	57.80	57.79
18.26	DISCHG	94.14	93.40	92.71	92.08	91.53	91.04	90.63	90.28	90.00	89.77
18.26	ELEV	57.78	57.78	57.77	57.77	57.76	57.76	57.76	57.75	57.75	57.75
19.09	DISCHG	89.58	89.45	89.34	89.27	89.23	89.20	89.20	89.21	89.23	89.26
19.09	ELEV	57.75	57.75	57.74	57.74	57.74	57.74	57.74	57.74	57.74	57.74
19.92	DISCHG	89.30	89.34	89.38	89.39	89.30	89.09	88.70	88.14	87.40	86.47
19.92	ELEV	57.74	57.74	57.74	57.74	57.74	57.74	57.74	57.73	57.73	57.72
20.75	DISCHG	85.36	84.09	82.69	81.18	79.59	77.95	76.29	74.66	73.07	71.54
20.75	ELEV	57.71	57.70	57.69	57.68	57.66	57.65	57.64	57.62	57.61	57.60
21.58	DISCHG	70.07	68.62	67.16	65.66	64.07	62.41	60.66	58.87	57.11	55.43
21.58	ELEV	57.58	57.57	57.56	57.55	57.53	57.52	57.51	57.49	57.48	57.46
22.41	DISCHG	53.91	52.58	51.48	50.60	49.92	49.36	48.89	48.45	48.00	47.54
22.41	ELEV	57.45	57.44	57.43	57.42	57.42	57.41	57.41	57.40	57.40	57.40
23.24	DISCHG	47.09	46.68	46.34	46.11	46.00	46.00	46.09	46.21	46.32	46.37
23.24	ELEV	57.39	57.39	57.39	57.38	57.38	57.38	57.38	57.39	57.39	57.39
24.07	DISCHG	46.33	46.16	45.81	45.25	44.48	43.50	42.35	41.05	39.63	38.14
24.07	ELEV	57.39	57.38	57.38	57.38	57.37	57.36	57.35	57.34	57.33	57.32

EXECUTIVE CONTROL OPERATION ENDCMP

RECORD ID

COMPUTATIONS COMPLETED FOR PASS 2

EXECUTIVE CONTROL OPERATION ENDJOB

RECORD ID

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ RUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
ECTION 82	RUNOFF	.19	1	2	.08	.0	4.40	24.00	1.40	---	6.03	249.72	1314.3
XSECTION 174	REACH	.19	1	2	.08	.0	4.40	24.00	1.40	---	6.13	235.29	1238.4
XSECTION 74	RUNOFF	.18	1	2	.08	.0	4.40	24.00	1.40	---	6.18	148.53	825.2
RUCTURE 74	ADDHYD	.37	1	2	.08	.0	4.40	24.00	1.40	---	6.14	379.44	1025.5

21.58	DISCHG	.23	.18	.17	.17	.17	.17	.20	.24	.25	.26
22.41	DISCHG	.26	.26	.23	.19	.17	.17	.17	.17	.20	.24
23.24	DISCHG	.25	.26	.26	.26	.23	.19	.18	.17	.17	.17
24.07	DISCHG	.13	.03	.01	.00						

***WARNING - LACK OF LOW FLOW DEFINITION FOR XSECT TABLE186. MAX.FLOW LESS THAN 2ND TABLE VALUE.

*** WARNING REACH 186 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 141 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 143 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 186 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 185 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

OPERATION RESVOR STRUCTURE 91

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.67	774.58	59.62
7.75	865.48	59.80
11.87	138.82	58.06
13.05	140.19	58.06
16.66	103.54	57.86
20.13	89.40	57.74
23.99	46.37	57.39

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .08 HOURS DRAINAGE AREA = 10.04 SQ.MI.

4.98	DISCHG	.00	.00	.00	.00	.00	.00	.00	.01	.42	3.25
4.98	ELEV	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.03
5.81	DISCHG	13.33	37.75	82.94	180.89	334.30	468.04	590.97	672.04	725.78	758.97
5.81	ELEV	57.11	57.31	57.69	58.18	58.63	59.02	59.26	59.42	59.53	59.59
6.64	DISCHG	773.54	770.94	756.53	739.03	725.76	720.71	724.91	737.70	757.73	782.93
6.64	ELEV	59.62	59.62	59.59	59.55	59.53	59.52	59.53	59.55	59.59	59.64
7.47	DISCHG	810.17	835.48	854.74	864.65	863.37	850.58	827.25	795.20	756.49	713.12
7.47	ELEV	59.69	59.75	59.78	59.80	59.80	59.77	59.73	59.67	59.59	59.50
8.30	DISCHG	666.99	619.85	573.23	528.35	486.08	448.94	417.75	387.73	360.40	336.30
8.30	ELEV	59.41	59.32	59.22	59.14	59.05	58.97	58.88	58.79	58.71	58.64
9.13	DISCHG	315.42	297.49	282.12	268.84	257.21	246.83	237.35	228.54	220.27	212.47
9.13	ELEV	58.57	58.52	58.48	58.44	58.40	58.37	58.35	58.32	58.29	58.27
9.96	DISCHG	205.16	198.36	192.03	186.05	180.28	174.66	169.14	163.76	158.53	153.50
9.96	ELEV	58.25	58.23	58.21	58.19	58.18	58.16	58.14	58.13	58.11	58.10
10.79	DISCHG	148.74	144.33	140.30	136.67	133.55	131.19	129.83	129.59	130.39	132.07
10.79	ELEV	58.08	58.07	58.06	58.05	58.04	58.03	58.03	58.03	58.03	58.04
11.62	DISCHG	134.30	136.52	138.16	138.82	138.33	136.76	134.43	131.82	129.50	127.96
11.62	ELEV	58.04	58.05	58.05	58.06	58.05	58.05	58.04	58.03	58.03	58.02

12.45	DISCHG	127.53	128.31	130.15	132.66	135.35	137.74	139.42	140.17	139.88	138.60
12.45	ELEV	58.02	58.02	58.03	58.04	58.05	58.05	58.06	58.06	58.06	58.05
13.28	DISCHG	136.49	133.80	130.83	127.80	124.90	122.22	119.90	118.75	117.39	115.90
13.28	ELEV	58.05	58.04	58.03	58.02	58.01	58.01	58.00	57.99	57.98	57.97

21.58	ELEV	57.92	57.90	57.87	57.85	57.83	57.81	57.80	57.78	57.77	57.76
22.41	DISCHG	90.64	90.55	90.74	91.01	91.18	91.13	90.79	90.21	89.51	88.82
22.41	ELEV	57.76	57.75	57.76	57.76	57.76	57.76	57.76	57.75	57.75	57.74
23.24	DISCHG	88.33	88.13	88.27	88.70	89.29	89.90	90.35	90.52	90.37	89.94
23.24	ELEV	57.74	57.73	57.74	57.74	57.74	57.75	57.75	57.75	57.75	57.75
24.07	DISCHG	89.32	88.58	87.63	86.28	84.33	81.64	78.23	74.22	69.77	65.02
24.07	ELEV	57.74	57.74	57.73	57.72	57.70	57.68	57.65	57.62	57.58	57.54

EXECUTIVE CONTROL OPERATION ENDCMP

RECORD ID

COMPUTATIONS COMPLETED FOR PASS 1

EXECUTIVE CONTROL OPERATION COMPUT

RECORD ID 10-YR

FROM XSECTION 82

TO STRUCTURE 91

STARTING TIME = .00 RAIN DEPTH = 3.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2

ALTERNATE NO.= 1 STORM NO.= 2 MAIN TIME INCREMENT = .08 HOURS

*** WARNING REACH 172 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 170 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 187 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING-MAIN TIME INCREMENT MAY BE TOO LARGE.

COMPUTED PEAK(27.75) AT EXCEEDS MAX. ADJACENT HYDROGRAPH COORDINATE BY 6 %.

XSECTION 87

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .08 HOURS DRAINAGE AREA = .04 SQ.MI.

4.98	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.00
5.81	DISCHG	7.71	16.89	25.40	26.00	10.28	4.83	3.56	3.29	3.27	3.07
6.64	DISCHG	2.34	2.09	2.05	2.05	2.06	1.94	1.47	1.30	1.27	1.27
7.47	DISCHG	1.27	1.32	1.49	1.55	1.57	1.58	1.59	1.47	.97	.79
8.30	DISCHG	.74	.73	.73	.74	.74	.74	.74	.74	.74	.74
9.13	DISCHG	.74	.75	.75	.75	.75	.75	.75	.75	.76	.76
9.96	DISCHG	.76	.72	.50	.41	.39	.38	.38	.38	.38	.38
10.79	DISCHG	.38	.38	.38	.45	.88	1.09	1.14	1.16	1.16	1.12
11.62	DISCHG	.67	.45	.40	.39	.39	.42	.64	.75	.78	.79
12.45	DISCHG	.79	.77	.55	.43	.40	.40	.40	.40	.40	.40
13.28	DISCHG	.40	.40	.40	.40	.40	.40	.40	.40	.40	.40
14.11	DISCHG	.45	.47	.48	.48	.48	.48	.48	.48	.48	.48
14.94	DISCHG	.49	.49	.49	.49	.49	.49	.49	.49	.53	.56
15.77	DISCHG	.57	.57	.57	.57	.49	.43	.41	.41	.41	.41
16.60	DISCHG	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41
17.43	DISCHG	.41	.41	.41	.42	.42	.42	.42	.42	.42	.42
18.26	DISCHG	.42	.42	.42	.42	.42	.42	.42	.42	.42	.42
19.09	DISCHG	.42	.42	.42	.42	.42	.42	.42	.42	.42	.42
19.92	DISCHG	.42	.42	.36	.28	.26	.26	.25	.25	.22	.18

1

20.75	DISCHG	.17	.17	.17	.17	.20	.24	.25	.25	.26	.26

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
7.05	3380.08	63.31
12.63	304.05	58.54
16.36	214.47	58.28
20.07	175.87	58.16
22.76	91.19	57.76
23.82	90.52	57.75

FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .08 HOURS DRAINAGE AREA = 10.04 SQ.MI.

TIME(HRS)											
4.98	DISCHG	.00	.00	.00	.00	.00	.00	.00	.21	2.78	15.77
4.98	ELEV	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.02	57.13
5.81	DISCHG	54.59	157.88	445.26	889.26	1419.89	1963.01	2428.90	2753.23	2935.83	3009.81
5.81	ELEV	57.45	58.11	58.96	59.85	60.74	61.53	62.16	62.56	62.79	62.88
6.64	DISCHG	3040.59	3083.92	3158.62	3255.27	3342.86	3379.98	3334.73	3196.65	2972.19	2691.37
6.64	ELEV	62.92	62.97	63.06	63.17	63.27	63.31	63.26	63.10	62.83	62.48
7.47	DISCHG	2392.21	2093.53	1821.98	1589.17	1393.90	1236.66	1111.45	1011.91	932.66	867.39
7.47	ELEV	62.11	61.71	61.33	61.01	60.69	60.44	60.24	60.08	59.94	59.81
8.30	DISCHG	809.93	757.90	710.34	667.51	630.09	598.19	570.94	546.85	524.38	502.26
8.30	ELEV	59.69	59.59	59.50	59.41	59.34	59.27	59.22	59.17	59.13	59.08
9.13	DISCHG	479.86	457.67	438.61	419.15	400.91	384.80	371.19	360.10	351.29	344.46
9.13	ELEV	59.04	58.99	58.94	58.88	58.83	58.78	58.74	58.71	58.68	58.66
9.96	DISCHG	339.25	335.30	332.14	329.00	324.95	319.32	311.96	303.24	293.84	284.34
9.96	ELEV	58.64	58.63	58.62	58.61	58.60	58.59	58.56	58.54	58.51	58.48
10.79	DISCHG	275.02	265.87	256.71	247.38	238.14	230.15	225.25	224.90	229.60	238.70
10.79	ELEV	58.46	58.43	58.40	58.37	58.35	58.32	58.31	58.31	58.32	58.35
11.62	DISCHG	250.49	262.51	272.45	279.03	282.24	283.19	283.58	284.92	288.00	292.60
11.62	ELEV	58.38	58.42	58.45	58.47	58.48	58.48	58.48	58.49	58.49	58.51
12.45	DISCHG	297.70	301.95	304.01	302.93	298.38	290.83	281.40	271.49	262.40	254.89
12.45	ELEV	58.52	58.54	58.54	58.54	58.52	58.50	58.47	58.45	58.42	58.40
13.28	DISCHG	248.97	244.12	239.60	234.71	229.03	222.50	215.38	208.12	201.18	194.90
13.28	ELEV	58.38	58.37	58.35	58.34	58.32	58.30	58.28	58.26	58.24	58.22
14.11	DISCHG	189.52	185.19	182.03	180.06	179.17	179.18	179.81	180.84	182.11	183.54
14.11	ELEV	58.20	58.19	58.18	58.18	58.17	58.17	58.18	58.18	58.18	58.19
14.94	DISCHG	185.12	186.85	188.73	190.72	192.75	194.73	196.58	198.23	199.68	201.03
14.94	ELEV	58.19	58.20	58.20	58.21	58.21	58.22	58.23	58.23	58.23	58.24
15.77	DISCHG	202.44	204.08	206.01	208.19	210.45	212.48	213.91	214.47	214.10	213.00
15.77	ELEV	58.24	58.25	58.25	58.26	58.27	58.27	58.28	58.28	58.28	58.27
16.60	DISCHG	211.49	209.85	208.22	206.54	204.68	202.52	199.96	197.03	193.87	190.66
16.60	ELEV	58.27	58.26	58.26	58.25	58.25	58.24	58.24	58.23	58.22	58.21
17.43	DISCHG	187.61	184.85	182.48	180.53	178.96	177.75	176.83	176.14	175.64	175.28
17.43	ELEV	58.20	58.19	58.18	58.18	58.17	58.17	58.17	58.17	58.16	58.16
18.26	DISCHG	175.03	174.87	174.76	174.71	174.68	174.69	174.71	174.75	174.80	174.85
18.26	ELEV	58.16	58.16	58.16	58.16	58.16	58.16	58.16	58.16	58.16	58.16
19.09	DISCHG	174.92	174.99	175.06	175.14	175.22	175.30	175.38	175.47	175.55	175.64
19.09	ELEV	58.16	58.16	58.16	58.16	58.16	58.16	58.16	58.16	58.16	58.16
19.92	DISCHG	175.73	175.81	175.86	175.72	175.09	173.66	171.33	168.16	164.44	160.40
19.92	ELEV	58.16	58.16	58.16	58.16	58.16	58.16	58.15	58.14	58.13	58.12
20.75	DISCHG	156.10	151.46	146.36	140.78	134.79	128.62	122.66	118.58	115.83	112.96

20.75	ELEV	58.11	58.09	58.08	58.06	58.04	58.03	58.01	57.99	57.97	57.94
21.58	DISCHG	110.18	107.53	105.00	102.52	100.07	97.71	95.52	93.61	92.13	91.13

EXECUTIVE CONTROL OPERATION INCREM RECORD ID

MAIN TIME INCREMENT = .08 HOURS

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID 100-YR

FROM XSECTION 82

TO STRUCTURE 91

STARTING TIME = .00 RAIN DEPTH = 4.40 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 1 MAIN TIME INCREMENT = .08 HOURS

*** WARNING REACH 174 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 173 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 172 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 177 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 170 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 187 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 169 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 186 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 148 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 153 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 147 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 141 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 143 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 186 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 185 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 137 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

ERATION RESVOR STRUCTURE 91

FILE NO. 1

COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1983 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:
CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

ID	LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	FLOW (CFS)	BASE (IN)	INCR (HR)	#	COEFF (X)	POWER (M)	FACTOR (K*)	O/I (Q*)	(K) (SEC)	COEFF (C)	AGE (HR)	MATIC (HR)
ALTERNATE 1 STORM 2																			
+141	2100	809	7.3	808	7.5	---	---	0	.51	.08	1	.380	1.56	.004	.999	225	.80?	.17	.06
+143	1900	164	6.2	162	6.3	---	---	0	.67	.08	1	1.26	1.46	.022	.984	226	.80?	.08	.06
+186	700	832	7.5	832	7.5	---	---	0	.52	.08	0	.160	1.63	.001	1.000	99	1.00?	.00	.00
+185	1100	844	7.5	844	7.6	846	7.6	0	.52	.08	1	.160	1.63	.002	1.000	155	.98?	.08	.04
+137	3300	868	7.5	857	7.6	858	7.6	0	.55	.08	1	.160	1.63	.008	.986	461	.49	.17	.13

ND OF 1 JOBS IN THIS RUN

+						---	---											
+159	3300	39	7.0	37	7.2			0	.32	.08	1	.500	1.62	.020	.936	766	.33	.25	.22
+						---	---												
+151	4000	749	7.1	699	7.2			0	.57	.08	1	.100	1.65	.032	.933	721	.34	.17	.20
+						---	---												
+158	3600	17	6.4	12	6.8			0	.51	.08	1	.400	1.63	.142	.720	1306	.21	.33	.39
+						---	---												
+152	3500	179	6.1	148	6.3			0	1.14	.08	1	.300	1.63	.102	.826	605	.40	.17	.17
+						---	---												
+161	3400	8	6.5	6	6.9			0	.19	.08	1	.700	1.51	.060	.739	1390	.19	.41	.41
+						---	---												
+150	3950	30	6.3	22	6.6			0	.31	.08	1	.600	1.53	.074	.748	1114	.24	.33	.32
+						---	---												
+149	2400	25	6.6	23	7.0			0	.28	.08	1	.300	1.63	.028	.889	883	.29	.33	.25
+						---	---												
-148	3300	760	7.2	750	7.4			0	.55	.08	1	.300	1.62	.008	.988	338	.61	.17	.09
-						752	7.4												
-157	2300	15	6.6	14	6.8			0	.25	.08	1	.800	1.53	.025	.896	679	.36	.25	.19
-						---	---												
-154	3500	23	6.4	20	6.9			0	.28	.08	1	.500	1.61	.036	.875	1013	.26	.50	.29
						---	---												
155	3450	30	6.1	16	6.4			0	.33	.08	1	.600	1.53	.231	.520	968	.27	.25	.30
						---	---												
153	2050	76	6.2	72	6.5			0	.31	.08	1	.500	1.61	.010	.937	379	.57	.25	.11
						---	---												
147	2300	139	6.2	130	6.4			0	.39	.08	1	.400	1.62	.015	.930	378	.57	.17	.11
						156	6.3												

UMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

	HYDROGRAPH INFORMATION				ROUTING PARAMETERS								PEAK	
			OUTFLOW+		VOLUME	MAIN	ITER-	Q AND A		PEAK	S/Q	ATT-	TRAVEL TIME	
SEC REACH	INFLOW	OUTFLOW	INTERV.AREA	BASE-	ABOVE	TIME	ATION	EQUATION	LENGTH	RATIO	@PEAK	KIN	STOR-	KINE-

TR-20 ANALYSIS

SAND CREEK D.B.P.S. FULLY DEVELOPED CONDITION MODEL MODIFIED TO REFLECT CURRENT PROPOSED FULLY DEVELOPED CONDITION IN ON-SITE AREA.

INPUT DATA FILE

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JOB TR-20                                              SUMMARY   NOPLOTS
 ITLE 001 UPPER SAND CREEK --DBPS FUALTC.DAT MOD. TO JR ENG. RIDGEVIEW MDDP
 ITLE     24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2) FILE NAME: FUJRMDDP.DAT
 5 RAINFL 1                  .50
 8                0.000      .0025      0.005      .0075      0.010
 8                0.015      0.020      0.025      0.030      0.050
 8                0.060      0.100      0.700      0.750      0.780
 8                0.798      0.820      0.830      0.840      0.850
 8                0.860      0.865      0.870      0.885      0.890
 8                0.900      0.905      0.910      0.915      0.921
 8                0.927      0.933      0.940      0.945      0.950
 8                0.955      0.960      0.965      0.970      0.975
 8                0.980      0.983      0.985      0.988      0.990
 8                0.993      0.995      0.998      1.000      1.000
 9 ENDTBL
 2 XSECTN   137        1.0
 8                     0.0          0.0        0.0
 8                     1.0        386.0      120.0
 8                     1.5        760.0      182.0
 8                     2.0       1226.0      244.0
 8                     2.5       1777.0      306.0
 8                     3.0       2407.0      369.0
 8                     3.5       3110.0      432.0
 8                     4.0       3884.0      496.0
 8                     4.5       4725.0      560.0
 8                     5.0       5630.0      624.0
 7 ENDTBL
 2 XSECTN   141        1.0
 8                     0.0          0.0        0.0
 8                     1.0        187.0       53.0
 8                     1.5        372.0       82.0
 8                     2.0        606.0      112.0
 8                     2.5        890.0      144.0
 8                     3.0       1220.0      177.0
 8                     3.5       1596.0      211.0
                       4.0       2018.0      248.0
 8                     4.5       2487.0      285.0
 8                     5.0       3001.0      325.0
                       5.5       3563.0      366.0
                       6.0       4173.0      408.0
 9 ENDTBL
 2 XSECTN   143        1.0
                       0.0          0.0        0.0
 8                     1.0         65.0       15.0
 8                     1.5        135.7       24.8
                       2.0        229.5       36.0
 8                     2.5        351.0       48.8
 8                     3.0        500.9       63.0
                       3.5        681.0       78.7
                       4.0        893.0       96.0
 8                     4.5       1138.8      114.8
                       5.0       1420.0      135.0
   ENDTBL
 2 XSECTN   185        1.0
 8                     0.0          0.0        0.0
                       1.0        386.0      120.0
 8                     1.5        760.0      182.0
 8                     2.0       1226.0      244.0
                       2.5       1777.0      306.0
                       3.0       2407.0      369.0
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 8                    3.5         3110.0      432.0
 8                    4.0         3884.0      496.0
 8                    4.5         4725.0      560.0
 8                    5.0         5630.0      624.0
 9 ENDTBL
 2 XSECTN   186       1.0
 8                    0.0            0.0        0.0
 8                    1.0          386.0      120.0
 8                    1.5          760.0      182.0
 8                    2.0         1226.0      244.0
 8                    2.5         1777.0      306.0
 8                    3.0         2407.0      369.0
 8                    3.5         3110.0      432.0
 8                    4.0         3884.0      496.0
 8                    4.5         4725.0      560.0
 8                    5.0         5630.0      624.0
 9 ENDTBL
 3 STRUCT     91
 8                   57.            0.         0.
 8                   58.          120.         2.6
 8                   59.          460.         5.8
 8                   60.          964.         9.6
 8                   61.         1584.        14.1
 8                   62.         2304.        19.4
 8                   63.         3108.        25.6
 8                   64.         3986.        32.8
 9 ENDTBL
 3 STRUCT     92
 8                    0.            0.         0.
 8                    4.           40.        40.
 8                    5.           60.        60.
 8                    6.           82.        90.
 8                    8.           90.       110.
 8                    9.           91.       120.
 8                   10.           95.       130.
 9 ENDTBL
 3 STRUCT     93
 8                    0.            0.         0.
 8                    4.           20.        10.
 8                    6.          100.        20.
 8                    8.          290.        30.
 9 ENDTBL
 3 STRUCT     94
 8                    0.            0.         0.
 8                    4.           80.        30.
 8                    5.           90.        40.
 8                    7.          300.        60.
 8                    8.          800.        80.
 8                    9.         1750.       120.
 8                   10.         2000.       130.
 9 ENDTBL
 3 STRUCT     95
 8                    0.            0.         0.
 8                    4.           10.        20.
 8                    7.           20.        34.
 8                    8.           30.        39.
 8                    9.           40.        42.
 8                   10.           43.        50.
 9 ENDTBL
 3 STRUCT     98
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8                          0.            0.        0.
                           4.         2000.       80.
                          10.         3500.      160.
9 ENDTBL
  STRUCT      97
                           0.            0.        0.
8                          4.          400.       75.0
8                          5.          800.      100.
                           6.         2000.      137.5
                           7.         2700.      162.5
8                          8.         2900.      187.5
                           9.         3000.      237.5
                          10.         3150.      250.
8                         13.         3200.      375.
  ENDTBL
   RUNOFF 1  82        1      0.19      67.0      0.19
6 REACH  3 174   1    2    2300.0       0.9      1.53
6 RUNOFF 1  74        1      0.18      67.0      0.48
   ADDHYD 4    74 1 2 3
  REACH  3 173   3    1    2800.0       0.7      1.53
6 RUNOFF 1  75        2      0.12      67.0       .70
   ADDHYD 4    75 1 2 3
   RUNOFF 1  73        1      0.12      67.0       .53
6 ADDHYD 4    75 1 3 2
  RUNOFF 1  81        1      0.39      67.0      0.51
   REACH  3 175   1    3    3850.0       0.6      1.56
  ADDHYD 4    75 2 3 1
6 RUNOFF 1  80        2      0.22      67.0      0.40
   REACH  3 176   2    3    4100.0       0.6      1.56
   ADDHYD 4    75 3 1 2
6 RUNOFF 1  76        1      0.17      67.0      0.68
   ADDHYD 4    75 1 2 3
   REACH  3 172   3    2    1700.0       0.8      1.53
6 RUNOFF 1  88        1      0.10      67.0       .34
  ADDHYD 4    77 1 2 3
   RUNOFF 1  77        2      0.25      67.0       .56
  ADDHYD 4    77 3 2 1
6 RUNOFF 1  79        2      0.29      67.0      0.29
   REACH  3 178   2    3    3000.0       0.6      1.56
  RUNOFF 1  78        2      0.88      67.0      0.44
6 ADDHYD 4    78 2 3 4
   REACH  3 177   4    2    3350.0       0.6      1.56
   ADDHYD 4    77 2 1 3
6 REACH  3 171   3    2    3850.0       0.2      1.63
  RUNOFF 1  71        1      0.36      75.0       .30
   ADDHYD 4    71 1 2 3
6 REACH  3 170   3    2    2500.0       0.3      1.63
6 RUNOFF 1  70        1      0.31      75.0      0.35
   ADDHYD 4    70 1 2 3
  REACH  3 187   3    2    1200.0       0.2      1.64
6 RUNOFF 1  87        3      0.04      71.0      0.14
   ADDHYD 4    87 3 2 4
   RUNOFF 1  72        2      0.25      70.0      0.23
6 REACH  3 169   2    3    3000.0        .8      1.55
  RUNOFF 1  69        1      0.25      75.0      0.80
   ADDHYD 4    69 3 1 2
6 REACH  3 186   2    1    1400.0       0.7      1.51
6 RUNOFF 1  86        2      0.05      75.0      0.37
  ADDHYD 4    87 1 2 3
  ADDHYD 4    87 4 3 1
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6 REACH  3 163   1   2      4400.0        0.2        1.64
6 RUNOFF 1  63       3        0.16       73.0        0.43
6 ADDHYD 4    63 2 3 4
6 REACH  3 160   4   1      4400.0        0.2        1.65
6 RUNOFF 1  60       3        0.15       72.0        0.41
6 ADDHYD 4    60 1 3 4
6 RUNOFF 1  59       3        0.16       86.0         .33
6 ADDHYD 4    60 4 3 5
6 RUNOFF 1  68       1        0.22       75.0         .65
6 REACH  3 167   1   3      3300.0        0.7        1.51
6 RUNOFF 1  67       1        0.27       85.0         .54
6 ADDHYD 4    67 3 1 2
6 REACH  3 164   2   3      2500.0        0.8        1.51
6 RUNOFF 1  64       2        0.25       85.0         .30
6 ADDHYD 4    64 3 2 1
6 REACH  3 159   1   3      3300.0        0.5        1.62
6 ADDHYD 4    60 5 3 2
6 REACH  3 151   2   1      4000.0        0.1        1.65
6 RESVOR 2    94 1   4
6 RUNOFF 1  51       5        0.15       75.0         .39
6 ADDHYD 4    51 4 5 2
6 RUNOFF 1  49       1        0.10       78.0        0.34
6 ADDHYD 4    51 1 2 5
6 RUNOFF 1  52       1        0.19       85.0        0.61
6 ADDHYD 4    51 1 5 3
6 RUNOFF 1  65       1        0.10       85.0        0.26
6 REACH  3 158   1   2      3600.0         .4        1.63
6 RUNOFF 1  58       1        0.17       93.0        0.26
6 ADDHYD 4    58 1 2 5
6 REACH  3 152   5   1      3500.0        0.3        1.63
6 RESVOR 2    93 1   2
6 ADDHYD 4    51 3 2 4
6 RUNOFF 1  62       3        0.25       86.0         .70
6 REACH  3 161   3   2      3400.0         .7        1.51
6 RUNOFF 1  61       1        0.13       73.0        0.62
6 ADDHYD 4    61 1 2 3
6 REACH  3 150   3   2      2950.0        0.6        1.53
6 RUNOFF 1  50       3        0.13       85.0        0.64
6 ADDHYD 4    50 2 3 1
6 RESVOR 2    95 1   5
6 REACH  3 149   5   2      2400.0        0.3        1.63
6 ADDHYD 4    51 4 2 3
6 REACH  3 148   3   1      3300.0        0.3        1.62
6 RUNOFF 1  48       2        0.15       73.0        0.23
6 ADDHYD 4 148   1 2 4
6 RUNOFF 1  66       3        0.31       87.0         .43
6 REACH  3 157   3   2      2300.0        0.8        1.53
6 RUNOFF 1  57       3        0.16       93.0        0.34
6 ADDHYD 4    57 2 3 1
6 REACH  3 154   1   2      3500.0        0.5        1.61
6 RUNOFF 1  55       3        0.25       86.0         .46
6 ADDHYD 4    54 2 3 1
6 RUNOFF 1  56       3        0.15       83.0        0.23
6 REACH  3 155   3   2      3450.0        0.6        1.53
6 ADDHYD 4    54 2 1 5
6 RUNOFF 1  54       7        0.25       93.0        0.33
6 ADDHYD 4    54 7 5 2
6 RESVOR 2    92 2   3
6 REACH  3 153   3   6      2050.0        0.5        1.61
6 RUNOFF 1  53       5        0.17       74.0        0.41
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 6 ADDHYD 4     30 2 3 1
 6 RUNOFF 1  44         3          0.11         81.0          .42
 6 REACH  3 135    3    2        3100.0          0.9         1.52
 6 RUNOFF 1  35         3          0.12         84.0         0.34
 6 ADDHYD 4     35 3 2 5
 6 RUNOFF 1  34         4          0.29         84.0          .54
 6 ADDHYD 4     35 5 4 3
 6 REACH  3 130    3    2        3700.0          0.9         1.52
 6 ADDHYD 4     30 1 2 3
 6 RUNOFF 1  32         1          0.11         95.0         0.56
 6 RUNOFF 1  33         2          0.29         92.0         0.25
 6 ADDHYD 4     33 2 1 4
 6 REACH  3 131    4    2        4400.0          0.7         1.52
 6 ADDHYD 4     30 3 2 1
 6 REACH  3 125    1    3        1200.0          0.4         1.63
 6 RUNOFF 1  26         2          0.19         85.0          .22
 6 ADDHYD 4     25 3 2 1
 6 RUNOFF 1  25         2          0.04         82.0          .07
 6 ADDHYD 4     25 1 2 3
 6 RUNOFF 1  24         1          0.19         93.0         0.23
 6 ADDHYD 4     25 1 3 2
 6 REACH  3 120    2    4        2700.0          0.4         1.61
 6 RUNOFF 1  22         2          0.13         90.0         0.13
 6 ADDHYD 4     20 4 2 3
 6 RUNOFF 1  20         2          0.09         79.0          .19
 6 ADDHYD 4     20 3 2 1
 5 RUNOFF 1  21         2          0.12         86.0         0.14
 6 ADDHYD 4     20 2 1 3
 5 RUNOFF 1  19         2          0.17         85.0         0.28
 5 ADDHYD 4     20 3 2 1
 6 RUNOFF 1  83         2          0.11         91.0         0.23
 6 ADDHYD 4     20 1 2 3
 5 RUNOFF 1  23         2          0.28         93.0          .34
 3 REACH  3 183    2    1        2700.0          1.4         1.45
 6 ADDHYD 4     20 1 3 2
 5 RESVOR 2     98 2    5
 5 REACH  3 113    5    1        4200.0          0.1         1.65
 6 RUNOFF 1  13         3          0.24         82.0         0.30
 5 ADDHYD 4     13 1 3 2
 ) RUNOFF 1  14         3          0.07         86.0         0.23
 6 ADDHYD 4     13 2 3 1
 6 RUNOFF 1  15         2          0.17         84.0         0.31
 ) ADDHYD 4     13 1 2 3
 ) RUNOFF 1  16         2          0.21         83.0         0.34
 6 REACH  3 115    2    1        1800.0          0.8         1.55
 · ADDHYD 4     13 1 3 2
   RUNOFF 1  18         1          0.13         87.0         0.23
 6 RUNOFF 1  17         3          0.17         85.0         0.30
   ADDHYD 4     18 1 3 6
   REACH  3 114    6    3        1750.0          0.7         1.56
 6 ADDHYD 4     13 3 2 1
 4 REACH  3 106    1    2        3100.0          0.3         1.64
   RUNOFF 1   6         1          0.13         81.0         0.37
 ) ADDHYD 4      6 1 2 3
 6 RUNOFF 1   5         2          0.15         84.0         0.26
   ADDHYD 4      6 3 2 1
   RUNOFF 1   7         3          0.19         93.0         0.54
 6 ADDHYD 4      6 3 1 2
   RUNOFF 1  11         1          0.16         91.0          .35
   RUNOFF 1  12         3          0.13         93.0          .30
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6 ADDHYD 4     53 6 5 1
6 REACH  3 147   1   3       2300.0          0.4         1.62
6 RUNOFF 1  47         2        0.27         74.0         0.45
6 ADDHYD 4 147   3 2 6
6 RUNOFF 1 142         1        0.06         81.0          .53
6 ADDHYD 4 147   1 6 2
6 ADDHYD 4 148   2 4 1
6 REACH  3 141   1   2       2100.0
6 RUNOFF 1 122         3        0.03         76.0          .36
6 ADDHYD 4 143   2 3 1
6 RUNOFF 1 141         3        0.05         67.0         0.42
6 ADDHYD 4 143   3 1 2
6 RUNOFF 1 145         1        0.24         86.0          .32
6 RUNOFF 1 146         3        0.18         75.0         0.45
6 ADDHYD 4 145   1 3 4
6 RUNOFF 1 121         1        0.05         76.0          .40
6 ADDHYD 4 145   1 4 3
6 REACH  3 143   3   1       1900.0
6 RUNOFF 1 123         3        0.04         81.0          .35
6 ADDHYD 4 142   3 1 5
6 ADDHYD 4 142   2 5 1
6 REACH  3 186   1   2        700.0
6 RUNOFF 1 124         1        0.02         81.0          .41
6 ADDHYD 4 141   2 1 3
6 RUNOFF 1 140         1        0.33         79.0          .65
6 ADDHYD 4 141   1 3 2
6 REACH  3 185   2   1       1100.0
6 RUNOFF 1 125         2        0.03         80.0         0.46
6 ADDHYD 4 185   1 2 3
6 RUNOFF 1 139         1        0.15         84.0         0.63
6 ADDHYD 4 185   3 1 4
6 RUNOFF 1 143         1        0.25         82.0          .43
6 ADDHYD 4 185   4 1 2
6 REACH  3 137   2   1       3300.0
6 RUNOFF 1 128         2        0.04         75.0          .39
6 ADDHYD 4 137   1 2 3
6 RUNOFF 1 137         2        0.11         80.0          .44
6 ADDHYD 4 137   3 2 1
6 RUNOFF 1 126         2        0.08         79.0          .45
6 RUNOFF 1 127         3        0.07         82.0         0.39
6 ADDHYD 4 137   2 3 4
6 ADDHYD 4 137   1 4 2
6 RESVOR 2     91 2   3
6 REACH  3 129   3   2       3800.0          0.1         1.65
6 RUNOFF 1  27         3        0.16         85.0         0.23
6 ADDHYD 4     29 2 3 1
6 RUNOFF 1  38         3        0.32         76.0         0.58
6 REACH  3 128   3   2       1700.0          1.2         1.47
6 RUNOFF 1  28         4        0.17         86.0         0.18
6 ADDHYD 4     28 2 4 5
6 REACH  3 127   5   3       2300.0          1.0         1.47
6 ADDHYD 4     29 1 3 5
5 RUNOFF 1  29         1         .20         80.0          .24
5 ADDHYD 4  29   1 5 4
5 REACH  3 184   4   2       1350.0           .2         1.63
5 RUNOFF 1  84         3        0.04         86.0          .08
5 ADDHYD 4     30 2 3 1
5 RUNOFF 1  30         3        0.10         82.0         0.57
5 ADDHYD 4     30 3 1 2
5 RUNOFF 1  31         3        0.21         92.0          .70
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6 ADDHYD 4     11 3 1 5
6 REACH  3 107   5   1        2650.0          1.0         1.45
6 ADDHYD 4      6 1 2 3
6 RESVOR 2     97 3   4
6 REACH  3 104   4   1        1950.0          0.2         1.65
6 RUNOFF 1   4         2          0.19         86.0        0.24
6 ADDHYD 4      4 1 2 3
6 RUNOFF 1   8         2          0.20         91.0         .39
6 ADDHYD 4      8 3 2 1
6 RUNOFF 1  10         2          0.14         85.0        0.17
6 REACH  3 109   2   3        2350.0          1.8         1.41
6 RUNOFF 1   9         2          0.25         87.0        0.15
6 ADDHYD 4      9 3 2 4
6 REACH  3 108   4   2        2500.0          0.9         1.47
6 ADDHYD 4     99 1 2 4
  ENDATA
7 INCREM 6                    .083
7 COMPUT 7  82       99          0.0          4.4         1.01 2  01  01 100-YR
  ENDCMP 1
7 COMPUT 7  82       99          0.0          3.0         1.01 2  01  02 10-YR
  ENDCMP 1
  ENDJOB 2
```

TR-20 ANALYSIS

SAND CREEK D.B.P.S. FULLY DEVELOPED CONDITION MODEL MODIFIED TO REFLECT CURRENT PROPOSED FULLY DEVELOPED CONDITION IN ON-SITE AREA

MODEL OUTPUT

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 137	ADDHYD	9.78	1	2	.08	.0	4.40	24.00	1.88	3.61	6.30	3285.02	335.9
XSECTION 137	RUNOFF	.11	1	2	.08	.0	4.40	24.00	2.37	---	6.13	179.79	1634.5
XSECTION 137	ADDHYD	9.89	1	2	.08	.0	4.40	24.00	1.88	3.70	6.29	3417.32	345.5
XSECTION 126	RUNOFF	.08	1	2	.08	.0	4.40	24.00	2.29	---	6.14	124.80	1560.0
XSECTION 127	RUNOFF	.07	1	2	.08	.0	4.40	24.00	2.55	---	6.10	131.62	1880.3
XSECTION 137	ADDHYD	.15	1	2	.08	.0	4.40	24.00	2.41	.66	6.12	255.51	1703.4
XSECTION 137	ADDHYD	10.04	1	2	.08	.0	4.40	24.00	1.89	3.82	6.27	3599.69	358.5
STRUCTURE 91	RESVOR	10.04	1	2	.08	.0	4.40	24.00	1.89	63.31	6.37	3383.76	337.0
XSECTION 129	REACH	10.04	1	2	.08	.0	4.40	24.00	1.88	---	6.52	3211.71	319.9
XSECTION 27	RUNOFF	.16	1	2	.08	.0	4.40	24.00	2.82	---	6.02	402.22	2513.9
STRUCTURE 29	ADDHYD	10.20	1	2	.08	.0	4.40	24.00	1.90	---	6.52	3255.04	319.1
XSECTION 38	RUNOFF	.32	1	2	.08	.0	4.40	24.00	2.04	---	6.22	368.55	1151.7
XSECTION 128	REACH	.32	1	2	.08	.0	4.40	24.00	2.04	---	6.31	368.18	1150.6
XSECTION 28	RUNOFF	.17	1	2	.08	.0	4.40	24.00	2.92	---	5.99	446.97	2629.3
STRUCTURE 28	ADDHYD	.49	1	2	.08	.0	4.40	24.00	2.35	---	6.05	627.69	1281.0
XSECTION 127	REACH	.49	1	2	.08	.0	4.40	24.00	2.34	---	6.14	614.64	1254.4
TRUCTURE 29	ADDHYD	10.69	1	2	.08	.0	4.40	24.00	1.92	---	6.50	3639.35	340.4
SECTION 29	RUNOFF	.20	1	2	.08	.0	4.40	24.00	2.38	---	6.03	421.54	2107.7
XSECTION 29	ADDHYD	10.89	1	2	.08	.0	4.40	24.00	1.93	---	6.50	3690.06	338.8
SECTION 184	REACH	10.89	1	2	.08	.0	4.40	24.00	1.93	---	6.50	3690.06	338.8
XSECTION 84	RUNOFF	.04	1	2	.08	.0	4.40	24.00	2.89	---	5.94	117.00	2925.0
STRUCTURE 30	ADDHYD	10.93	1	2	.08	.0	4.40	24.00	1.93	---	6.50	3699.61	338.5
SECTION 30	RUNOFF	.10	1	2	.08	.0	4.40	24.00	2.55	---	6.20	153.79	1537.9
STRUCTURE 30	ADDHYD	11.03	1	2	.08	.0	4.40	24.00	1.93	---	6.49	3784.09	343.1
XSECTION 31	RUNOFF	.21	1	2	.08	.0	4.40	24.00	3.51	---	6.24	411.97	1961.8
TRUCTURE 30	ADDHYD	11.24	1	2	.08	.0	4.40	24.00	1.96	---	6.47	4088.97	363.8
XSECTION 44	RUNOFF	.11	1	2	.08	.0	4.40	24.00	2.46	---	6.12	192.18	1747.1
SECTION 135	REACH	.11	1	2	.08	.0	4.40	24.00	2.46	---	6.25	177.81	1616.4
SECTION 35	RUNOFF	.12	1	2	.08	.0	4.40	24.00	2.72	---	6.07	257.11	2142.6
STRUCTURE 35	ADDHYD	.23	1	2	.08	.0	4.40	24.00	2.60	---	6.13	396.46	1723.7
ECTION 34	RUNOFF	.29	1	2	.08	.0	4.40	24.00	2.72	---	6.17	493.81	1702.8
STRUCTURE 35	ADDHYD	.52	1	2	.08	.0	4.40	24.00	2.67	---	6.15	885.71	1703.3
XSECTION 130	REACH	.52	1	2	.08	.0	4.40	24.00	2.67	---	6.26	859.11	1652.1
RUCTURE 30	ADDHYD	11.76	1	2	.08	.0	4.40	24.00	1.99	---	6.43	4736.10	402.7
ECTION 32	RUNOFF	.11	1	2	.08	.0	4.40	24.00	3.82	---	6.15	266.06	2418.7
ECTION 33	RUNOFF	.29	1	2	.08	.0	4.40	24.00	3.50	---	6.02	870.16	3000.5

		(SQ MI)			(HR)	(HR)	(IN)	(HR)	(IN)	(FT)	(HR)	(CFS)	(CSM)
ALTERNATE 1 STORM 1													
XSECTION 53	RUNOFF	.17	1	2	.08	.0	4.40	24.00	1.89	---	6.13	222.27	1307.5
STRUCTURE 53	ADDHYD	1.29	1	2	.08	.0	4.40	24.00	2.10	---	6.16	256.09	198.5
XSECTION 147	REACH	1.29	1	2	.08	.0	4.40	24.00	2.09	---	6.28	242.09	187.7
XSECTION 47	RUNOFF	.27	1	2	.08	.0	4.40	24.00	1.89	---	6.15	336.71	1247.1
XSECTION 147	ADDHYD	1.56	1	2	.08	.0	4.40	24.00	2.06	---	6.20	551.92	353.8
XSECTION 142	RUNOFF	.06	1	2	.08	.0	4.40	24.00	2.46	---	6.17	92.93	1548.8
XSECTION 147	ADDHYD	1.62	1	2	.08	.0	4.40	24.00	2.07	---	6.19	644.08	397.6
XSECTION 148	ADDHYD	8.37	1	2	.08	.0	4.40	24.00	1.80	---	7.17	2633.35	314.6
XSECTION 141	REACH	8.37	1	2	.08	.0	4.40	24.00	1.79	4.64	7.25	2632.66	314.5
XSECTION 122	RUNOFF	.03	1	2	.08	.0	4.40	24.00	2.05	---	6.10	46.28	1542.8
XSECTION 143	ADDHYD	8.40	1	2	.08	.0	4.40	24.00	1.79	7.16	7.25	2635.65	313.8
XSECTION 141	RUNOFF	.05	1	2	.08	.0	4.40	24.00	1.40	---	6.15	44.75	895.0
XSECTION 143	ADDHYD	8.45	1	2	.08	.0	4.40	24.00	1.79	7.17	7.25	2639.80	312.4
XSECTION 145	RUNOFF	.24	1	2	.08	.0	4.40	24.00	2.91	---	6.05	566.69	2361.2
XSECTION 146	RUNOFF	.18	1	2	.08	.0	4.40	24.00	1.97	---	6.15	235.30	1307.2
XSECTION 145	ADDHYD	.42	1	2	.08	.0	4.40	24.00	2.51	---	6.08	782.67	1863.5
XSECTION 121	RUNOFF	.05	1	2	.08	.0	4.40	24.00	2.05	---	6.12	72.62	1452.3
XSECTION 145	ADDHYD	.47	1	2	.08	.0	4.40	24.00	2.46	---	6.08	853.15	1815.2
XSECTION 143	REACH	.47	1	2	.08	.0	4.40	24.00	2.46	3.91	6.08	853.15	1815.2
XSECTION 123	RUNOFF	.04	1	2	.08	.0	4.40	24.00	2.46	---	6.08	75.90	1897.6
XSECTION 142	ADDHYD	.51	1	2	.08	.0	4.40	24.00	2.46	---	6.08	929.05	1821.7
XSECTION 142	ADDHYD	8.96	1	2	.08	.0	4.40	24.00	1.83	---	7.24	2697.83	301.1
XSECTION 186	REACH	8.96	1	2	.08	.0	4.40	24.00	1.83	3.21	7.24	2697.83	301.1
XSECTION 124	RUNOFF	.02	1	2	.08	.0	4.40	24.00	2.46	---	6.11	35.31	1765.7
XSECTION 141	ADDHYD	8.98	1	2	.08	.0	4.40	24.00	1.83	4.71	7.24	2700.26	300.7
XSECTION 140	RUNOFF	.33	1	2	.08	.0	4.40	24.00	2.29	---	6.25	406.27	1231.1
XSECTION 141	ADDHYD	9.31	1	2	.08	.0	4.40	24.00	1.85	4.76	7.23	2759.34	296.4
XSECTION 185	REACH	9.31	1	2	.08	.0	4.40	24.00	1.85	3.25	7.23	2759.34	296.4
XSECTION 125	RUNOFF	.03	1	2	.08	.0	4.40	24.00	2.37	---	6.14	48.22	1607.2
XSECTION 185	ADDHYD	9.34	1	2	.08	.0	4.40	24.00	1.85	3.25	7.23	2763.27	295.9
XSECTION 139	RUNOFF	.15	1	2	.08	.0	4.40	24.00	2.72	---	6.22	233.19	1554.6
XSECTION 185	ADDHYD	9.49	1	2	.08	.0	4.40	24.00	1.86	3.38	6.19	2934.87	309.3
XSECTION 143	RUNOFF	.25	1	2	.08	.0	4.40	24.00	2.55	---	6.12	449.59	1798.4
XSECTION 185	ADDHYD	9.74	1	2	.08	.0	4.40	24.00	1.88	3.67	6.18	3380.54	347.1
XSECTION 137	REACH	9.74	1	2	.08	.0	4.40	24.00	1.88	3.59	6.30	3249.53	333.6
XSECTION 128	RUNOFF	.04	1	2	.08	.0	4.40	24.00	1.97	---	6.12	56.35	1408.7

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

XSECTION 52	RUNOFF	.19	1	2	.08	.0	4.40	24.00	2.81	---	6.21	311.88	1641.5
STRUCTURE 51	ADDHYD	5.82	1	2	.08	.0	4.40	24.00	1.69	---	7.09	2315.31	397.8
XSECTION 65	RUNOFF	.10	1	2	.08	.0	4.40	24.00	2.82	---	6.03	244.95	2449.5
XSECTION 158	REACH	.10	1	2	.08	.0	4.40	24.00	2.82	---	6.24	213.73	2137.3
XSECTION 58	RUNOFF	.17	1	2	.08	.0	4.40	24.00	3.61	---	6.02	517.29	3042.9
STRUCTURE 58	ADDHYD	.27	1	2	.08	.0	4.40	24.00	3.32	---	6.05	647.91	2399.7
XSECTION 152	REACH	.27	1	2	.08	.0	4.40	24.00	3.31	---	6.17	600.45	2223.9
STRUCTURE 93	RESVOR	.27	1	2	.08	.0	4.40	24.00	3.08	6.82	6.64	178.27	660.2
STRUCTURE 51	ADDHYD	6.09	1	2	.08	.0	4.40	24.00	1.75	---	7.07	2448.96	402.1
XSECTION 62	RUNOFF	.25	1	2	.08	.0	4.40	24.00	2.91	---	6.26	394.99	1580.0
XSECTION 161	REACH	.25	1	2	.08	.0	4.40	24.00	2.91	---	6.41	373.47	1493.9
XSECTION 61	RUNOFF	.13	1	2	.08	.0	4.40	24.00	1.82	---	6.25	123.70	951.5
STRUCTURE 61	ADDHYD	.38	1	2	.08	.0	4.40	24.00	2.54	---	6.37	481.68	1267.6
XSECTION 150	REACH	.38	1	2	.08	.0	4.40	24.00	2.54	---	6.50	466.70	1228.2
XSECTION 50	RUNOFF	.13	1	2	.08	.0	4.40	24.00	2.82	---	6.22	208.78	1606.0
STRUCTURE 50	ADDHYD	.51	1	2	.08	.0	4.40	24.00	2.61	---	6.43	616.00	1207.8
STRUCTURE 95	RESVOR	.51	1	2	.08	.0	4.40	24.00	1.54	9.45	8.57	41.35	81.1
XSECTION 149	REACH	.51	1	2	.08	.0	4.40	24.00	1.53	---	8.82	41.32	81.0
STRUCTURE 51	ADDHYD	6.60	1	2	.08	.0	4.40	24.00	1.73	---	7.08	2472.38	374.6
XSECTION 148	REACH	6.60	1	2	.08	.0	4.40	24.00	1.73	---	7.18	2463.04	373.2
XSECTION 48	RUNOFF	.15	1	2	.08	.0	4.40	24.00	1.82	---	6.04	243.72	1624.8
XSECTION 148	ADDHYD	6.75	1	2	.08	.0	4.40	24.00	1.73	---	7.18	2477.43	367.0
XSECTION 66	RUNOFF	.31	1	2	.08	.0	4.40	24.00	3.00	---	6.11	668.83	2157.5
XSECTION 157	REACH	.31	1	2	.08	.0	4.40	24.00	3.00	---	6.20	663.21	2139.4
XSECTION 57	RUNOFF	.16	1	2	.08	.0	4.40	24.00	3.61	---	6.04	452.40	2827.5
STRUCTURE 57	ADDHYD	.47	1	2	.08	.0	4.40	24.00	3.21	---	6.13	1041.60	2216.2
XSECTION 154	REACH	.47	1	2	.08	.0	4.40	24.00	3.21	---	6.23	1017.74	2165.4
XSECTION 55	RUNOFF	.25	1	2	.08	.0	4.40	24.00	2.91	---	6.13	505.86	2023.5
STRUCTURE 54	ADDHYD	.72	1	2	.08	.0	4.40	24.00	3.10	---	6.19	1479.29	2054.6
XSECTION 56	RUNOFF	.15	1	2	.08	.0	4.40	24.00	2.63	---	6.03	354.24	2361.6
XSECTION 155	REACH	.15	1	2	.08	.0	4.40	24.00	2.63	---	6.14	315.06	2100.4
STRUCTURE 54	ADDHYD	.87	1	2	.08	.0	4.40	24.00	3.02	---	6.18	1784.67	2051.3
(SECTION 54	RUNOFF	.25	1	2	.08	.0	4.40	24.00	3.61	---	6.04	714.19	2856.8
STRUCTURE 54	ADDHYD	1.12	1	2	.08	.0	4.40	24.00	3.15	---	6.13	2385.37	2129.8
STRUCTURE 92	RESVOR	1.12	1	2	.08	.0	4.40	24.00	2.14	9.64	8.35	93.58	83.6
XSECTION 153	REACH	1.12	1	2	.08	.0	4.40	24.00	2.13	---	8.48	93.56	83.5

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ RUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM	PRECIPITATION BEGIN	PRECIPITATION AMOUNT	PRECIPITATION DURATION	RUNOFF AMOUNT	PEAK DISCHARGE ELEVATION	PEAK DISCHARGE TIME	PEAK DISCHARGE RATE	PEAK DISCHARGE RATE

XSECTION 87	RUNOFF	.04	1	2	.08	.0	4.40	24.00	1.68	---	6.00	64.35	1608.6
STRUCTURE 87	ADDHYD	3.62	1	2	.08	.0	4.40	24.00	1.51	---	6.46	2387.76	659.6
XSECTION 72	RUNOFF	.25	1	2	.08	.0	4.40	24.00	1.60	---	6.04	354.53	1418.1
XSECTION 169	REACH	.25	1	2	.08	.0	4.40	24.00	1.60	---	6.15	327.64	1310.6
XSECTION 69	RUNOFF	.25	1	2	.08	.0	4.40	24.00	1.97	---	6.36	219.07	876.3
STRUCTURE 69	ADDHYD	.50	1	2	.08	.0	4.40	24.00	1.79	---	6.18	495.97	991.9
XSECTION 186	REACH	.50	1	2	.08	.0	4.40	24.00	1.79	1.15	6.18	495.97	991.9
XSECTION 86	RUNOFF	.05	1	2	.08	.0	4.40	24.00	1.97	---	6.10	71.95	1439.0
STRUCTURE 87	ADDHYD	.55	1	2	.08	.0	4.40	24.00	1.80	---	6.17	563.33	1024.2
STRUCTURE 87	ADDHYD	4.17	1	2	.08	.0	4.40	24.00	1.54	---	6.44	2702.46	648.1
XSECTION 163	REACH	4.17	1	2	.08	.0	4.40	24.00	1.54	---	6.56	2632.57	631.3
XSECTION 63	RUNOFF	.16	1	2	.08	.0	4.40	24.00	1.82	---	6.14	194.93	1218.3
STRUCTURE 63	ADDHYD	4.33	1	2	.08	.0	4.40	24.00	1.55	---	6.55	2689.28	621.1
XSECTION 160	REACH	4.33	1	2	.08	.0	4.40	24.00	1.55	---	6.67	2631.49	607.7
XSECTION 60	RUNOFF	.15	1	2	.08	.0	4.40	24.00	1.74	---	6.13	178.07	1187.1
STRUCTURE 60	ADDHYD	4.48	1	2	.08	.0	4.40	24.00	1.56	---	6.66	2667.50	595.4
XSECTION 59	RUNOFF	.16	1	2	.08	.0	4.40	24.00	2.91	---	6.06	371.80	2323.7
STRUCTURE 60	ADDHYD	4.64	1	2	.08	.0	4.40	24.00	1.61	---	6.66	2711.61	584.4
XSECTION 68	RUNOFF	.22	1	2	.08	.0	4.40	24.00	1.97	---	6.26	224.59	1020.9
XSECTION 167	REACH	.22	1	2	.08	.0	4.40	24.00	1.97	---	6.42	206.19	937.2
XSECTION 67	RUNOFF	.27	1	2	.08	.0	4.40	24.00	2.81	---	6.17	477.87	1769.9
STRUCTURE 67	ADDHYD	.49	1	2	.08	.0	4.40	24.00	2.44	---	6.23	620.87	1267.1
XSECTION 164	REACH	.49	1	2	.08	.0	4.40	24.00	2.43	---	6.33	612.79	1250.6
XSECTION 64	RUNOFF	.25	1	2	.08	.0	4.40	24.00	2.81	---	6.05	584.18	2336.7
STRUCTURE 64	ADDHYD	.74	1	2	.08	.0	4.40	24.00	2.56	---	6.13	971.26	1312.5
XSECTION 159	REACH	.74	1	2	.08	.0	4.40	24.00	2.56	---	6.23	953.85	1289.0
STRUCTURE 60	ADDHYD	5.38	1	2	.08	.0	4.40	24.00	1.74	---	6.60	3295.53	612.6
XSECTION 151	REACH	5.38	1	2	.08	.0	4.40	24.00	1.74	---	6.73	3231.01	600.6
STRUCTURE 94	RESVOR	5.38	1	2	.08	.0	4.40	24.00	1.63	10.95	7.10	2237.01	415.8
XSECTION 51	RUNOFF	.15	1	2	.08	.0	4.40	24.00	1.97	---	6.12	211.31	1408.7
STRUCTURE 51	ADDHYD	5.53	1	2	.08	.0	4.40	24.00	1.64	---	7.10	2255.57	407.9
XSECTION 49	RUNOFF	.10	1	2	.08	.0	4.40	24.00	2.21	---	6.08	170.40	1704.0
STRUCTURE 51	ADDHYD	5.63	1	2	.08	.0	4.40	24.00	1.65	---	7.10	2269.58	403.1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)

ALTERNATE 1 STORM 1

XSECTION 74	RUNOFF	.18	1	2	.08	.0	4.40	24.00	1.40	---	6.18	148.53	825.2
STRUCTURE 74	ADDHYD	.37	1	2	.08	.0	4.40	24.00	1.40	---	6.14	379.44	1025.5
XSECTION 173	REACH	.37	1	2	.08	.0	4.40	24.00	1.40	---	6.25	346.58	936.7
XSECTION 75	RUNOFF	.12	1	2	.08	.0	4.40	24.00	1.40	---	6.33	75.13	626.1
STRUCTURE 75	ADDHYD	.49	1	2	.08	.0	4.40	24.00	1.40	---	6.25	418.87	854.8
XSECTION 73	RUNOFF	.12	1	2	.08	.0	4.40	24.00	1.40	---	6.21	92.61	771.7
STRUCTURE 75	ADDHYD	.61	1	2	.08	.0	4.40	24.00	1.40	---	6.25	510.06	836.2
XSECTION 81	RUNOFF	.39	1	2	.08	.0	4.40	24.00	1.40	---	6.20	304.01	779.5
XSECTION 175	REACH	.39	1	2	.08	.0	4.40	24.00	1.40	---	6.36	271.28	695.6
STRUCTURE 75	ADDHYD	1.00	1	2	.08	.0	4.40	24.00	1.40	---	6.28	754.36	754.4
XSECTION 80	RUNOFF	.22	1	2	.08	.0	4.40	24.00	1.40	---	6.14	202.83	922.0
XSECTION 176	REACH	.22	1	2	.08	.0	4.40	24.00	1.40	---	6.30	166.10	755.0
STRUCTURE 75	ADDHYD	1.22	1	2	.08	.0	4.40	24.00	1.40	---	6.28	919.57	753.7
XSECTION 76	RUNOFF	.17	1	2	.08	.0	4.40	24.00	1.39	---	6.31	107.47	632.2
STRUCTURE 75	ADDHYD	1.39	1	2	.08	.0	4.40	24.00	1.40	---	6.28	1026.56	738.5
XSECTION 172	REACH	1.39	1	2	.08	.0	4.40	24.00	1.40	---	6.28	1026.56	738.5
XSECTION 88	RUNOFF	.10	1	2	.08	.0	4.40	24.00	1.40	---	6.11	100.20	1002.0
STRUCTURE 77	ADDHYD	1.49	1	2	.08	.0	4.40	24.00	1.40	---	6.27	1086.70	729.3
XSECTION 77	RUNOFF	.25	1	2	.08	.0	4.40	24.00	1.40	---	6.23	182.71	730.9
STRUCTURE 77	ADDHYD	1.74	1	2	.08	.0	4.40	24.00	1.40	---	6.26	1275.55	733.1
XSECTION 79	RUNOFF	.29	1	2	.08	.0	4.40	24.00	1.40	---	6.08	318.12	1097.0
XSECTION 178	REACH	.29	1	2	.08	.0	4.40	24.00	1.40	---	6.20	284.15	979.8
XSECTION 78	RUNOFF	.88	1	2	.08	.0	4.40	24.00	1.40	---	6.16	762.75	866.8
STRUCTURE 78	ADDHYD	1.17	1	2	.08	.0	4.40	24.00	1.40	---	6.17	1041.83	890.4
XSECTION 177	REACH	1.17	1	2	.08	.0	4.40	24.00	1.40	---	6.28	998.05	853.0
STRUCTURE 77	ADDHYD	2.91	1	2	.08	.0	4.40	24.00	1.40	---	6.27	2262.04	777.3
XSECTION 171	REACH	2.91	1	2	.08	.0	4.40	24.00	1.40	---	6.40	2130.34	732.1
XSECTION 71	RUNOFF	.36	1	2	.08	.0	4.40	24.00	1.97	---	6.07	575.74	1599.3
STRUCTURE 71	ADDHYD	3.27	1	2	.08	.0	4.40	24.00	1.46	---	6.39	2270.28	694.3
XSECTION 170	REACH	3.27	1	2	.08	.0	4.40	24.00	1.46	---	6.47	2264.65	692.6

UMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

ECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 70	RUNOFF	.31	1	2	.08	.0	4.40	24.00	1.97	---	6.09	458.78	1479.9
RUCTURE 70	ADDHYD	3.58	1	2	.08	.0	4.40	24.00	1.50	---	6.46	2380.85	665.0
ECTION 187	REACH	3.58	1	2	.08	.0	4.40	24.00	1.50	---	6.46	2380.85	665.0

*** WARNING REACH 185 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 128 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 127 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 184 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 125 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 120 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 183 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 115 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 114 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 106 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 107 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 104 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 109 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 108 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

COMPUTATIONS COMPLETED FOR PASS 2

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
SECTION 82	RUNOFF	.19	1	2	.08	.0	4.40	24.00	1.40	---	6.03	249.72	1314.3
SECTION 174	REACH	.19	1	2	.08	.0	4.40	24.00	1.40.	---	6.13	235.29	1238.4

TIME(HRS)		FIRST HYDROGRAPH POINT =	.00 HOURS			TIME INCREMENT =	.08 HOURS		DRAINAGE AREA =		.04 SQ.MI.
4.98	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.61
5.81	DISCHG	9.31	18.83	27.43	27.70	10.91	5.11	3.75	3.46	3.43	3.23
6.64	DISCHG	2.45	2.20	2.15	2.15	2.16	2.03	1.54	1.37	1.33	1.33
7.47	DISCHG	1.33	1.38	1.55	1.62	1.64	1.65	1.66	1.54	1.02	.82
8.30	DISCHG	.78	.77	.77	.77	.77	.77	.77	.77	.77	.78
9.13	DISCHG	.78	.78	.78	.78	.78	.78	.78	.79	.79	.79
9.96	DISCHG	.79	.76	.53	.43	.40	.40	.40	.40	.40	.40
10.79	DISCHG	.40	.40	.40	.46	.92	1.14	1.19	1.21	1.21	1.16
11.62	DISCHG	.70	.47	.42	.41	.41	.43	.66	.78	.81	.82
12.45	DISCHG	.82	.80	.57	.45	.42	.41	.41	.41	.41	.41
13.28	DISCHG	.41	.41	.41	.41	.41	.42	.42	.42	.42	.42
14.11	DISCHG	.46	.49	.50	.50	.50	.50	.50	.50	.50	.50
14.94	DISCHG	.50	.50	.51	.51	.51	.51	.51	.51	.55	.58
15.77	DISCHG	.59	.59	.59	.59	.51	.45	.43	.43	.43	.43
16.60	DISCHG	.43	.43	.43	.43	.43	.43	.43	.43	.43	.43
17.43	DISCHG	.43	.43	.43	.43	.43	.43	.43	.43	.43	.43
18.26	DISCHG	.43	.43	.43	.43	.43	.43	.43	.43	.43	.44
19.09	DISCHG	.44	.44	.44	.44	.44	.44	.44	.44	.44	.44
19.92	DISCHG	.44	.44	.37	.29	.27	.26	.26	.26	.23	.19
20.75	DISCHG	.18	.18	.18	.18	.21	.25	.26	.26	.26	.26
21.58	DISCHG	.23	.19	.18	.18	.18	.18	.21	.25	.26	.26
22.41	DISCHG	.27	.27	.24	.19	.18	.18	.18	.18	.20	.25
23.24	DISCHG	.26	.27	.27	.27	.24	.19	.18	.18	.18	.18
24.07	DISCHG	.13	.04	.01	.00						

***WARNING - LACK OF LOW FLOW DEFINITION FOR XSECT TABLE186. MAX.FLOW LESS THAN 2ND TABLE VALUE.

*** WARNING REACH 186 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 164 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 159 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***
*** WARNING - REACH 149 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 10.06 CFS, 71.35 % OF PEAK.

*** WARNING REACH 157 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 154 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***
*** WARNING - REACH 153 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 31.46 CFS, 46.24 % OF PEAK.
*** WARNING - REACH 147 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 31.86 CFS, 27.80 % OF PEAK.

*** WARNING REACH 141 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***
*** WARNING - REACH 141 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 98.98 CFS, 12.04 % OF PEAK.

*** WARNING REACH 143 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 186 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 137 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 128 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 127 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 184 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 130 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 125 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 120 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 183 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 115 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 114 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 106 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 107 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 104 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 109 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 108 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

COMPUTATIONS COMPLETED FOR PASS 1

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID 10-YR

FROM XSECTION 82

TO STRUCTURE 99

STARTING TIME = .00 RAIN DEPTH = 3.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2

ALTERNATE NO.= 1 STORM NO.= 2 MAIN TIME INCREMENT = .08 HOURS

*** WARNING REACH 172 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 170 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 187 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING-MAIN TIME INCREMENT MAY BE TOO LARGE.

COMPUTED PEAK(29.70) AT EXCEEDS MAX. ADJACENT HYDROGRAPH COORDINATE BY 7 %.

XSECTION 87

EXECUTIVE CONTROL OPERATION INGREM

\+ RECORD ID

MAIN TIME INCREMENT = .08 HOURS

EXECUTIVE CONTROL OPERATION COMPUT

\+ RECORD ID 100-YR

FROM XSECTION 82

TO STRUCTURE 99

STARTING TIME = .00 RAIN DEPTH = 4.40 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 1 MAIN TIME INCREMENT = .08 HOURS

*** WARNING REACH 174 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 173 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 172 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 177 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 170 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 187 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 169 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 186 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 164 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 159 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***
*** WARNING - REACH 149 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 16.49 CFS, 39.87 % OF PEAK.

*** WARNING REACH 148 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 157 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 154 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***
*** WARNING - REACH 153 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 60.20 CFS, 64.33 % OF PEAK.
*** WARNING - REACH 147 INFLOW HYDROGRAPH VOLUME TRUNCATED ABOVE BASEFLOW AT 60.73 CFS, 23.77 % OF PEAK.

*** WARNING REACH 141 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 143 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 186 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 185 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

FILE NO. 1

COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1983 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:
CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

XSECTION 185	ADDHYD	9.74	1	2	.08	.0	3.00	24.00	.95	2.37	6.23	1636.27	168.0
XSECTION 137	REACH	9.74	1	2	.08	.0	3.00	24.00	.95	2.27	6.36	1520.40	156.1
XSECTION 128	RUNOFF	.04	1	2	.08	.0	3.00	24.00	.96	---	6.14	25.81	645.3
XSECTION 137	ADDHYD	9.78	1	2	.08	.0	3.00	24.00	.95	2.28	6.36	1533.33	156.8
XSECTION 137	RUNOFF	.11	1	2	.08	.0	3.00	24.00	1.25	---	6.15	90.47	822.5
XSECTION 137	ADDHYD	9.89	1	2	.08	.0	3.00	24.00	.95	2.33	6.35	1588.25	160.6
XSECTION 126	RUNOFF	.08	1	2	.08	.0	3.00	24.00	1.19	---	6.15	61.50	768.7
XSECTION 127	RUNOFF	.07	1	2	.08	.0	3.00	24.00	1.38	---	6.12	69.20	988.6
XSECTION 137	ADDHYD	.15	1	2	.08	.0	3.00	24.00	1.28	.34	6.13	130.11	867.4
XSECTION 137	ADDHYD	10.04	1	2	.08	.0	3.00	24.00	.96	2.40	6.34	1671.96	166.5
STRUCTURE 91	RESVOR	10.04	1	2	.08	.0	3.00	24.00	.95	61.00	6.43	1583.78	157.7
XSECTION 129	REACH	10.04	1	2	.08	.0	3.00	24.00	.95	---	6.62	1436.65	143.1
XSECTION 27	RUNOFF	.16	1	2	.08	.0	3.00	24.00	1.59	---	6.03	228.28	1426.8
STRUCTURE 29	ADDHYD	10.20	1	2	.08	.0	3.00	24.00	.96	---	6.61	1458.34	143.0

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
ECTION 38	RUNOFF	.32	1	2	.08	.0	3.00	24.00	1.01	---	6.24	168.41	526.3
ECTION 128	REACH	.32	1	2	.08	.0	3.00	24.00	1.01	---	6.34	166.28	519.6
SECTION 28	RUNOFF	.17	1	2	.08	.0	3.00	24.00	1.67	---	6.01	259.20	1524.7
RUCTURE 28	ADDHYD	.49	1	2	.08	.0	3.00	24.00	1.24	---	6.04	323.12	659.4
CTION 127	REACH	.49	1	2	.08	.0	3.00	24.00	1.24	---	6.14	308.77	630.1
UCTURE 29	ADDHYD	10.69	1	2	.08	.0	3.00	24.00	.97	---	6.59	1625.52	152.1
CTION 29	RUNOFF	.20	1	2	.08	.0	3.00	24.00	1.25	---	6.04	219.72	1098.6
SECTION 29	ADDHYD	10.89	1	2	.08	.0	3.00	24.00	.98	---	6.59	1650.58	151.6
SECTION 184	REACH	10.89	1	2	.08	.0	3.00	24.00	.98	---	6.59	1650.58	151.6
CTION 84	RUNOFF	.04	1	2	.08	.0	3.00	24.00	1.64	---	5.95	68.96	1723.9
TRUCTURE 30	ADDHYD	10.93	1	2	.08	.0	3.00	24.00	.98	---	6.59	1655.06	151.4
CTION 30	RUNOFF	.10	1	2	.08	.0	3.00	24.00	1.38	---	6.21	79.43	794.3
JCTURE 30	ADDHYD	11.03	1	2	.08	.0	3.00	24.00	.98	---	6.58	1689.88	153.2
SECTION 31	RUNOFF	.21	1	2	.08	.0	3.00	24.00	2.16	---	6.25	250.37	1192.2
JCTURE 30	ADDHYD	11.24	1	2	.08	.0	3.00	24.00	1.00	---	6.56	1844.76	164.1
ECTION 44	RUNOFF	.11	1	2	.08	.0	3.00	24.00	1.31	---	6.13	98.77	897.9
ECTION 135	REACH	.11	1	2	.08	.0	3.00	24.00	1.31	---	6.28	86.44	785.8
TION 35	RUNOFF	.12	1	2	.08	.0	3.00	24.00	1.51	---	6.08	140.36	1169.7
UCTURE 35	ADDHYD	.23	1	2	.08	.0	3.00	24.00	1.42	---	6.14	202.32	879.6

XSECTION 34	RUNOFF	.29	1	2	.08	.0	3.00	24.00	1.51	---	6.19	263.30	907.9
STRUCTURE 35	ADDHYD	.52	1	2	.08	.0	3.00	24.00	1.47	---	6.16	463.12	890.6
XSECTION 130	REACH	.52	1	2	.08	.0	3.00	24.00	1.47	---	6.29	437.14	840.6
STRUCTURE 30	ADDHYD	11.76	1	2	.08	.0	3.00	24.00	1.03	---	6.51	2142.99	182.2
XSECTION 32	RUNOFF	.11	1	2	.08	.0	3.00	24.00	2.45	---	6.15	170.51	1550.1
XSECTION 33	RUNOFF	.29	1	2	.08	.0	3.00	24.00	2.16	---	6.02	545.79	1882.0
STRUCTURE 33	ADDHYD	.40	1	2	.08	.0	3.00	24.00	2.24	---	6.04	697.31	1743.3
XSECTION 131	REACH	.40	1	2	.08	.0	3.00	24.00	2.24	---	6.15	636.41	1591.0
STRUCTURE 30	ADDHYD	12.16	1	2	.08	.0	3.00	24.00	1.06	---	6.44	2414.31	198.5
XSECTION 125	REACH	12.16	1	2	.08	.0	3.00	24.00	1.06	---	6.44	2414.31	198.5
XSECTION 26	RUNOFF	.19	1	2	.08	.0	3.00	24.00	1.59	---	6.03	274.23	1443.3
STRUCTURE 25	ADDHYD	12.35	1	2	.08	.0	3.00	24.00	1.07	---	6.43	2448.53	198.3
XSECTION 25	RUNOFF	.04	1	2	.08	.0	3.00	24.00	1.35	---	5.95	59.63	1490.8
STRUCTURE 25	ADDHYD	12.39	1	2	.08	.0	3.00	24.00	1.07	---	6.43	2454.06	198.1
XSECTION 24	RUNOFF	.19	1	2	.08	.0	3.00	24.00	2.25	---	6.01	366.42	1928.5
STRUCTURE 25	ADDHYD	12.58	1	2	.08	.0	3.00	24.00	1.09	---	6.13	2616.57	208.0
XSECTION 120	REACH	12.58	1	2	.08	.0	3.00	24.00	1.09	---	6.21	2616.27	208.0

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
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A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
XSECTION 22	RUNOFF	.13	1	2	.08	.0	3.00	24.00	1.99	---	5.96	243.28	1871.4
STRUCTURE 20	ADDHYD	12.71	1	2	.08	.0	3.00	24.00	1.10	---	6.19	2654.76	208.9
XSECTION 20	RUNOFF	.09	1	2	.08	.0	3.00	24.00	1.19	---	6.03	101.48	1127.5
STRUCTURE 20	ADDHYD	12.80	1	2	.08	.0	3.00	24.00	1.10	---	6.18	2705.36	211.4
XSECTION 21	RUNOFF	.12	1	2	.08	.0	3.00	24.00	1.67	---	5.98	189.87	1582.2
STRUCTURE 20	ADDHYD	12.92	1	2	.08	.0	3.00	24.00	1.11	---	6.15	2750.86	212.9
XSECTION 19	RUNOFF	.17	1	2	.08	.0	3.00	24.00	1.59	---	6.05	227.31	1337.1
STRUCTURE 20	ADDHYD	13.09	1	2	.08	.0	3.00	24.00	1.11	---	6.13	2942.98	224.8
XSECTION 83	RUNOFF	.11	1	2	.08	.0	3.00	24.00	2.07	---	6.02	201.78	1834.3
STRUCTURE 20	ADDHYD	13.20	1	2	.08	.0	3.00	24.00	1.12	---	6.10	3141.22	238.0
XSECTION 23	RUNOFF	.28	1	2	.08	.0	3.00	24.00	2.25	---	6.05	497.80	1777.9
XSECTION 183	REACH	.28	1	2	.08	.0	3.00	24.00	2.25	---	6.15	488.46	1744.5
STRUCTURE 20	ADDHYD	13.48	1	2	.08	.0	3.00	24.00	1.14	---	6.11	3580.97	265.7
STRUCTURE 98	RESVOR	13.48	1	2	.08	.0	3.00	24.00	1.14	5.41	6.73	2351.87	174.5
XSECTION 113	REACH	13.48	1	2	.08	.0	3.00	24.00	1.13	---	6.90	2319.81	172.1

XSECTION 58	RUNOFF	.17	1	2	.08	.0	3.00	24.00	2.25	---	6.02	328.47	1932.2
TRUCTURE 58	ADDHYD	.27	1	2	.08	.0	3.00	24.00	2.01	---	6.05	410.18	1519.2
XSECTION 152	REACH	.27	1	2	.08	.0	3.00	24.00	2.01	---	6.26	366.77	1358.4
TRUCTURE 93	RESVOR	.27	1	2	.08	.0	3.00	24.00	1.83	5.12	6.89	64.80	240.0
TRUCTURE 51	ADDHYD	6.09	1	2	.08	.0	3.00	24.00	.83	---	7.68	721.58	118.5
XSECTION 62	RUNOFF	.25	1	2	.08	.0	3.00	24.00	1.66	---	6.28	216.11	864.4
SECTION 161	REACH	.25	1	2	.08	.0	3.00	24.00	1.66	---	6.44	198.93	795.7

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A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

ECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
XSECTION 61	RUNOFF	.13	1	2	.08	.0	3.00	24.00	.86	---	6.28	52.23	401.7
RUCTURE 61	ADDHYD	.38	1	2	.08	.0	3.00	24.00	1.39	---	6.41	244.23	642.7
ECTION 150	REACH	.38	1	2	.08	.0	3.00	24.00	1.39	---	6.56	231.48	609.2
XSECTION 50	RUNOFF	.13	1	2	.08	.0	3.00	24.00	1.59	---	6.24	112.99	869.2
RUCTURE 50	ADDHYD	.51	1	2	.08	.0	3.00	24.00	1.44	---	6.48	304.02	596.1
STRUCTURE 95	RESVOR	.51	1	2	.08	.0	3.00	24.00	.70	5.23	10.29	14.09	27.6
ECTION 149	REACH	.51	1	2	.08	.0	3.00	24.00	.69	---	10.62	14.08	27.6
RUCTURE 51	ADDHYD	6.60	1	2	.08	.0	3.00	24.00	.82	---	7.68	732.55	111.0
XSECTION 148	REACH	6.60	1	2	.08	.0	3.00	24.00	.82	---	7.83	726.58	110.1
XSECTION 48	RUNOFF	.15	1	2	.08	.0	3.00	24.00	.86	---	6.05	110.61	737.4
ECTION 148	ADDHYD	6.75	1	2	.08	.0	3.00	24.00	.82	---	7.83	733.19	108.6
XSECTION 66	RUNOFF	.31	1	2	.08	.0	3.00	24.00	1.74	---	6.12	380.46	1227.3
ECTION 157	REACH	.31	1	2	.08	.0	3.00	24.00	1.74	---	6.22	372.02	1200.1
ECTION 57	RUNOFF	.16	1	2	.08	.0	3.00	24.00	2.25	---	6.05	284.46	1777.9
STRUCTURE 57	ADDHYD	.47	1	2	.08	.0	3.00	24.00	1.91	---	6.14	600.63	1277.9
ECTION 154	REACH	.47	1	2	.08	.0	3.00	24.00	1.91	---	6.26	575.37	1224.2
(SECTION 55	RUNOFF	.25	1	2	.08	.0	3.00	24.00	1.66	---	6.14	282.19	1128.8
STRUCTURE 54	ADDHYD	.72	1	2	.08	.0	3.00	24.00	1.82	---	6.22	826.97	1148.6
ECTION 56	RUNOFF	.15	1	2	.08	.0	3.00	24.00	1.45	---	6.03	194.79	1298.6
SECTION 155	REACH	.15	1	2	.08	.0	3.00	24.00	1.44	---	6.25	160.42	1069.5
UCTURE 54	ADDHYD	.87	1	2	.08	.0	3.00	24.00	1.76	---	6.22	985.80	1133.1
CTION 54	RUNOFF	.25	1	2	.08	.0	3.00	24.00	2.25	---	6.05	449.47	1797.9
TRUCTURE 54	ADDHYD	1.12	1	2	.08	.0	3.00	24.00	1.87	---	6.16	1322.20	1180.5
UCTURE 92	RESVOR	1.12	1	2	.08	.0	3.00	24.00	1.34	5.37	8.27	68.04	60.8
CTION 153	REACH	1.12	1	2	.08	.0	3.00	24.00	1.34	---	8.40	68.02	60.7

XSECTION 53	RUNOFF	.17	1	2	.08	.0	3.00	24.00	.91	---	6.15	98.97	582.2
STRUCTURE 53	ADDHYD	1.29	1	2	.08	.0	3.00	24.00	1.28	---	6.18	116.36	90.2
XSECTION 147	REACH	1.29	1	2	.08	.0	3.00	24.00	1.27	---	6.33	105.12	81.5
XSECTION 47	RUNOFF	.27	1	2	.08	.0	3.00	24.00	.91	---	6.17	148.81	551.2
XSECTION 147	ADDHYD	1.56	1	2	.08	.0	3.00	24.00	1.21	---	6.23	236.65	151.7
XSECTION 142	RUNOFF	.06	1	2	.08	.0	3.00	24.00	1.31	---	6.19	47.04	783.9
XSECTION 147	ADDHYD	1.62	1	2	.08	.0	3.00	24.00	1.21	---	6.22	283.25	174.8
XSECTION 148	ADDHYD	8.37	1	2	.08	.0	3.00	24.00	.90	---	7.83	822.84	98.3
XSECTION 141	REACH	8.37	1	2	.08	.0	3.00	24.00	.90	2.38	7.94	821.00	98.1
XSECTION 122	RUNOFF	.03	1	2	.08	.0	3.00	24.00	1.01	---	6.12	21.82	727.4
XSECTION 143	ADDHYD	8.40	1	2	.08	.0	3.00	24.00	.90	3.83	7.94	822.48	97.9

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A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
XSECTION 141	RUNOFF	.05	1	2	.08	.0	3.00	24.00	.58	---	6.18	16.09	321.9
XSECTION 143	ADDHYD	8.45	1	2	.08	.0	3.00	24.00	.89	3.84	7.94	824.11	97.5
XSECTION 145	RUNOFF	.24	1	2	.08	.0	3.00	24.00	1.66	---	6.07	320.91	1337.1
XSECTION 146	RUNOFF	.18	1	2	.08	.0	3.00	24.00	.96	---	6.16	106.50	591.6
XSECTION 145	ADDHYD	.42	1	2	.08	.0	3.00	24.00	1.36	---	6.09	415.05	988.2
XSECTION 121	RUNOFF	.05	1	2	.08	.0	3.00	24.00	1.01	---	6.14	33.93	678.6
XSECTION 145	ADDHYD	.47	1	2	.08	.0	3.00	24.00	1.32	---	6.09	447.42	952.0
XSECTION 143	REACH	.47	1	2	.08	.0	3.00	24.00	1.32	2.81	6.18	443.01	942.6
XSECTION 123	RUNOFF	.04	1	2	.08	.0	3.00	24.00	1.31	---	6.09	39.29	982.2
XSECTION 142	ADDHYD	.51	1	2	.08	.0	3.00	24.00	1.32	---	6.17	478.37	938.0
XSECTION 142	ADDHYD	8.96	1	2	.08	.0	3.00	24.00	.92	---	6.24	1074.03	119.9
XSECTION 186	REACH	8.96	1	2	.08	.0	3.00	24.00	.92	1.84	6.24	1074.03	119.9
XSECTION 124	RUNOFF	.02	1	2	.08	.0	3.00	24.00	1.31	---	6.13	18.17	908.4
XSECTION 141	ADDHYD	8.98	1	2	.08	.0	3.00	24.00	.92	2.80	6.24	1089.27	121.3
XSECTION 140	RUNOFF	.33	1	2	.08	.0	3.00	24.00	1.19	---	6.27	195.80	593.3
XSECTION 141	ADDHYD	9.31	1	2	.08	.0	3.00	24.00	.93	3.09	6.24	1284.61	138.0
XSECTION 185	REACH	9.31	1	2	.08	.0	3.00	24.00	.93	2.05	6.24	1284.61	138.0
XSECTION 125	RUNOFF	.03	1	2	.08	.0	3.00	24.00	1.25	---	6.16	24.20	806.6
XSECTION 185	ADDHYD	9.34	1	2	.08	.0	3.00	24.00	.93	2.07	6.24	1306.58	139.9
XSECTION 139	RUNOFF	.15	1	2	.08	.0	3.00	24.00	1.51	---	6.24	124.14	827.6
XSECTION 185	ADDHYD	9.49	1	2	.08	.0	3.00	24.00	.94	2.19	6.24	1430.73	150.8
XSECTION 143	RUNOFF	.25	1	2	.08	.0	3.00	24.00	1.38	---	6.14	235.07	940.3

XSECTION 69	RUNOFF	.25	1	2	.08	.0	3.00	24.00	.96	---	6.39	96.75	387.0
STRUCTURE 69	ADDHYD	.50	1	2	.08	.0	3.00	24.00	.84	---	6.22	199.28	398.6
XSECTION 186	REACH	.50	1	2	.08	.0	3.00	24.00	.84	.51	6.32	196.07	392.1
XSECTION 86	RUNOFF	.05	1	2	.08	.0	3.00	24.00	.96	---	6.12	33.01	660.2

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A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
STRUCTURE 87	ADDHYD	.55	1	2	.08	.0	3.00	24.00	.85	---	6.30	215.54	391.9
STRUCTURE 87	ADDHYD	4.17	1	2	.08	.0	3.00	24.00	.68	---	6.69	817.30	196.0
XSECTION 163	REACH	4.17	1	2	.08	.0	3.00	24.00	.68	---	6.92	782.62	187.7
SECTION 63	RUNOFF	.16	1	2	.08	.0	3.00	24.00	.86	---	6.16	84.35	527.2
STRUCTURE 63	ADDHYD	4.33	1	2	.08	.0	3.00	24.00	.69	---	6.91	795.11	183.6
SECTION 160	REACH	4.33	1	2	.08	.0	3.00	24.00	.68	---	7.07	769.25	177.7
SECTION 60	RUNOFF	.15	1	2	.08	.0	3.00	24.00	.81	---	6.15	75.35	502.4
STRUCTURE 60	ADDHYD	4.48	1	2	.08	.0	3.00	24.00	.69	---	7.07	778.50	173.8
SECTION 59	RUNOFF	.16	1	2	.08	.0	3.00	24.00	1.66	---	6.07	210.03	1312.7
TRUCTURE 60	ADDHYD	4.64	1	2	.08	.0	3.00	24.00	.72	---	7.06	793.48	171.0
XSECTION 68	RUNOFF	.22	1	2	.08	.0	3.00	24.00	.96	---	6.29	99.36	451.7
SECTION 167	REACH	.22	1	2	.08	.0	3.00	24.00	.96	---	6.48	86.72	394.2
XSECTION 67	RUNOFF	.27	1	2	.08	.0	3.00	24.00	1.59	---	6.18	259.19	960.0
STRUCTURE 67	ADDHYD	.49	1	2	.08	.0	3.00	24.00	1.30	---	6.23	311.16	635.0
SECTION 164	REACH	.49	1	2	.08	.0	3.00	24.00	1.30	---	6.35	301.40	615.1
XSECTION 64	RUNOFF	.25	1	2	.08	.0	3.00	24.00	1.59	---	6.06	326.66	1306.6
RUCTURE 64	ADDHYD	.74	1	2	.08	.0	3.00	24.00	1.40	---	6.13	500.77	676.7
SECTION 159	REACH	.74	1	2	.08	.0	3.00	24.00	1.40	---	6.25	480.27	649.0
STRUCTURE 60	ADDHYD	5.38	1	2	.08	.0	3.00	24.00	.82	---	6.67	945.72	175.8
SECTION 151	REACH	5.38	1	2	.08	.0	3.00	24.00	.81	---	7.10	933.78	173.6
STRUCTURE 94	RESVOR	5.38	1	2	.08	.0	3.00	24.00	.75	7.69	7.70	646.77	120.2
XSECTION 51	RUNOFF	.15	1	2	.08	.0	3.00	24.00	.96	---	6.14	96.79	645.3
RUCTURE 51	ADDHYD	5.53	1	2	.08	.0	3.00	24.00	.75	---	7.70	653.17	118.1
SECTION 49	RUNOFF	.10	1	2	.08	.0	3.00	24.00	1.13	---	6.10	83.50	835.0
STRUCTURE 51	ADDHYD	5.63	1	2	.08	.0	3.00	24.00	.76	---	7.70	657.97	116.9
SECTION 52	RUNOFF	.19	1	2	.08	.0	3.00	24.00	1.59	---	6.23	169.12	890.1
STRUCTURE 51	ADDHYD	5.82	1	2	.08	.0	3.00	24.00	.79	---	7.69	670.54	115.2
SECTION 65	RUNOFF	.10	1	2	.08	.0	3.00	24.00	1.59	---	6.04	138.16	1381.6
SECTION 158	REACH	.10	1	2	.08	.0	3.00	24.00	1.59	---	6.18	110.85	1108.5

STRUCTURE 75	ADDHYD	.49	1	2	.08	.0	3.00	24.00	.58	---	6.32	135.83	277.2

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
XSECTION 73	RUNOFF	.12	1	2	.08	.0	3.00	24.00	.59	---	6.24	32.80	273.4
STRUCTURE 75	ADDHYD	.61	1	2	.08	.0	3.00	24.00	.58	---	6.31	166.64	273.2
XSECTION 81	RUNOFF	.39	1	2	.08	.0	3.00	24.00	.58	---	6.24	107.97	276.8
XSECTION 175	REACH	.39	1	2	.08	.0	3.00	24.00	.58	---	6.43	87.43	224.2
STRUCTURE 75	ADDHYD	1.00	1	2	.08	.0	3.00	24.00	.58	---	6.34	246.80	246.8
XSECTION 80	RUNOFF	.22	1	2	.08	.0	3.00	24.00	.58	---	6.16	73.32	333.3
XSECTION 176	REACH	.22	1	2	.08	.0	3.00	24.00	.58	---	6.36	51.48	234.0
STRUCTURE 75	ADDHYD	1.22	1	2	.08	.0	3.00	24.00	.58	---	6.34	298.32	244.5
XSECTION 76	RUNOFF	.17	1	2	.08	.0	3.00	24.00	.58	---	6.34	37.62	221.3
STRUCTURE 75	ADDHYD	1.39	1	2	.08	.0	3.00	24.00	.58	---	6.34	335.94	241.7
XSECTION 172	REACH	1.39	1	2	.08	.0	3.00	24.00	.58	---	6.43	333.92	240.2
XSECTION 88	RUNOFF	.10	1	2	.08	.0	3.00	24.00	.58	---	6.13	36.82	368.2
STRUCTURE 77	ADDHYD	1.49	1	2	.08	.0	3.00	24.00	.58	---	6.42	346.32	232.4
XSECTION 77	RUNOFF	.25	1	2	.08	.0	3.00	24.00	.58	---	6.27	64.37	257.5
STRUCTURE 77	ADDHYD	1.74	1	2	.08	.0	3.00	24.00	.58	---	6.41	399.63	229.7
XSECTION 79	RUNOFF	.29	1	2	.08	.0	3.00	24.00	.58	---	6.10	117.87	406.5
XSECTION 178	REACH	.29	1	2	.08	.0	3.00	24.00	.58	---	6.24	93.39	322.0
XSECTION 78	RUNOFF	.88	1	2	.08	.0	3.00	24.00	.58	---	6.19	271.55	308.6
STRUCTURE 78	ADDHYD	1.17	1	2	.08	.0	3.00	24.00	.58	---	6.21	361.72	309.2
XSECTION 177	REACH	1.17	1	2	.08	.0	3.00	24.00	.58	---	6.34	327.48	279.9
STRUCTURE 77	ADDHYD	2.91	1	2	.08	.0	3.00	24.00	.58	---	6.37	715.59	245.9
XSECTION 171	REACH	2.91	1	2	.08	.0	3.00	24.00	.58	---	6.55	630.48	216.7
XSECTION 71	RUNOFF	.36	1	2	.08	.0	3.00	24.00	.96	---	6.08	267.37	742.7
STRUCTURE 71	ADDHYD	3.27	1	2	.08	.0	3.00	24.00	.63	---	6.53	677.48	207.2
XSECTION 170	REACH	3.27	1	2	.08	.0	3.00	24.00	.62	---	6.65	664.95	203.3
XSECTION 70	RUNOFF	.31	1	2	.08	.0	3.00	24.00	.96	---	6.11	210.83	680.1
STRUCTURE 70	ADDHYD	3.58	1	2	.08	.0	3.00	24.00	.65	---	6.64	702.63	196.3
XSECTION 187	REACH	3.58	1	2	.08	.0	3.00	24.00	.65	---	6.72	702.48	196.2
XSECTION 87	RUNOFF	.04	1	2	.08	.0	3.00	24.00	.76	---	6.02	29.70	742.4
STRUCTURE 87	ADDHYD	3.62	1	2	.08	.0	3.00	24.00	.65	---	6.72	704.68	194.7
XSECTION 72	RUNOFF	.25	1	2	.08	.0	3.00	24.00	.71	---	6.06	148.80	595.2
XSECTION 169	REACH	.25	1	2	.08	.0	3.00	24.00	.71	---	6.18	124.18	496.7

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A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 17	RUNOFF	.17	1	2	.08	.0	4.40	24.00	2.81	---	6.05	397.24	2336.7
STRUCTURE 18	ADDHYD	.30	1	2	.08	.0	4.40	24.00	2.90	---	6.03	740.96	2469.9
XSECTION 114	REACH	.30	1	2	.08	.0	4.40	24.00	2.90	---	6.03	740.96	2469.9
STRUCTURE 13	ADDHYD	14.47	1	2	.08	.0	4.40	24.00	2.18	---	6.75	4722.20	326.3
XSECTION 106	REACH	14.47	1	2	.08	.0	4.40	24.00	2.18	---	6.75	4722.20	326.3
XSECTION 6	RUNOFF	.13	1	2	.08	.0	4.40	24.00	2.46	---	6.09	240.33	1848.7
STRUCTURE 6	ADDHYD	14.60	1	2	.08	.0	4.40	24.00	2.18	---	6.74	4751.99	325.5
XSECTION 5	RUNOFF	.15	1	2	.08	.0	4.40	24.00	2.73	---	6.03	355.89	2372.6
STRUCTURE 6	ADDHYD	14.75	1	2	.08	.0	4.40	24.00	2.19	---	6.73	4778.84	324.0
XSECTION 7	RUNOFF	.19	1	2	.08	.0	4.40	24.00	3.61	---	6.14	442.41	2328.5
STRUCTURE 6	ADDHYD	14.94	1	2	.08	.0	4.40	24.00	2.21	---	6.15	5083.81	340.3
XSECTION 11	RUNOFF	.16	1	2	.08	.0	4.40	24.00	3.40	---	6.05	425.05	2656.6
XSECTION 12	RUNOFF	.13	1	2	.08	.0	4.40	24.00	3.60	---	6.03	382.51	2942.3
STRUCTURE 11	ADDHYD	.29	1	2	.08	.0	4.40	24.00	3.49	---	6.04	806.16	2779.9
XSECTION 107	REACH	.29	1	2	.08	.0	4.40	24.00	3.49	---	6.14	788.35	2718.5
STRUCTURE 6	ADDHYD	15.23	1	2	.08	.0	4.40	24.00	2.23	---	6.15	5871.13	385.5
STRUCTURE 97	RESVOR	15.23	1	2	.08	.0	4.40	24.00	2.16	12.29	8.31	3188.17	209.3
XSECTION 104	REACH	15.23	1	2	.08	.0	4.40	24.00	2.16	---	8.31	3188.17	209.3
XSECTION 4	RUNOFF	.19	1	2	.08	.0	4.40	24.00	2.91	---	6.02	487.20	2564.2
STRUCTURE 4	ADDHYD	15.42	1	2	.08	.0	4.40	24.00	2.17	---	8.02	3207.58	208.0
XSECTION 8	RUNOFF	.20	1	2	.08	.0	4.40	24.00	3.40	---	6.07	508.36	2541.8
STRUCTURE 8	ADDHYD	15.62	1	2	.08	.0	4.40	24.00	2.19	---	6.84	3242.81	207.6
XSECTION 10	RUNOFF	.14	1	2	.08	.0	4.40	24.00	2.82	---	5.99	360.29	2573.5
XSECTION 109	REACH	.14	1	2	.08	.0	4.40	24.00	2.81	---	6.08	355.09	2536.4
XSECTION 9	RUNOFF	.25	1	2	.08	.0	4.40	24.00	3.01	---	5.97	692.07	2768.3
STRUCTURE 9	ADDHYD	.39	1	2	.08	.0	4.40	24.00	2.94	---	6.00	1011.48	2593.5
XSECTION 108	REACH	.39	1	2	.08	.0	4.40	24.00	2.93	---	6.09	997.37	2557.3
STRUCTURE 99	ADDHYD	16.01	1	2	.08	.0	4.40	24.00	2.20	---	6.24	3579.76	223.6
ALTERNATE 1 STORM 2													
XSECTION 82	RUNOFF	.19	1	2	.08	.0	3.00	24.00	.59	---	6.05	97.75	514.5
XSECTION 174	REACH	.19	1	2	.08	.0	3.00	24.00	.58	---	6.16	82.70	435.2
SECTION 74	RUNOFF	.18	1	2	.08	.0	3.00	24.00	.58	---	6.21	52.40	291.1
TRUCTURE 74	ADDHYD	.37	1	2	.08	.0	3.00	24.00	.58	---	6.17	133.56	361.0
XSECTION 173	REACH	.37	1	2	.08	.0	3.00	24.00	.58	---	6.31	109.98	297.2
ECTION 75	RUNOFF	.12	1	2	.08	.0	3.00	24.00	.58	---	6.36	26.14	217.8

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SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
STRUCTURE 33	ADDHYD	.40	1	2	.08	.0	4.40	24.00	3.59	---	6.03	1108.60	2771.5
XSECTION 131	REACH	.40	1	2	.08	.0	4.40	24.00	3.59	---	6.14	1044.35	2610.9
STRUCTURE 30	ADDHYD	12.16	1	2	.08	.0	4.40	24.00	2.05	---	6.37	5251.51	431.9
XSECTION 125	REACH	12.16	1	2	.08	.0	4.40	24.00	2.05	---	6.37	5251.51	431.9
XSECTION 26	RUNOFF	.19	1	2	.08	.0	4.40	24.00	2.82	---	6.02	482.00	2536.8
STRUCTURE 25	ADDHYD	12.35	1	2	.08	.0	4.40	24.00	2.06	---	6.36	5321.14	430.9
XSECTION 25	RUNOFF	.04	1	2	.08	.0	4.40	24.00	2.50	---	5.94	107.02	2675.6
STRUCTURE 25	ADDHYD	12.39	1	2	.08	.0	4.40	24.00	2.06	---	6.36	5330.28	430.2
XSECTION 24	RUNOFF	.19	1	2	.08	.0	4.40	24.00	3.61	---	5.99	576.76	3035.6
STRUCTURE 25	ADDHYD	12.58	1	2	.08	.0	4.40	24.00	2.08	---	6.18	5439.89	432.4
XSECTION 120	REACH	12.58	1	2	.08	.0	4.40	24.00	2.08	---	6.18	5439.89	432.4
XSECTION 22	RUNOFF	.13	1	2	.08	.0	4.40	24.00	3.30	---	5.95	394.57	3035.2
STRUCTURE 20	ADDHYD	12.71	1	2	.08	.0	4.40	24.00	2.10	---	6.15	5519.00	434.2
XSECTION 20	RUNOFF	.09	1	2	.08	.0	4.40	24.00	2.30	---	6.02	194.86	2165.1
STRUCTURE 20	ADDHYD	12.80	1	2	.08	.0	4.40	24.00	2.10	---	6.11	5636.73	440.4
XSECTION 21	RUNOFF	.12	1	2	.08	.0	4.40	24.00	2.92	---	5.96	326.33	2719.4
STRUCTURE 20	ADDHYD	12.92	1	2	.08	.0	4.40	24.00	2.11	---	6.09	5923.97	458.5
XSECTION 19	RUNOFF	.17	1	2	.08	.0	4.40	24.00	2.82	---	6.04	405.10	2382.9
STRUCTURE 20	ADDHYD	13.09	1	2	.08	.0	4.40	24.00	2.11	---	6.08	6314.80	482.4
XSECTION 83	RUNOFF	.11	1	2	.08	.0	4.40	24.00	3.40	---	6.00	318.60	2896.3
STRUCTURE 20	ADDHYD	13.20	1	2	.08	.0	4.40	24.00	2.13	---	6.08	6611.44	500.9
XSECTION 23	RUNOFF	.28	1	2	.08	.0	4.40	24.00	3.61	---	6.04	791.70	2827.5
XSECTION 183	REACH	.28	1	2	.08	.0	4.40	24.00	3.61	---	6.13	784.60	2802.1
STRUCTURE 20	ADDHYD	13.48	1	2	.08	.0	4.40	24.00	2.16	---	6.08	7366.95	546.5
STRUCTURE 98	RESVOR	13.48	1	2	.08	.0	4.40	24.00	2.14	14.31	6.64	4577.09	339.5
XSECTION 113	REACH	13.48	1	2	.08	.0	4.40	24.00	2.14	---	6.79	4526.91	335.8
XSECTION 13	RUNOFF	.24	1	2	.08	.0	4.40	24.00	2.55	---	6.05	505.77	2107.4
STRUCTURE 13	ADDHYD	13.72	1	2	.08	.0	4.40	24.00	2.15	---	6.78	4568.59	333.0
XSECTION 14	RUNOFF	.07	1	2	.08	.0	4.40	24.00	2.91	---	6.02	181.29	2589.8
STRUCTURE 13	ADDHYD	13.79	1	2	.08	.0	4.40	24.00	2.15	---	6.78	4580.10	332.1
XSECTION 15	RUNOFF	.17	1	2	.08	.0	4.40	24.00	2.73	---	6.05	378.63	2227.3
STRUCTURE 13	ADDHYD	13.96	1	2	.08	.0	4.40	24.00	2.16	---	6.77	4612.25	330.4
XSECTION 16	RUNOFF	.21	1	2	.08	.0	4.40	24.00	2.63	---	6.07	434.11	2067.2
XSECTION 115	REACH	.21	1	2	.08	.0	4.40	24.00	2.63	---	6.15	433.22	2063.0
STRUCTURE 13	ADDHYD	14.17	1	2	.08	.0	4.40	24.00	2.17	---	6.76	4666.59	329.3
XSECTION 18	RUNOFF	.13	1	2	.08	.0	4.40	24.00	3.00	---	6.02	346.50	2665.4

130	3700	885	6.1	851	6.2	---	---	0	2.67	.08	1	.900	1.52	.033	.961	256	.74?	.08	.07
131	4400	1094	6.1	1044	6.1	---	---	0	3.59	.08	1	.700	1.52	.066	.954	334	.62	.08	.09
125	1200	5246	6.4	5246	6.4	---	---	0	2.05	.08	0	.400	1.63	.000	1.000	47	1.00?	.00	.00
120	2700	5411	6.1	5411	6.1	---	---	0	2.08	.08	0	.400	1.61	.001	1.000	114	1.00?	.00	.00
183	2700	789	6.1	784	6.1	---	---	0	3.61	.08	1	1.40	1.45	.031	.993	186	.89?	.08	.05
113	4200	4577	6.6	4525	6.8	---	---	0	2.14	.08	1	.100	1.65	.005	.989	371	.57	.17	.10
+115	1800	433	6.1	432	6.1	---	---	0	2.63	.08	1	.800	1.55	.020	.998	156	.98?	.08	.04
+114	1750	731	6.1	731	6.1	---	---	0	2.90	.08	0	.700	1.56	.017	1.000	132	1.00?	.00	.00
'06	3100	4720	6.7	4720	6.7	---	---	0	2.18	.08	0	.300	1.64	.001	1.000	145	1.00?	.00	.00
+107	2650	803	6.1	788	6.1	---	---	0	3.49	.08	1	1.00	1.45	.043	.982	229	.79?	.08	.06
+104	1950	3188	8.3	3188	8.3	---	---	0	2.16	.08	0	.200	1.65	.000	1.000	131	1.00?	.00	.00
+109	2350	360	6.0	354	6.1	---	---	0	2.82	.08	1	1.80	1.41	.044	.982	198	.86?	.08	.06
+108	2500	1007	6.0	987	6.1	---	---	0	2.94	.08	1	.900	1.47	.040	.980	200	.85?	.08	.06

ALTERNATE 1 STORM 2

'4	2300	97	6.1	82	6.1	---	---	0	.59	.08	1	.900	1.53	.079	.845	330	.62	.08	.09
'3	2800	131	6.1	110	6.3	---	---	0	.58	.08	1	.700	1.53	.067	.837	426	.52	.17	.12
'5	3850	108	6.2	87	6.4	---	---	0	.58	.08	1	.600	1.56	.083	.803	638	.38	.17	.18
'6	4100	73	6.1	51	6.4	---	---	0	.58	.08	1	.600	1.56	.150	.706	783	.32	.25	.23
'2	1700	332	6.3	328	6.4	---	---	0	.58	.08	1	.800	1.53	.009	.989	172	.93?	.08	.05

+178	3000	113	6.1	93	6.2			0	.58	.08	1	.600	1.56	.093	.822	489	.47	.17	.14
+						---	---												
+177	3350	360	6.2	323	6.3			0	.58	.08	1	.600	1.56	.040	.898	360	.59	.08	.10
+						---	---												
+171	3850	714	6.4	630	6.6			0	.58	.08	1	.200	1.63	.044	.883	500	.46	.17	.1(
+						---	---												
+170	2500	676	6.6	665	6.6			0	.63	.08	1	.300	1.63	.010	.984	259	.73?	.08	.0:
+						---	---												
+187	1200	703	6.6	702	6.7			0	.65	.08	1	.200	1.64	.004	1.000	151	.99?	.08	.04
+						---	---												
+169	3000	149	6.1	120	6.1			0	.71	.08	1	.800	1.55	.089	.809	379	.57	.08	.11
+						---	---												
1																			

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS									PEAK	
						OUTFLOW+			VOLUME	MAIN	ITER-	Q AND A			PEAK	S/Q	ATT-	TRAVEL TIME	
XSEC	REACH	INFLOW		OUTFLOW		INTERV.AREA		BASE-	ABOVE	TIME	ATION	EQUATION		LENGTH	RATIO	@PEAK	KIN	STOR-	KINE-
ID	LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	FLOW (CFS)	BASE (IN)	INCR (HR)	#	COEFF (X)	POWER (M)	FACTOR (K*)	O/I (Q*)	(K) (SEC)	COEFF (C)	AGE (HR)	MATIC (HR)
	ALTERNATE 1 STORM 2																		
+186	1400	199	6.2	196	6.3			0	.84	.08	1	.700	1.51	.015	.983	196	.86?	.08	.05
+						---	---												
+163	4400	813	6.7	781	6.9			0	.68	.08	1	.200	1.64	.025	.960	524	.44	.08	.15
+						---	---												
+160	4400	794	6.9	769	7.1			0	.69	.08	1	.200	1.65	.021	.969	510	.45	.17	.14
+						---	---												
+167	3300	99	6.3	87	6.5			0	.96	.08	1	.700	1.51	.074	.875	586	.41	.17	.17
+						---	---												
+164	2500	311	6.2	299	6.4			0	1.30	.08	1	.800	1.51	.025	.961	276	.70?	.17	.08
						---	---												

87	1200	2378	6.5	2378	6.5	---	---	0	1.50	.08	0		1.64	.003	1.000	94	1.00?	.00	.00
69	3000	353	6.1	327	6.1	---	---	0	1.60	.08	1	.800	1.55	.061	.929	279	.70?	.08	.08
86	1400	486	6.1	486	6.1	---	---	0	1.79	.08	0	.700	1.51	.011	1.000	145	1.00?	.00	.00
63	4400	2685	6.5	2633	6.6	---	---	0	1.54	.08	1	.200	1.64	.022	.980	329	.63	.08	.09
160	4400	2688	6.6	2625	6.6	---	---	0	1.55	.08	1	.200	1.65	.019	.976	315	.64	.08	.09
67	3300	222	6.2	205	6.4	---	---	0	1.97	.08	1	.700	1.51	.056	.922	446	.50	.17	.13
54	2500	621	6.2	611	6.3	---	---	0	2.44	.08	1	.800	1.51	.020	.983	219	.81?	.08	.06
159	3300	970	6.1	953	6.2	---	---	0	2.56	.08	1	.500	1.62	.017	.982	225	.80?	.08	.06
151	4000	3280	6.6	3231	6.7	---	---	0	1.74	.08	1	.100	1.65	.023	.985	403	.54	.08	.11
158	3600	242	6.1	213	6.2	---	---	0	2.82	.08	1	.400	1.63	.125	.881	465	.49	.08	.13
52	3500	647	6.1	597	6.1	---	---	0	3.32	.08	1	.300	1.63	.065	.922	368	.58	.08	.10
161	3400	391	6.2	373	6.4	---	---	0	2.91	.08	1	.700	1.51	.047	.953	380	.56	.17	.11
150	2950	480	6.4	465	6.5	---	---	0	2.54	.08	1	.600	1.53	.031	.969	317	.64	.08	.09
149	2400	41	8.5	41	8.8	---	---	0	1.54*	.08	1	.300	1.63	.003	.999	731	.34	.25	.20
48	3300	2470	7.1	2456	7.2	2471	7.1	0	1.73	.08	1	.300	1.62	.004	.995	215	.82?	.17	.06
-	2300	661	6.1	658	6.2	---	---	0	3.00	.08	1	.800	1.53	.023	.997	183	.90?	.08	.05
54	3500	1040	6.1	1017	6.2	---	---	0	3.21	.08	1	.500	1.61	.031	.978	241	.77?	.08	.07
53	3450	345	6.1	315	6.1	---	---	0	2.63	.08	1	.600	1.53	.112	.913	416	.53	.08	.12
--	2050	94	8.4	94	8.5	---	---	0	2.14*	.08	1	.500	1.61	.001	1.000	351	.60	.08	.10

												.400							
+147	2300	256	6.1	240	6.3			0	2.10*	.08	1		1.62	.002	.941	300	.67	.17	.08
+						548	6.2												
												.469							
+141	2100	2629	7.1	2628	7.2			0	1.80	.08	1		1.52	.002	1.000	156	.98?	.08	.04
+						---	---												
												1.51							
+143	1900	848	6.1	848	6.1			0	2.46	.08	0		1.40	.022	1.000	148	1.00?	.00	.00
+						---	---												
												.159							
+186	700	2696	7.2	2696	7.2			0	1.83	.08	0		1.63	.000	1.000	63	1.00?	.00	.00
+						---	---												
1																			

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS									PEAK	
						OUTFLOW+			VOLUME	MAIN	ITER-	Q AND A			PEAK	S/Q	ATT-	TRAVEL TIME	
XSEC	REACH	INFLOW		OUTFLOW		INTERV.AREA		BASE-	ABOVE	TIME	ATION	EQUATION		LENGTH	RATIO	@PEAK	KIN	STOR-	KINE-
ID	LENGTH	PEAK	TIME	PEAK	TIME	PEAK	TIME	FLOW	BASE	INCR	#	COEFF	POWER	FACTOR	O/I	(K)	COEFF	AGE	MATIC
	(FT)	(CFS)	(HR)	(CFS)	(HR)	(CFS)	(HR)	(CFS)	(IN)	(HR)		(X)	(M)	(K*)	(Q*)	(SEC)	(C)	(HR)	(HR)
ALTERNATE 1 STORM 1																			
												.159							
+185	1100	2759	7.2	2759	7.2			0	1.85	.08	0		1.63	.001	1.000	98	1.00?	.00	.00
+						2763	7.2												
												.160							
+137	3300	3336	6.1	3248	6.3			0	1.88	.08	1		1.63	.004	.974	274	.71?	.17	.08
+						3282	6.3												
												.100							
+129	3800	3378	6.4	3192	6.6			0	1.89	.08	1		1.65	.007	.945	379	.57	.17	.11
+						---	---												
												1.20							
+128	1700	369	6.2	368	6.3			0	2.04	.08	1		1.47	.014	.999	154	.98?	.08	.04
+						---	---												
												1.00							
+127	2300	626	6.1	614	6.1			0	2.35	.08	1		1.47	.020	.982	200	.86?	.08	.06
+						---	---												
												.200							
+184	1350	3680	6.5	3680	6.5			0	1.93	.08	0		1.63	.001	1.000	93	1.00?	.00	.00
+						---	---												
												.900							
+135	3100	191	6.1	177	6.2			0	2.46	.08	1		1.52	.066	.928	363	.58	.08	.10
+						---	---												

XSECTION 13	RUNOFF	.24	1	2	.08	.0	3.00	24.00	1.38	---	6.07	269.05	1121.1
TRUCTURE 13	ADDHYD	13.72	1	2	.08	.0	3.00	24.00	1.14	---	6.90	2341.08	170.6
SECTION 14	RUNOFF	.07	1	2	.08	.0	3.00	24.00	1.66	---	6.03	104.49	1492.7
STRUCTURE 13	ADDHYD	13.79	1	2	.08	.0	3.00	24.00	1.14	---	6.90	2347.71	170.2
SECTION 15	RUNOFF	.17	1	2	.08	.0	3.00	24.00	1.52	---	6.07	207.82	1222.5
STRUCTURE 13	ADDHYD	13.96	1	2	.08	.0	3.00	24.00	1.14	---	6.89	2364.08	169.3
XSECTION 16	RUNOFF	.21	1	2	.08	.0	3.00	24.00	1.44	---	6.08	233.03	1109.7
SECTION 115	REACH	.21	1	2	.08	.0	3.00	24.00	1.44	---	6.18	228.82	1089.6
STRUCTURE 13	ADDHYD	14.17	1	2	.08	.0	3.00	24.00	1.15	---	6.88	2388.61	168.6
XSECTION 18	RUNOFF	.13	1	2	.08	.0	3.00	24.00	1.74	---	6.03	202.75	1559.6
SECTION 17	RUNOFF	.17	1	2	.08	.0	3.00	24.00	1.59	---	6.06	222.13	1306.6
STRUCTURE 18	ADDHYD	.30	1	2	.08	.0	3.00	24.00	1.65	---	6.04	422.71	1409.0
SECTION 114	REACH	.30	1	2	.08	.0	3.00	24.00	1.65	---	6.13	420.73	1402.4
RUCTURE 13	ADDHYD	14.47	1	2	.08	.0	3.00	24.00	1.16	---	6.86	2421.19	167.3
XSECTION 106	REACH	14.47	1	2	.08	.0	3.00	24.00	1.16	---	6.95	2419.75	167.2
ECTION 6	RUNOFF	.13	1	2	.08	.0	3.00	24.00	1.31	---	6.11	124.14	954.9
RUCTURE 6	ADDHYD	14.60	1	2	.08	.0	3.00	24.00	1.16	---	6.95	2431.71	166.6
XSECTION 5	RUNOFF	.15	1	2	.08	.0	3.00	24.00	1.52	---	6.04	197.55	1317.0
RUCTURE 6	ADDHYD	14.75	1	2	.08	.0	3.00	24.00	1.16	---	6.95	2445.17	165.8
ECTION 7	RUNOFF	.19	1	2	.08	.0	3.00	24.00	2.25	---	6.15	274.84	1446.5
RUCTURE 6	ADDHYD	14.94	1	2	.08	.0	3.00	24.00	1.18	---	6.92	2483.82	166.3

MMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

TION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
SECTION 11	RUNOFF	.16	1	2	.08	.0	3.00	24.00	2.07	---	6.06	259.09	1619.3
CTION 12	RUNOFF	.13	1	2	.08	.0	3.00	24.00	2.25	---	6.04	241.63	1858.7
UCTURE 11	ADDHYD	.29	1	2	.08	.0	3.00	24.00	2.15	---	6.05	499.54	1722.5
SECTION 107	REACH	.29	1	2	.08	.0	3.00	24.00	2.15	---	6.15	480.63	1657.4
TRUCTURE 6	ADDHYD	15.23	1	2	.08	.0	3.00	24.00	1.20	---	6.24	2867.34	188.3
JCTURE 97	RESVOR	15.23	1	2	.08	.0	3.00	24.00	1.15	6.38	7.33	2264.90	148.7
SECTION 104	REACH	15.23	1	2	.08	.0	3.00	24.00	1.15	---	7.41	2264.89	148.7
CTION 4	RUNOFF	.19	1	2	.08	.0	3.00	24.00	1.66	---	6.03	280.12	1474.3
JCTURE 4	ADDHYD	15.42	1	2	.08	.0	3.00	24.00	1.15	---	7.41	2275.81	147.6
SECTION 8	RUNOFF	.20	1	2	.08	.0	3.00	24.00	2.07	---	6.09	308.85	1544.2
JCTURE 8	ADDHYD	15.62	1	2	.08	.0	3.00	24.00	1.16	---	7.41	2290.34	146.6
SECTION 10	RUNOFF	.14	1	2	.08	.0	3.00	24.00	1.59	---	6.00	205.93	1470.9

XSECTION 109	REACH	.14	1	2	.08	.0	3.00	24.00	1.58	---	6.10	205.85	1470.4
XSECTION 9	RUNOFF	.25	1	2	.08	.0	3.00	24.00	1.75	---	5.98	408.21	1632.8
STRUCTURE 9	ADDHYD	.39	1	2	.08	.0	3.00	24.00	1.69	---	6.02	581.15	1490.1
XSECTION 108	REACH	.39	1	2	.08	.0	3.00	24.00	1.68	---	6.11	576.48	1478.1
STRUCTURE 99	ADDHYD	16.01	1	2	.08	.0	3.00	24.00	1.18	---	7.40	2313.97	144.5

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SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS									PEAK TRAVEL TIM	
						OUTFLOW+			VOLUME	MAIN	ITER-	Q AND A			PEAK	S/Q	ATT-		
XSEC	REACH	INFLOW		OUTFLOW		INTERV.AREA		BASE-	ABOVE	TIME	ATION	EQUATION		LENGTH	RATIO	@PEAK	KIN	STOR-	KINE
ID	LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	FLOW (CFS)	BASE (IN)	INCR (HR)	#	COEFF (X)	POWER (M)	FACTOR (K*)	Q/I (Q*)	(K) (SEC)	COEFF (C)	AGE (HR)	MATIC (HR
ALTERNATE 1 STORM 1																			
												.900							
+174	2300	244	6.1	234	6.1			0	1.40	.08	1		1.53	.052	.957	240	.77?	.08	.07
+						---	---												
												.700							
+173	2800	379	6.1	343	6.2			0	1.40	.08	1		1.53	.051	.903	295	.67?	.08	.08
+						---	---												
												.600							
+175	3850	303	6.2	269	6.4			0	1.40	.08	1		1.56	.060	.888	441	.51	.17	.12
+						---	---												
												.600							
+176	4100	203	6.1	166	6.3			0	1.40	.08	1		1.56	.108	.819	542	.43	.17	.1(
+						---	---												
												.800							
+172	1700	1021	6.3	1021	6.3			0	1.40	.08	0		1.53	.007	1.000	117	1.00?	.00	.0(
+						---	---												
												.600							
+178	3000	316	6.1	281	6.2			0	1.40	.08	1		1.56	.067	.891	338	.61	.17	.10
+						---	---												
												.600							
+177	3350	1026	6.1	990	6.3			0	1.40	.08	1		1.56	.029	.965	247	.75?	.17	.07
+						---	---												
												.200							
+171	3850	2235	6.3	2128	6.4			0	1.40	.08	1		1.63	.033	.952	322	.63	.08	.09
+						---	---												
												.300							
+170	2500	2270	6.4	2265	6.5			0	1.46	.08	1		1.63	.009	.998	162	.96?	.08	.05
+						---	---												
												.200							

-128	1700	168	6.2	165	6.3	---	---	0	1.01	.08	1	1.20	1.47	.018	.981	199	.86?	.08	.06
-127	2300	321	6.1	309	6.1	---	---	0	1.24	.08	1	1.00	1.47	.026	.962	247	.75?	.08	.07
184	1350	1643	6.6	1643	6.6	---	---	0	.98	.08	0	.200	1.63	.001	1.000	127	1.00?	.00	.00
-135	3100	99	6.1	86	6.3	---	---	0	1.31	.08	1	.900	1.52	.089	.869	454	.49	.17	.13
+130	3700	461	6.1	436	6.3	---	---	0	1.47	.08	1	.900	1.52	.043	.947	320	.64	.17	.09
+131	4400	691	6.1	635	6.1	---	---	0	2.24	.08	1	.700	1.52	.085	.919	391	.55	.08	.11
-125	1200	2407	6.5	2407	6.5	---	---	0	1.06	.08	0	.400	1.63	.000	1.000	64	1.00?	.00	.00
+120	2700	2614	6.1	2614	6.2	---	---	0	1.09	.08	1	.400	1.61	.002	1.000	150	1.00?	.08	.04

MMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS									PEAK	
						OUTFLOW+			VOLUME	MAIN	ITER-	Q AND A			PEAK	S/Q	ATT-	TRAVEL TIME	
XSEC	REACH	INFLOW		OUTFLOW		INTERV.AREA		BASE-	ABOVE	TIME	ATION	EQUATION		LENGTH	RATIO	@PEAK	KIN	STOR-	KINE-
	LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	FLOW (CFS)	BASE (IN)	INCR (HR)	#	COEFF (X)	POWER (M)	FACTOR (K*)	O/I (Q*)	(K) (SEC)	COEFF (C)	AGE (HR)	MATIC (HR)
	ALTERNATE 1 STORM 2																		
	2700	497	6.1	488	6.1	---	---	0	2.25	.08	1	1.40	1.45	.039	.982	215	.82?	.08	.06
	4200	2352	6.7	2320	6.9	---	---	0	1.14	.08	1	.100	1.65	.008	.986	483	.47	.17	.13
	1800	231	6.1	225	6.1	---	---	0	1.44	.08	1	.800	1.55	.028	.974	194	.87?	.08	.05

159	3300	500	6.1	477	6.2	---	---	0	1.40	.08	1	.500	1.62	.023	.953	290	.68?	.08	.08
151	4000	945	6.6	933	7.1	---	---	0	.82	.08	1	.100	1.65	.023	.987	658	.37	.50	.18
158	3600	137	6.1	109	6.2	---	---	0	1.59	.08	1	.400	1.63	.181	.791	578	.41	.17	.17
152	3500	409	6.1	362	6.2	---	---	0	2.01	.08	1	.300	1.63	.093	.884	440	.51	.08	.13
161	3400	215	6.3	198	6.5	---	---	0	1.66	.08	1	.700	1.51	.061	.921	465	.49	.17	.13
150	2950	244	6.4	231	6.6	---	---	0	1.39	.08	1	.600	1.53	.040	.949	401	.54	.17	.11
149	2400	14	10.3	14	10.6	---	---	0	.70*	.08	1	.300	1.63	.003	.999	1108	.24	.25	.31
148	3300	732	7.7	726	7.8	733	7.8	0	.82	.08	1	.300	1.62	.004	.992	343	.61	.08	.10
157	2300	379	6.1	372	6.2	---	---	0	1.74	.08	1	.800	1.53	.031	.982	222	.80?	.08	.06
154	3500	601	6.1	570	6.2	---	---	0	1.91	.08	1	.500	1.61	.041	.948	296	.67?	.08	.08
155	3450	192	6.1	159	6.2	---	---	0	1.45	.08	1	.600	1.53	.156	.830	510	.45	.08	.15
153	2050	68	8.3	68	8.4	---	---	0	1.34*	.08	1	.500	1.61	.001	1.000	396	.55	.08	.11
147	2300	115	6.1	105	6.3	237	6.2	0	1.28*	.08	1	.400	1.62	.002	.912	407	.54	.17	.12
141	2100	822	7.8	820	8.0	---	---	0	.90*	.08	1	.381	1.56	.002	.998	224	.80?	.17	.06
143	1900	441	6.1	434	6.1	---	---	0	1.32	.08	1	1.40	1.42	.026	.985	175	.92?	.08	.05
186	700	1071	6.2	1071	6.2	---	---	0	.92	.08	0	.159	1.63	.000	1.000	90	1.00?	.00	.00
185	1100	1280	6.2	1280	6.2	1303	6.2	0	.93	.08	0	.159	1.63	.001	1.000	132	1.00?	.00	.00
137	3300	1636	6.2	1514	6.4	1525	6.4	0	.95	.08	1	.157	1.63	.006	.925	360	.59	.17	.10
129	3800	1566	6.4	1434	6.6	---	---	0	.95	.08	1	.100	1.65	.010	.916	513	.45	.25	.14

14	1750	420	6.1	419	6.1	---	---	0	1.65	.08	1	.700	1.56	.024	.997	161	.96?	.08	.04
06	3100	2420	6.9	2419	7.0	---	---	0	1.16	.08	1	.300	1.64	.002	1.000	188	.88?	.08	.05
07	2650	499	6.1	480	6.1	---	---	0	2.15	.08	1	1.00	1.45	.053	.962	266	.72?	.08	.07
04	1950	2264	7.3	2264	7.4	---	---	0	1.15	.08	1	.200	1.65	.001	1.000	149	1.00?	.08	.04
09	2350	204	6.0	197	6.1	---	---	0	1.59	.08	1	1.80	1.41	.056	.966	234	.78?	.17	.07
108	2500	571	6.0	563	6.1	---	---	0	1.69	.08	1	.900	1.47	.051	.986	240	.77?	.17	.07

HYDROLOGIC CALCULATIONS

RATIONAL METHOD

SAND CREEK DRAINAGE BASIN
RIDGEVIEW, NORTH OF DUBLIN BVLD.
MASTER DEVELOPMENT DRAINAGE PLAN
DEVELOPED CONDITION

ESTIMATED RUNOFF COEFFICIENTS, C_{100}

12/17/2002

SUB-BASIN LABEL	SUB AREA ONE				SUB AREA TWO				SUB AREA THREE				SUB AREA FOUR				TOTAL AREA AC.	WEIGHTED C	WEIGHTED INPERV.
	ASSUMED LAND USE	ESTIMATED PERCENT IMPERVIOUS	ESTIMATED C	AREA AC.	ASSUMED LAND USE	ESTIMATED PERCENT IMPERVIOUS	ESTIMATED C	AREA AC.	ASSUMED LAND USE	ESTIMATED PERCENT IMPERVIOUS	ESTIMATED C	AREA AC.	ASSUMED LAND USE	ESTIMATED PERCENT IMPERVIOUS	ESTIMATED C	AREA AC.			
121	3.6 DU/AC	40.0	0.60	15.2													15.2	0.60	40.0
122	3.6 DU/AC	40.0	0.60	20.6													20.6	0.60	40.0
123	MULT FAM	70.0	0.70	12.3	OPEN SPACE	2.0	0.35	1.5									13.8	0.66	62.6
142-1	RANCHETTE	1.0	0.35	35.0	OPEN SPACE	2.0	0.35	0.8									35.8	0.35	1.0
142-2	RANCHETTE	1.0	0.35	5.8	L. L. RES.	85.0	0.35	7.4	OPEN SPACE	2.0	0.35	0.7					13.9	0.35	45.8
142-3	Sub-Basin 142-3 was added to Basin147/47 in the Sand Creek Basin TR20 Analysis																		
145-1	3.6 DU/AC	40.0	0.60	12.3													12.3	0.60	40.0
145-2	2 DU/AC	25.0	0.45	22.5	SCHOOL SITE	50.0	0.68	4.6									27.1	0.49	29.2
145-3	2 DU/AC	25.0	0.45	16.8	COMMERCIAL	95.0	0.90	24.6	SCHOOL SITE	50.0	0.68	26.2					67.6	0.70	60.2
145-4	SCHOOL SITE	50.0	0.68	6.0													6.0	0.68	50.0
145-5	3.6 DU/AC	40.0	0.60	13.1	OPEN SPACE	2.0	0.35	2.1									15.2	0.57	34.8
145-6	3.6 DU/AC	40.6	0.60	26.2													26.2	0.60	40.6
146-1	RANCHETTE	1.0	0.35	59.9	ART. STREET	85.0	0.87	8.7	COMMERCIAL	95.0	0.90	18.8	SCHOOL SITE	50.0	0.68	15.5	102.9	0.54	32.7
146-2	ART. STREET	85.0	0.87	5.9	OPEN SPACE	2.0	0.35	1.3									7.2	0.78	70.0
D1	3.6 DU/AC	40.0	0.60	2.0													2.0	0.60	40.0
D2	ART. STREET	85.0	0.87	3.7	OPEN SPACE	2.0	0.35	0.8									4.5	0.78	70.2
D3	ART. STREET	85.0	0.87	3.3													3.3	0.87	85.0
D4	ART. STREET	85.0	0.87	2.7													2.7	0.87	85.0
D5	ART. STREET	85.0	0.87	2.5													2.5	0.87	85.0
																	378.8		

DEVELOPED CONDITION

ESTIMATED RUNOFF COEFFICIENTS, C_5

12/17/2002

SUB-BASIN LABEL	SUB AREA ONE				SUB AREA TWO				SUB AREA THREE				SUB AREA FOUR				TOTAL AREA AC.	WEIGHTED C	WEIGHTED INPERV.
	ASSUMED LAND USE	ESTIMATED PERCENT IMPERVIOUS	ESTIMATED C	AREA AC.	ASSUMED LAND USE	ESTIMATED PERCENT IMPERVIOUS	ESTIMATED C	AREA AC.	ASSUMED LAND USE	ESTIMATED PERCENT IMPERVIOUS	ESTIMATED C	AREA AC.	ASSUMED LAND USE	ESTIMATED PERCENT IMPERVIOUS	ESTIMATED C	AREA AC.			
121	3.6 DU/AC	40.0	0.50	15.2													15.2	0.50	40.0
122	3.6 DU/AC	40.0	0.50	20.6													20.6	0.50	40.0
123	MULT FAM	70.0	0.60	12.3	OPEN SPACE	2.0	0.25	1.5									13.8	0.56	62.6
142-1	RANCHETTE	1.0	0.25	35.0	OPEN SPACE	2.0	0.25	0.8									35.8	0.25	1.0
142-2	RANCHETTE	1.0	0.25	5.8	L. L. RES.	85.0	0.25	7.4	OPEN SPACE	2.0	0.25	0.7					13.9	0.25	45.8
142-3	Sub-Basin 142-3 was added to Basin147/47 in the Sand Creek Basin TR20 Analysis																		
145-1	3.6 DU/AC	40.0	0.50	12.3													12.3	0.50	40.0
145-2	2 DU/AC	25.0	0.35	22.5	SCHOOL SITE	50.0	0.58	4.6									27.1	0.39	29.2
145-3	2 DU/AC	25.0	0.35	16.8	COMMERCIAL	95.0	0.90	24.6	SCHOOL SITE	50.0	0.58	26.2					67.6	0.64	60.2
145-4	SCHOOL SITE	50.0	0.58	6.0													6.0	0.58	50.0
145-5	3.6 DU/AC	40.0	0.50	13.1	OPEN SPACE	2.0	0.25	2.1									15.2	0.47	34.8
145-6	3.6 DU/AC	40.6	0.50	26.2													26.2	0.50	40.6
146-1	RANCHETTE	1.0	0.25	59.9	ART. STREET	85.0	0.77	8.7	COMMERCIAL	95.0	0.90	18.8	SCHOOL SITE	50.0	0.68	15.5	102.9	0.48	32.7
146-2	ART. STREET	85.0	0.77	5.9	OPEN SPACE	2.0	0.25	1.3									7.2	0.68	70.0
D1	3.6 DU/AC	40.0	0.50	2.0													2.0	0.50	40.0
D2	ART. STREET	85.0	0.82	3.7	OPEN SPACE	2.0	0.25	0.8									4.5	0.72	70.2
D3	ART. STREET	85.0	0.82	3.3													3.3	0.82	85.0
D4	ART. STREET	85.0	0.82	2.7													2.7	0.82	85.0
D5	ART. STREET	85.0	0.82	2.5													2.5	0.82	85.0
																	378.8		

BASIN "C" VALUES 12/17/2002

RIDGEVIEW
MASTER DEVELOPMENT DRAINAGE PLAN
(Area Drainage Summary)

(SAND CREEK BASIN, DEVELOPED)

SUB-BASIN/ OUTFALL	AREA TOTAL (Ac)	WEIGHTED C(5) * For Calcs See Runoff Summary	WEIGHTED C(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL Length (ft)	STREET / CHANNEL Slope (%)	STREET / CHANNEL Velocity (fps)	STREET / CHANNEL Tc (min)	Tc TOTAL (min)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (c.f.s.)	TOTAL FLOWS Q(100) (c.f.s.)
121 (DP-N4)	15.20	0.50	0.60	0.25	100	2.00	12.65	500 600	3.30% 1.80%	6.36 4.70	1.31 2.13	16.09	3.37	5.69 CA(equiv.)	**26** **7.60**	**52** **9.12**
122 (DP-N9)	20.60	0.50	0.60	0.25	100	2.00	12.65	1150	2.00%	4.95	3.87	16.52	3.33	5.62 CA(equiv.)	**34** **10.30**	**69** **12.36**
123 CHANNEL)	13.80	0.56	0.66	0.25	100	2.00	12.65	650	4.00%	7.00	1.55	14.19	3.55	6.05 CA(equiv.)	**27** **7.73**	**55** **9.11**
142-1 (DP-147) OS	35.80	0.25	0.35	0.25	200	4.00	17.88	2200 600	6.00% 1.00%	8.57 5.00	4.28 2.00	24.16	2.78	4.59 CA(equiv.)	**25** **8.95**	**58** **12.53**
142-2 (DP-147) OS	13.90	0.25	0.35	0.25	200	4.00	17.88	950 600	6.60% 5.00%	8.99 7.83	1.76 1.28	20.92	2.98	4.97 CA(equiv.)	**10** **3.48**	**24** **4.87**
145-1 (DP-N2) OS	12.30	0.50	0.60	0.25	100	2.00	12.65	1100 550	2.50% 7.30%	5.53 9.46	3.31 0.97	16.93	3.29	5.55 CA(equiv.)	**20** **6.15**	**41** **7.38**
145-2 (DP-N2) OS	27.10	0.39	0.49	0.25	200	12.00	12.44	800	6.50%	8.92	1.49	13.94	3.58	6.10 CA(equiv.)	**38** **10.57**	**81** **13.28**
145-3 (DP-N1) OS	67.60	0.64	0.70	0.45	200	8.00	10.88	1100 2000	3.60% 6.00%	6.64 8.57	2.76 3.89	17.53	3.24	5.45 CA(equiv.)	**140** **43.26**	**258** **47.32**

RIDGEVIEW
MASTER DEVELOPMENT DRAINAGE PLAN
(Area Drainage Summary)

(SAND CREEK BASIN, DEVELOPED)

SUB-BASIN	AREA TOTAL (Ac)	WEIGHTED C(5) * For Calcs See Runoff Summary	WEIGHTED C(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL Length (ft)	STREET / CHANNEL Slope (%)	STREET / CHANNEL Velocity (fps)	STREET / CHANNEL Tc (min)	Tc TOTAL (min)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (c.f.s.)	TOTAL FLOWS Q(100) (c.f.s.)
145-4 (DP-N1) OS	6.00	0.58	0.68	0.25	100	4.00	10.06	400 150	4.00% 1.00%	7.00 3.50	0.95 0.71	11.73	3.83	6.61 CA(equiv.)	13 **3.48**	27 **4.08**
145-5 (DP-N2)	15.20	0.47	0.57	0.25	100	2.40	11.91	1000	2.00%	4.95	3.37	15.27	3.44	5.84 CA(equiv.)	25 **7.14**	51 **8.66**
145-6 (DP-N3)	26.20	0.50	0.60	0.25	100	2.00	12.65	1700	2.00%	4.95	5.72	18.37	3.17	5.32 CA(equiv.)	42 **13.10**	84 **15.72**
146-1 (DP-N1) OS	102.90	0.48	0.54	0.25 0.70	50 100	8.00 3.00	4.50 5.21	3400 800	4.00% 2.00%	7.00 4.95	8.10 2.69	20.50	3.01	5.02 CA(equiv.)	149 **49.39**	279 **55.57**
146-2 (DP-N7)	7.20	0.68	0.78	0.25	30	0.60	6.93	1300	3.00%	6.06	3.57	10.50	3.99	6.93 CA(equiv.)	20 **4.90**	39 **5.62**
D-1	2.00	0.50	0.60	0.25	100	3.00	11.06	100 800	1.00% 3.75%	3.50 6.78	0.48 1.97	13.50	3.62	6.19 CA(equiv.)	4 **1.00**	7 **1.20**
D-2	4.50	0.72	0.78	0.60	15	0.30	2.88	580 850 700	3.80% 6.20% 1.86%	6.82 8.71 4.77	1.42 1.63 2.44	8.37	4.32	7.60 CA(equiv.)	14 **3.24**	27 **3.51**
D-3	3.30	0.83	0.87	0.60	15	0.30	2.88	580 850 700	3.80% 6.20% 1.86%	6.82 8.71 4.77	1.42 1.63 2.44	8.37	4.32	7.60 CA(equiv.)	12 **2.74**	22 **2.87**
D-4	2.70	0.83	0.87	0.60	15	0.30	2.88	800 800	1.50% 1.00%	4.29 3.50	3.11 3.81	9.80	4.09	7.13 CA(equiv.)	9 **2.24**	17 **2.35**
D-5	2.50	0.83	0.87	0.60	15	0.30	2.88	800 800	1.50% 1.00%	4.29 3.50	3.11 3.81	9.80	4.09	7.13 CA(equiv.)	8 **2.08**	16 **2.18**

RIDGEVIEW
MASTER DEVELOPMENT DRAINAGE PLAN

COMPOSITE "CA" CALCULATION

SAND CREEK SUBBASINS DEVELOPED CONDITION

ANALYSIS POINT	SUB-BASIN I.D.	SUB-BASIN AREA (ac)	SUB-BASIN CA(5)	SUB-BASIN CA(100)	COMPOSITE CA(5)	COMPOSITE CA(100)
DP-N1	145-3	67.6	43.26	47.32		
	145-4	6.0	3.48	4.08		
	146-1	102.9	49.39	55.57		
	TOTAL	176.5			96.13	106.97
DP-N2	145-1	12.3	6.15	7.38		
	145-2	27.1	10.57	13.28		
	145-5	15.2	7.14	8.66		
	TOTAL	54.6			23.86	29.32
DP-N3	145-1	12.3	6.15	7.38		
	145-2	27.1	10.57	13.28		
	145-5	15.2	7.14	8.66		
	145-6	26.2	13.10	15.72		
	TOTAL	80.8			36.96	45.04
DP-N4	0.5(121) 1/2 0F SUB-BASIN 121	7.6	3.80	4.56		
	TOTAL	7.6			3.80	4.56
DP-N5	DP-N1	176.5	96.13	106.97		
	DP-N4	7.6	3.80	4.56		
	TOTAL	184.1			99.93	111.53
DP-N6	DP-N5	184.1	99.93	111.53		
	DP-N3	80.8	36.96	45.04		
	TOTAL	264.9			136.89	156.57
DP-N7	DP-N6	264.9	136.89	156.57		
	146-2	7.2	4.90	5.62		
	TOTAL	272.1			141.79	162.19
DP-N8	DP-N7	272.1	141.79	162.19		
	.5(121)	7.6	3.80	4.56		
	D-I	2	1.00	1.20		
	D-2	4.5	3.24	3.51		
	D-3	3.3	2.74	2.87		
	D-4	2.7	2.24	2.35		
	D-5	2.5	2.08	2.18		
	TOTAL	294.7			156.89	178.86
DP-N9	142-1	35.8	8.95	12.53		
	142-2	13.9	3.48	4.87		
	TOTAL	49.7			12.43	17.40

Comc 12/16/2002

RIDGEVIEW
MASTER DEVELOPMENT DRAINAGE PLAN

COMPOSITE "CA" CALCULATION

SAND CREEK SUBBASINS DEVELOPED CONDITION

ANALYSIS POINT	SUB-BASIN I.D.	SUB-BASIN AREA (ac)	SUB-BASIN CA(5)	SUB-BASIN CA(100)	COMPOSITE CA(5)	COMPOSITE CA(100)
DP-N10	0.5(121)	7.6	3.80	4.56		
	TOTAL	7.6			3.80	4.56
DP-N11	DP-N10	7.6	3.80	4.56		
	D-4	2.7	2.24	2.35		
	TOTAL	10.3			6.04	6.91
DP-N12	DP-N11	10.3	6.04	6.91		
	D-5	2.5	2.08	2.18		
	TOTAL	12.8			8.12	9.09
DP-N13	D-1	2	1.00	1.20		
	D-2	4.5	3.24	3.51		
	TOTAL	6.5			4.24	4.71
DP-N14	DP-N13	6.5	4.24	4.71		
	D-3	3.3	2.74	2.87		
	TOTAL	9.8			6.98	7.58

Comc 12/16/2002

RIDGEVIEW
MASTER DEVELOPMENT DRAINAGE PLAN

(SAND CREEK BASINS DEVELOPED CONDITION ROUTING)

DESIGN POINT	AREA TOTAL (Ac)	WEIGHTED CA(5) * For Calcs See Runoff Summary	WEIGHTED CA(100) * For Calcs See Runoff Summary	OVERLAND/POND OUTFLOW C(5)	OVERLAND/POND OUTFLOW Length (ft)	OVERLAND/POND OUTFLOW Height (ft)	OVERLAND/POND OUTFLOW Tc (min)	STREET / CHANNEL/PIPE Length (ft)	STREET / CHANNEL/PIPE Slope (%)	STREET / CHANNEL/PIPE Velocity (fps)	STREET / CHANNEL/PIPE Tc (min)	Tc TOTAL (min)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (c.f.s.)	TOTAL FLOWS Q(100) (c.f.s.)
DP-N1	176.50	96.13	106.97	0.25 0.70	50 100	8.00 3.00	4.50 5.21	3400 800	4.00% 2.00%	7.00 4.95	8.10 2.69	20.50	3.01	5.02	**290**	**537**
DP-N2	54.60	23.86	29.32	0.25	200	12.00	12.44	800 1100	6.50% 1.80%	8.92 12.00	1.49 1.53	15.47	3.42	5.80	**82**	**170**
DP-N3	80.80	36.96	45.04	0.25	200	12.00	12.44	800 1100 900	6.50% 1.80% 1.80%	8.92 4.70 12.00	1.49 3.90 1.25	19.09	3.12	5.22	**115**	**235**
DP-N4	7.60	3.80	4.56	0.25	100	2.00	12.65	500 600	3.30% 1.80%	6.36 4.70	1.31 2.13	16.09	3.37	5.69	**13**	**26**
DP-N5	184.10	99.93	111.53	0.25 0.70	50 100	8.00 3.00	4.50 5.21	3400 800 1450	4.00% 2.00% 3.00%	7.00 4.95 14.00	8.10 2.69 1.73	22.22	2.90	4.81	**289**	**536**
DP-N6	264.90	136.89	156.57	0.25 0.70	50 100	8.00 3.00	4.50 5.21	3400 800 1450 100	4.00% 2.00% 3.00% 3.00%	7.00 4.95 14.00 14.00	8.10 2.69 1.73 0.12	22.34	2.89	4.79	**395**	**751**
DP-N7	272.10	141.79	162.19	0.25 0.70	50 100	8.00 3.00	4.50 5.21	3400 800 1550 150	4.00% 2.00% 3.00% 2.00%	7.00 4.95 14.00 14.00	8.10 2.69 1.85 0.18	22.52	2.88	4.77	**408**	**774**
DP-N8	294.70	156.89	178.86	0.25 0.70	50 100	8.00 3.00	4.50 5.21	3400 800 1550 270	4.00% 2.00% 3.00% 2.00%	7.00 4.95 14.00 14.00	8.10 2.69 1.85 0.32	22.66	2.87	4.76	**450**	**851**
DP-N9	49.70	12.43	17.40	0.25	100	2.00	12.65	2200 600 550	6.00% 1.00% 1.00%	8.57 5.00 5.00	4.28 2.00 1.83	20.76	2.99	4.99	**37**	**87**

RIDGEVIEW
MASTER DEVELOPMENT DRAINAGE PLAN

(SAND CREEK BASINS DEVELOPED CONDITION ROUTING)

DESIGN POINT	AREA TOTAL (Ac)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND/POND OUTFLOW C(5)	OVERLAND/POND OUTFLOW Length (ft)	OVERLAND/POND OUTFLOW Height (ft)	OVERLAND/POND OUTFLOW Tc (min)	STREET / CHANNEL/PIPE Length (ft)	STREET / CHANNEL/PIPE Slope (%)	STREET / CHANNEL/PIPE Velocity (fps)	STREET / CHANNEL/PIPE Tc (min)	Tc TOTAL (min)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (c.f.s.)	TOTAL FLOWS Q(100) (c.f.s.)
		* For Calcs See Runoff Summary														
DP-N10	7.60	3.80	4.56	0.25	100	2.00	12.65	500 600	3.30% 1.80%	6.36 4.70	1.31 2.13	16.09	3.37	5.69	**13**	**26**
DP-N11	10.30	6.04	6.91	0.25	100	2.00	12.65	500 600 420	3.30% 1.80% 1.00%	6.36 4.70 10.00	1.31 2.13 0.70	16.79	3.30	5.57	**20**	**39**
DP-N12	12.80	8.12	9.09	0.25	100	2.00	12.65	500 600 420 100	3.30% 1.80% 1.00% 1.00%	6.36 4.70 10.00 10.00	1.31 2.13 0.70 0.17	16.95	3.29	5.55	**27**	**50**
DP-N13	6.50	4.24	4.71	0.60	15	0.30	2.88	580 850 700	3.80% 6.20% 1.86%	6.82 5.00 5.00	1.42 2.83 2.33	9.46	4.14	7.24	**18**	**34**
DP-N14	9.80	6.98	7.58	0.60	15	0.30	2.88	580 850 700 50	3.80% 6.20% 1.86% 1.00%	6.82 5.00 5.00 14.00	1.42 2.83 2.33 0.06	9.52	4.14	7.22	**29**	**55**

TING 12/16/02

SAND CREEK PHASE II CHANNEL ANALYSIS

1) FLOW DATA TABLE

2) PRELIMINARY HEC-RAS ANALYSIS

HEC-RAS Cross Section Number	FIS Cross Section Number	TR20 Drainage Basi (c UPSTREAM Existing 10 YR	Existing 100 YR	10 YR	Comments
310	CF			1,200	
294.5	CD	753	2864	1,200	Begin project Section 295+/-
214	-	811	3134	1,200	Junction north diversion
179				1,200	South of Dublin Blvd.
174	CA				
107	-	833	3,239	1,200	Junction south diversion
84	-	846	3,303	1,200	
75	BY			1,250	
69	-	870	3,383		
49	BW				
38	BV	870	3,383	1,300	
33	-	865	3,427		Junction west tributary
22	BT			1,400	End Project Section 24+/-
18	BS			1,400	
490 (1)	-	164	661		
390 (1)	-	164	661		

Flow rates generated in the project "Master Development herefore, it was logical to adjust the FIS flow rates upstream within the project segment to pen channel divisions bring storm drainage to Sand Creek channel upstream of t

(1) Flows for proposed diversion channel reach two, constr

Revised 12/10/2002: Section #222 revised to #214, Sectio

HEC-RAS September 1998 Version 2.2
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X     X    X   X
XXXXXXX  XXXX     X       XXX  XXXX      XXXXXX    XXXX
X     X  X        X            X  X      X    X        X
X     X  X        X    X       X   X     X    X        X
X     X  XXXXXX    XXXX        X    X    X    X   XXXXX
```

PROJECT DATA
Project Title: 2002improv.
Project File : 02imp.prj
Run Date and Time: 12/4/2002 1:23:49 PM

Project in English units

Project Description:
Phase II Improvements 11-27-02

PLAN DATA

Plan Title: MDDP 2002
Plan File : x:\2910000.all\2910401\HEC-RAS\02imp.p03

Geometry Title: 02improv
Geometry File : x:\2910000.all\2910401\HEC-RAS\02imp.g02

Flow Title : MDDP02: 10-50-100-500
Flow File : x:\2910000.all\2910401\HEC-RAS\02imp.f01

Plan Summary Information:
Number of: Cross Sections = 61 Mulitple Openings = 0
Culverts = 0 Inline Weirs = 0
Bridges = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculaton tolerance = 0.01
Maximum number of interations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed at all cross sections
Conveyance Calculation Method: Between every coordinate point (HEC2 Style)
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: MDDP02: 10-50-100-500
Flow File : x:\2910000.all\2910401\HEC-RAS\02imp.f01

Flow Data (cfs)

River	Reach	RS	PF#1	PF 2	PF 3	PF 4
SAND CREEK	ONE	310	1200	2100	2500	3900
SAND CREEK	ONE	294.5	1200	2100	2600	3900
SAND CREEK	ONE	214	1200	2400	3100	4600
SAND CREEK	ONE	179	1200	2600	3150	4800
SAND CREEK	ONE	110	1200	2600	3250	5100

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
SAND CREEK	ONE	PF#1	Normal S = .01	Normal S = .01
SAND CREEK	ONE	PF 2	Normal S = .01	Normal S = .01
SAND CREEK	ONE	PF 3	Normal S = .01	Normal S = .01
SAND CREEK	ONE	PF 4	Normal S = .01	Normal S = .01

GEOMETRY DATA

Geometry Title: 02improv
Geometry File : x:\2910000.all\2910401\HEC-RAS\02imp.g02

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 310

INPUT
Description: FIS CF-4075 UPSTREAM OF PROPERTY
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	6828	1030	6824	1075	6820	1090	6816	1110	6812
1120	6808	1132	6804	1140	6802	1142	6800	1180	6800
1190	6802	1285	6804	1370	6808	1445	6812	1470	6814
1520	6815	1605	6816	1665	6816	1810	6818	1945	6820

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.04	1140	.032	1190	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1140	1190	730	850	730	.2 .4

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 305

INPUT
Description: FIS CE-4080 UPSTREAM OF PROPERTY
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	6820	1040	6816	1080	6812	1115	6808	1160	6804
1190	6800	1200	6796	1210	6792	1230	6788	1231	6786.4
1242	6786.4	1245	6788	1270	6792	1350	6792	1390	6796
1435	6800	1465	6800.2	1500	6800	1540	6802	1600	6802
1680	6802	1720	6801.6	1760	6802	1790	6802.2	1840	6802
1890	6802	1960	6803	2020	6804	2145	6806	2370	6808

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.06	1230	.03	1245	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1230	1245	390	395	400 .2	.4

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 300

INPUT
Description: UPSTREAM OF PROPERTY
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
402	6796	422	6794	428	6792	430	6790	436	6788
443	6786	454	6784	500	6784	548	6784	560	6786
600	6788	701	6790						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
402	.04	430	.035	560	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
430	560	230	205	170 .2	.4

CROSS SECTION RIVER: SAND CREEK

REACH: ONE RS: 295

INPUT
Description: NEAR UPSTREAM END OF PROPERTY
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
192	6788	283	6786	397	6784	420	6783.8	442	6784
459	6784.2	469	6784	476	6782	482	6780	500	6779.8
518	6780	573	6782	580	6784	586	6784.2	590	6784
603	6783.9	616	6784	646	6786	698	6788		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
192	.04	469	.035	580	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
469	580	87	86	85	.2	.4

Left Levee Station= 459 Elevation= 6786

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 294.5

INPUT
Description: FIS CD-4082 ROTATED
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
10	6784	44	6782	81	6780.3	120	6778	177	6776.5
236	6778	268	6778.4	362	6780	443	6782	458	6784
468	6782	474	6780	500	6777.9	531	6778	557	6780
562	6782	595	6784						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
10	.04	474	.035	562	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
474	562	60	68	80	.2	.4

Left Levee Station= 458 Elevation= 6785

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 290

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
10	6786	103	6780	120	6778	160	6776	225	6776
262	6778	368	6780	427	6781	455	6784	461	6782
475	6780	486	6778	500	6777.2	536	6778	543	6780
565	6782	589	6784	615	6786				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
10	.04	455	.035	565	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
455	565	62	56	56	.2	.4

Left Levee Station= 455 Elevation= 6785

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 280

INPUT
Description:
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6782	20	6780	48	6778	65	6776	90	6774
170	6773	242	6774	265	6776	279	6778	419	6780
451	6784	457	6782	467	6780	472	6778	480	6776.8
500	6776.7	520	6776.8	525	6778	532	6780	559	6782
571	6784	602	6786						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	451	.035	559	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
451	559	122	129	144	.2	.4

Left Levee Station= 451 Elevation= 6785

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 265

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6782	15	6780	40	6778	53	6776	77	6774
105	6772.4	160	6774	312	6776	357	6778	426	6782.5
434	6782	440	6780	454	6778	470	6776	500	6774.6
528	6776	539	6778	547	6780	559	6782	595	6784

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	454	.035	539	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
454	539	43	40	42	.2 .4

Left Levee Station= 426 Elevation= 6784

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 260

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
14	6778	31	6776	44	6774	59	6772	74	6770
170	6770	191	6772	204	6774	315	6776	360	6778
415	6780.5	427	6780	438	6778	443	6776	480	6774
500	6773.9	518	6774	543	6776	546	6778	550	6780
557	6782								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
14	.04	415	.035	543	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
415	543	99	114	126 .2	.4

Left Levee Station= 415 Elevation= 6782

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 250

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
432	6780	438	6778	446	6776	451	6774	479	6772
486	6770	492	6768	503	6768	511	6768	525	6768
530	6770	537	6772	549	6774	557	6776	570	6780
607	6784								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
432	.04	432	.035	607	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
432	607	76	56	58 .2	.4

Left Levee Station= 432 Elevation= 6782

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 240

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
428	6778	445	6774	457	6772	505	6770	508	6768
512	6766	516	6765.7	522	6766	526	6768	540	6770
547	6772	559	6774	564	6776	571	6780	595	6784

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
428	.04	428	.035	595	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
428	595	70	70	72 .2	.4

Left Levee Station= 428 Elevation= 6782

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 230

INPUT
Description: FIS CC-4084 ROTATED
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
438	6778	456	6772	483	6770	493	6768	500	6766
508	6764	513	6763	517	6764	532	6770	536	6772
557	6774	583	6782						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
438	.04	493	.035	583	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
493	583	32	36	40	.2	.4

Left Levee Station= 438 Elevation= 6782

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 225

INPUT
Description: AT WING WALLS
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
443	6778	470	6770	500	6768	524	6770	560	6780
566	6782								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
443	.04	443	.035	566	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
443	566	34	35	36	.3	.5

Left Levee Station= 443 Elevation= 6782

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 222

INPUT
Description: BEGIN DROP CHUTE CHANNEL
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
474.9	6781.2	475	6770	525	6770	525.1	6781.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
474.9	.04	474.9	.013	525.1	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
474.9	525.1	16	16	16	.3	.5

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 221.5

INPUT
Description: ENTRANCE MODIFICATION
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
475	6781.2	475.1	6771	494.3	6771	494.4	6770	500	6770
500.1	6771	525	6771	525.1	6781.2				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
475	.04	475	.013	525.1	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
475	525.1	4	4	4	.2	.4

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 221

INPUT
Description: TOP OF DROP CHUTE
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
   474.9  6781.2     475    6770     525    6770   525.1  6781.2

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
   474.9     .04   474.9     .11   525.1     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         474.9   525.1                 46       46       46             .2      .4

CROSS SECTION          RIVER: SAND CREEK
REACH: ONE               RS: 215

INPUT
Description: DROP CHUTE UPSTREAM OF JUNCTION
Station Elevation Data    num=       4
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   474.9  6770.3     475 6758.45     525 6758.45   525.1  6770.3

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
   474.9     .04   474.9     .11   525.1     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         474.9   525.1                 11       20       30             .2      .4

CROSS SECTION          RIVER: SAND CREEK
REACH: ONE               RS: 214

INPUT
Description: DROP CHUTE DOWNSTREAM OF JUNCTION
Station Elevation Data    num=       4
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   474.9  6770.3     475  6758.4     525  6758.4   525.1  6770.3

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
   474.9     .04   474.9     .11   525.1     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         474.9   525.1                 35       35       35             .2      .4

CROSS SECTION          RIVER: SAND CREEK
REACH: ONE               RS: 210

INPUT
Description: INTERSECTION CHANNEL GRADE IN DROP CHUTE
Station Elevation Data    num=       4
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   474.9 6761.52     475 6749.75     525 6749.75   525.1 6761.52

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
   474.9     .04   474.9     .09   525.1     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         474.9   525.1                 18       18       18             .2      .4

CROSS SECTION          RIVER: SAND CREEK
REACH: ONE               RS: 209

INPUT
Description: END OF DROP CHUTE
Station Elevation Data    num=       6
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
     450    6760   474.9 6757.02     475 6749.66     525 6749.66   525.1 6761.52
     550    6760

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
     450     .04   474.9     .04   525.1     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         474.9   525.1                 24       25       26             .3      .5

CROSS SECTION          RIVER: SAND CREEK
REACH: ONE               RS: 208

INPUT
Description: END OF RIPRAP
```

Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
443.6	6760	475	6749.53	500	6749.53	525	6749.53	556.4	6760

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
443.6	.04	443.6	.032	556.4	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
443.6	556.4	120	146	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 207

INPUT
Description: BEGIN RIPRAP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
447.4	6758	475	6748.8	525	6748.8	552.6	6758

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
447.4	.04	447.4	.04	552.6	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
447.4	552.6	10	10	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 206

INPUT
Description: TOP OF DROP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
447.25	6758	475	6748.75	525	6748.75	552.75	6758

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
447.25	.04	447.25	.04	552.75	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
447.25	552.75	1	1	.4	.7

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 205

INPUT
Description: BOTTOM OF DROP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
441.25	6758	475	6746.75	525	6746.75	558.75	6758

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
441.25	.04	441.25	.04	558.75	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
441.25	558.75	10	10	.4	.7

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 204

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
441.25	6758	475	6746.7	525	6746.7	558.75	6758

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
441.25	.04	441.25	.04	558.75	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
441.25	558.75	20	20	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 203

INPUT

Description: END OF DROP RIPRAP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
440.8	6758	475	6746.6	525	6746.6	559.2	6758

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
440.8	.04	440.8	.032	559.2	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
440.8	559.2	105	105	105	.1 .3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 202

INPUT
Description: CHANNEL
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
433.24	6760	475	6746.08	525	6746.08	554.76	6756

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
433.24	.04	433.24	.032	554.76	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
433.24	554.76	105	105	105	.1 .3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 200

INPUT
Description: BEGIN DROP RIPRAP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
431.65	6760	475	6745.55	525	6745.55	550.35	6754

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
431.65	.04	431.65	.032	550.35	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
431.65	550.35	10	10	10	.1 .3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 199

INPUT
Description: TOP OF DROP RIPRAP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
431.5	6760	475	6745.5	525	6745.5	550.5	6754

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
431.5	.04	431.5	.04	550.5	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
431.5	550.5	1	1	1	.4 .7

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 198

INPUT
Description: BOTTOM OF DROP RIPRAP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
443.5	6760	475	6743.5	525	6743.5	574.5	6754

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
443.5	.04	443.5	.04	574.5	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
443.5	574.5	10	10	10	.4 .7

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 197

INPUT
Description: IN RIPRAP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
425.35	6760	475	6743.45	525	6743.45	556.65	6754

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
425.35	.04	425.35	.04	556.65	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
425.35	556.65	20	20	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 196

INPUT
Description: END OF DROP RIPRAP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
425.05	6760	475	6743.35	525	6743.35	556.95	6754

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
425.05	.04	475	.032	556.95	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
475	556.95	120	105	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 195

INPUT
Description: CHANNEL
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
435.5	6756	475	6742.83	525	6742.83	555.5	6753

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
435.5	.04	475	.032	555.5	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
475	555.5	114	99	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 194

INPUT
Description: FEMA SECTION CB
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
440	6754	475	6742.33	525	6742.33	554	6752

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
440	.04	475	.032	554	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
475	554	6	6	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 193

INPUT
Description: BEGIN DROP RIPRAP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
445.9	6752	475	6742.3	525	6742.3	554.1	6752

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
445.9	.04	475	.04	554.1	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
475	554.1	10	10	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 192

INPUT
Description: TOP OF DROP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
445.75	6752	475	6742.25	525	6742.25	554.25	6752

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
445.75	.04	475	.04	554.25	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
475	554.25	1	1	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 191

INPUT
Description: BOTTOM OF DROP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
439.75	6752	475	6740.25	525	6740.25	560.25	6752

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
439.75	.04	475	.04	560.25	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
475	560.25	10	10	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 190

INPUT
Description: IN RIPRAP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
439.75	6752	475	6740.2	525	6740.2	560.25	6752

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
439.75	.04	475	.04	560.25	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
475	560.25	20	20	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 189

INPUT
Description: END OF RIPRAP
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
439.3	6752	475	6740.1	525	6740.1	560.7	6752

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
439.3	.04	475	.032	560.7	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
475	560.7	75	63	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 188

INPUT
Description: CHANNEL
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
440	6753	440.5	6751	475	6739.5	525	6739.5	559.5	6751
612	6752								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
440	.04	475	.032	559.5	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
475	559.5	57	57	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 187

INPUT
Description: CHANNEL
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
465	6752	466	6751.5	466.1	6742.2	475	6739.5	525	6739.5
557.4	6750.3	563	6752						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
465	.014	466.1	.032	557.4	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
466.1	557.4	26	26	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 186

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
468.9	6753			474.9	6747	475	6739.12	500	6739.12
525	6739.12	55[illegible]	[illegible]748	556	6750	562	6752		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
46[illegible]		[illegible]	[illegible]	551.64	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
475	551.64	55	55	.2	.4

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 184

INPUT
Description: 2-CELL RCB INLET
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
481.5	6751	481.51	6739.1	499.5	6739.1	499.51	6748.1	500.5	6748.1
500.51	6739.1	518.51	6739.1	518.52	6751				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
481.5	.013	481.5	.013	518.52	.013

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
481.5	518.52	49	49	.3	.5

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 183

INPUT
Description: 2-CELL RCB
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
481.5	6747.85	481.51	6738.85	499.5	6738.85	499.51	6747.85	500.5	6747.85
500.51	6738.85	518.51	6738.85	518.52	6747.85				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
481.5	.013	481.5	.013	518.52	.013

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
481.5	518.52	45	45	.2	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 182

INPUT
Description: 2-CELL RCB
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
481.5	6747.63	481.51	6738.63	499.5	6738.63	499.51	6747.63	500.5	6747.63
500.51	6738.63	518.51	6738.63	518.52	6747.63				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
481.5	.013	481.5	.013	518.52	.013

Bank Sta: Left 481.5, Right 518.52 | Lengths: Left Channel 52, Right 52 | Coeff Contr. .1 | Expan. .3

CROSS SECTION — RIVER: SAND CREEK
REACH: ONE — RS: 181

INPUT
Description: 2-CELL RCB
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
481.5	6747.36	481.51	6738.36	499.5	6738.36	499.51	6747.36	500.5	6747.36
500.51	6738.36	518.5	6738.36	518.51	6747.36				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
481.5	.013	481.5	.013	518.51	.013

Bank Sta: Left 481.5, Right 518.51 | Lengths: Left Channel 41, Right 41 | Coeff Contr. .1 | Expan. .3

CROSS SECTION — RIVER: SAND CREEK
REACH: ONE — RS: 180

INPUT
Description: 2-CELL RCB
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
481.5	6747.15	481.51	6738.15	499.5	6738.15	499.51	6747.15	500.5	6747.15
500.51	6738.15	518.5	6738.15	518.51	6747.15				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
481.5	.013	481.5	.013	518.51	.013

Bank Sta: Left 481.5, Right 518.51 | Lengths: Left Channel 1, Right 1 | Coeff Contr. .1 | Expan. .3

CROSS SECTION — RIVER: SAND CREEK
REACH: ONE — RS: 179.5

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
481.5	6746.15	481.51	6738.15	518.5	6738.15	518.51	6746.15

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
481.5	.016	481.51	.045	518.51	.016

Bank Sta: Left 481.51, Right 518.51 | Lengths: Left Channel 16.3, Right 16.3 | Coeff Contr. .3 | Expan. .5

CROSS SECTION — RIVER: SAND CREEK
REACH: ONE — RS: 179

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
462	6747	475	6744	475.01	6738	482.5	6735	500	6735
515.5	6735	524.5	6738	524.6	6756				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
462	.035	475.01	.045	524.5	.016

Bank Sta: Left 475.01, Right 524.5 | Lengths: Left Channel 66, Right 65.5 | Coeff Contr. .1 | Expan. .3

CROSS SECTION — RIVER: SAND CREEK
REACH: ONE — RS: 178

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
451	6746	464.9	6743	465	6741.5	470	6739	485	6735
500	6735	515	6735	526	6738	550	6746		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
451	.035	465	.045	550	.045

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
465	550	9.1	9.1	9.1	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 177

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
450.1	6746	475	6737.7	525	6737.7	549.9	6746

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
450.1	.045	450.1	.045	549.9	.045

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
450.1	549.9	20	20	20	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 176

INPUT
Description: END OF RIPRAP SPLASH POOL
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
450	6746	475	6737.7	525	6737.7	550	6746

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
450	.045	450	.032	525	.045

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
450	525	103	108.7	113	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 175

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
448.1	6746	475	6737.04	525	6737.04	551.9	6746

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
448.1	.045	448.1	.032	525	.045

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
448.1	525	103	108.7	113	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 174

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
446.2	6746	475	6736.4	525	6736.4	553.8	6746

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
446.2	.045	446.2	.032	525	.045

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
446.2	525	103	108.7	113	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 170

INPUT

Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
449.7	6746	475	6735.57	525	6735.57	550.3	6746

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
449.7	.045	449.7	.032	525	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
449.7	525	160 140.87	120	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 124

INPUT
Description: FEMA SECTION BZ
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
445.1	6744	473	6734.72	500	6734.72	527	6734.72	556	6744

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
445.1	.045	473	.032	556	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
473	556	41 36.74	30	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 122

INPUT
Description:
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
447.5	6742	470	6734.5	500	6734.5	530	6734.5	552.5	6742

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
447.5	.045	470	.032	552.5	.032

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
470	552.5	1 1	1	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 121

INPUT
Description:
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
447.5	6742	470	6734.5	500	6734.5	530	6734.5	552.5	6742

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
447.5	.045	470	.045	552.5	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
470	552.5	10 10	10	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 120

INPUT
Description: TOP OF DROP
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
447.5	6742	470	6734.5	500	6734.5	530	6734.5	552.5	6742

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
447.5	.045	470	.045	552.5	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
470	552.5	16 16	16	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 115

INPUT
Description: BOTTOM OF DROP
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
447.5	6738	470	6730.5	500	6730.5	530	6730.5	552.5	6738

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
447.5	.045	470	.045	552.5	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
470	552.5	40	40	.1	.3

CROSS SECTION RIVER: SAND CREEK
REACH: ONE RS: 110

INPUT
Description:
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
447	6740	475	6730.34	500	6730.34	535	6730.34	564	6740

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
447	.045	447	.045	564	.045

Bank Sta: Left	Right	Coeff Contr.	Expan.
447	564	.1	.3

SUMMARY OF MANNING'S N VALUES

River:SAND CREEK

Reach	River Sta.	n1	n2	n3
ONE	310	.04	.032	.04
ONE	305	.06	.03	.06
ONE	300	.04	.035	.04
ONE	295	.04	.035	.04
ONE	294.5	.04	.035	.04
ONE	290	.04	.035	.04
ONE	280	.04	.035	.04
ONE	265	.04	.035	.04
ONE	260	.04	.035	.04
ONE	250	.04	.035	.04
ONE	240	.04	.035	.04
ONE	230	.04	.035	.04
ONE	225	.04	.035	.04
ONE	222	.04	.013	.04
ONE	221.5	.04	.013	.04
ONE	221	.04	.11	.04
ONE	215	.04	.11	.04
ONE	214	.04	.11	.04
ONE	210	.04	.09	.04
ONE	209	.04	.04	.04
ONE	208	.04	.032	.04
ONE	207	.04	.04	.04
ONE	206	.04	.04	.04
ONE	205	.04	.04	.04
ONE	204	.04	.04	.04
ONE	203	.04	.032	.04
ONE	202	.04	.032	.04
ONE	200	.04	.032	.04
ONE	199	.04	.04	.04
ONE	198	.04	.04	.04
ONE	197	.04	.04	.04
ONE	196	.04	.032	.04
ONE	195	.04	.032	.04
ONE	194	.04	.032	.04
ONE	193	.04	.04	.04
ONE	192	.04	.04	.04
ONE	191	.04	.04	.04
ONE	190	.04	.04	.04
ONE	189	.04	.032	.04
ONE	188	.04	.032	.04
ONE	187	.014	.032	.04
ONE	186	.015	.032	.04

ONE	184	.013	.013	.013
ONE	183	.013	.013	.013
ONE	182	.013	.013	.013
ONE	181	.013	.013	.013
ONE	180	.013	.013	.013
ONE	179.5	.016	.045	.016
ONE	179	.035	.045	.016
ONE	178	.035	.045	.045
ONE	177	.045	.045	.045
ONE	176	.045	.032	.045
ONE	175	.045	.032	.045
ONE	174	.045	.032	.045
ONE	170	.045	.032	.045
ONE	124	.045	.032	.045
ONE	122	.045	.032	.032
ONE	121	.045	.045	.045
ONE	120	.045	.045	.045
ONE	115	.045	.045	.045
ONE	110	.045	.045	.045

SUMMARY OF REACH LENGTHS

River: SAND CREEK

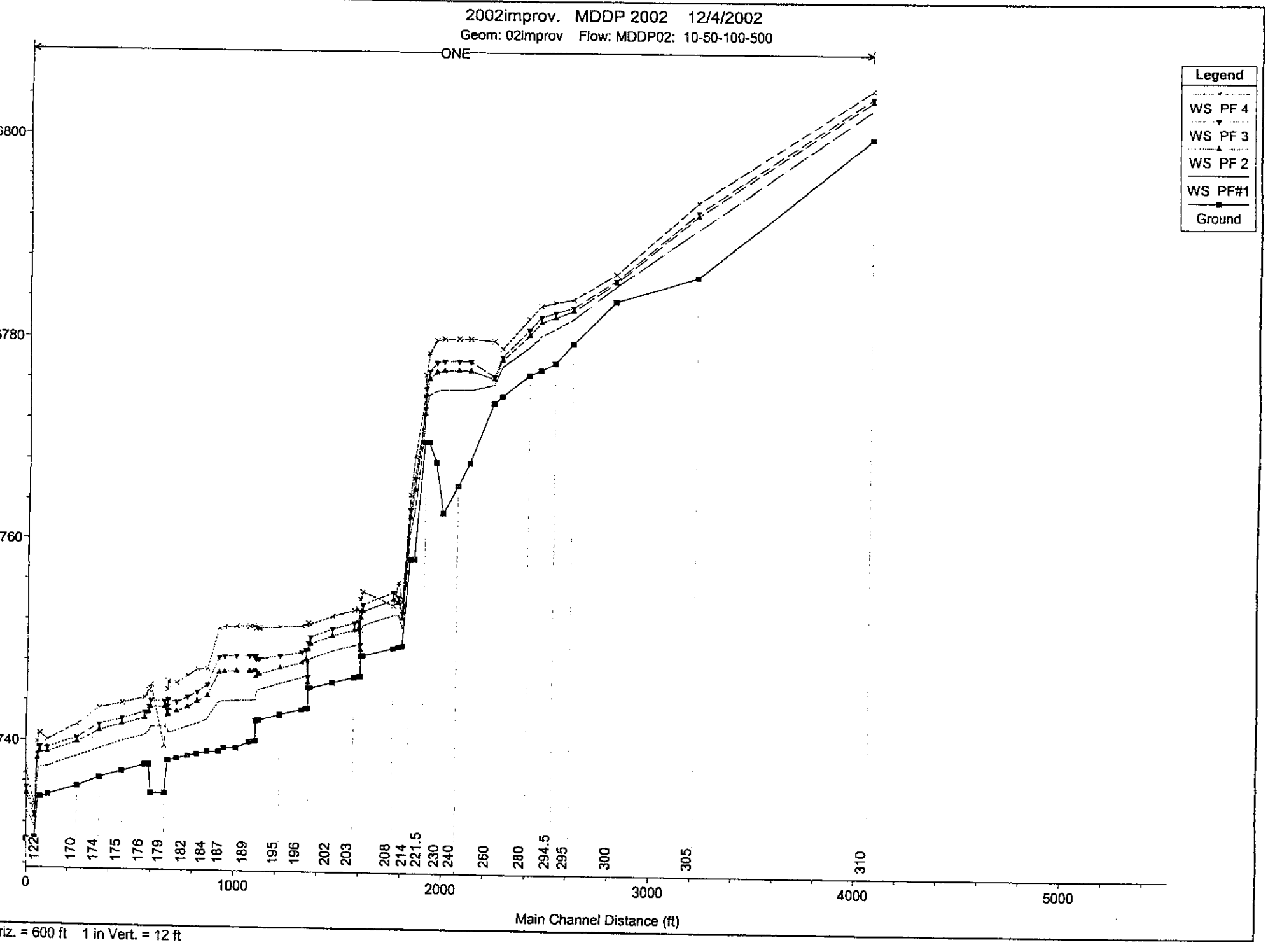
Reach	River Sta.	Left	Channel	Right
ONE	310	730	850	730
ONE	305	390	395	400
ONE	300	230	205	170
ONE	295	87	86	85
ONE	294.5	60	68	80
ONE	290	62	56	56
ONE	280	122	129	144
ONE	265	43	40	42
ONE	260	99	114	126
ONE	250	76	56	58
ONE	240	70	70	72
ONE	230	32	36	40
ONE	225	34	35	36
ONE	222	16	16	16
ONE	221.5	4	4	4
ONE	221	46	46	46
ONE	215	11	20	30
ONE	214	35	35	35
ONE	210	18	18	18
ONE	209	24	25	26
ONE	208	120	146	170
ONE	207	10	10	10
ONE	206	1	1	1
ONE	205	10	10	10
ONE	204	20	20	20
ONE	203	105	105	105
ONE	202	105	105	105
ONE	200	10	10	10
ONE	199	1	1	1
ONE	198	10	10	10
ONE	197	20	20	20
ONE	196	120	105	185
ONE	195	114	99	179
ONE	194	6	6	6
ONE	193	10	10	10
ONE	192	1	1	1
ONE	191	10	10	10
ONE	190	20	20	20
ONE	189	75	63	52
ONE	188	57	57	57
ONE	187	26	26	26
ONE	186	55	55	55
ONE	184	49	49	49
ONE	183	45	45	45
ONE	182	52	52	52
ONE	181	41	41	41
ONE	180	1	1	1
ONE	179.5	16.3	16.3	16.3
ONE	179	66	65.5	66
ONE	178	9.1	9.1	9.1

ONE	177	20	20	20
ONE	176	103	108.7	113
ONE	175	103	108.7	113
ONE	174	103	108.7	113
ONE	170	160	140.87	120
ONE	124	41	36.74	30
ONE	122	1	1	1
ONE	121	10	10	10
ONE	120	16	16	16
ONE	115	40	40	40
ONE	110			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: SAND CREEK

Reach	River Sta.	Contr.	Expan.
ONE	310	.2	.4
ONE	305	.2	.4
ONE	300	.2	.4
ONE	295	.2	.4
ONE	294.5	.2	.4
ONE	290	.2	.4
ONE	280	.2	.4
ONE	265	.2	.4
ONE	260	.2	.4
ONE	250	.2	.4
ONE	240	.2	.4
ONE	230	.2	.4
ONE	225	.3	.5
ONE	222	.3	.5
ONE	221.5	.2	.4
ONE	221	.2	.4
ONE	215	.2	.4
ONE	214	.2	.4
ONE	210	.2	.4
ONE	209	.3	.5
ONE	208	.1	.3
ONE	207	.1	.3
ONE	206	.4	.7
ONE	205	.4	.7
ONE	204	.1	.3
ONE	203	.1	.3
ONE	202	.1	.3
ONE	200	.1	.3
ONE	199	.4	.7
ONE	198	.4	.7
ONE	197	.1	.3
ONE	196	.1	.3
ONE	195	.1	.3
ONE	194	.1	.3
ONE	193	.1	.3
ONE	192	.1	.3
ONE	191	.1	.3
ONE	190	.1	.3
ONE	189	.1	.3
ONE	188	.1	.3
ONE	187	.1	.3
ONE	186	.2	.4
ONE	184	.3	.5
ONE	183	.2	.3
ONE	182	.1	.3
ONE	181	.1	.3
ONE	180	.1	.3
ONE	179.5	.3	.5
ONE	179	.1	.3
ONE	178	.1	.3
ONE	177	.1	.3
ONE	176	.1	.3
ONE	175	.1	.3
ONE	174	.1	.3
ONE	170	.1	.3
ONE	124	.1	.3
ONE	122	.1	.3
ONE	121	.1	.3

ONE	120	.1	.3
ONE	115	.1	.3
ONE	110	.1	.3


2002improv. MDDP 2002 12/4/2002
Geom: 02improv Flow: MDDP02: 10-50-100-500
ONE
Legend
WS PF 4
WS PF 3
WS PF 2
WS PF#1
Ground
6800
6780
760
740
122
170
174
175
176
179
182
184
187
189
195
196
202
203
208
214
221.5
230
240
260
280
294.5
295
300
305
310
0
1000
2000
3000
4000
5000
Main Channel Distance (ft)
iz. = 600 ft 1 in Vert. = 12 ft

HEC-RAS Plan: MDDP02 River: SAND CREEK Reach: ONE

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ONE	310	1200.00	6800.00	6802.88	6803.01	6804.03	0.010010	8.76	152.12	95.41	0.95
ONE	310	2100.00	6800.00	6803.73	6804.17	6805.27	0.010012	10.55	251.56	139.09	0.99
NE	310	2500.00	6800.00	6804.02	6804.44	6805.67	0.010009	11.13	294.37	153.53	1.01
ONE	310	3900.00	6800.00	6804.80	6805.27	6806.73	0.010001	12.59	420.71	172.34	1.04
NE	305	1200.00	6786.40	6791.08	6792.43	6793.97	0.013643	14.86	120.46	49.67	1.24
NE	305	2100.00	6786.40	6792.46	6793.55	6795.70	0.012425	16.96	236.45	145.74	1.24
ONE	305	2500.00	6786.40	6792.80	6793.90	6796.14	0.012623	17.76	287.28	150.04	1.26
ONE	305	3900.00	6786.40	6793.77	6794.88	6797.29	0.012922	19.79	437.87	162.10	1.30
NE	300	1200.00	6784.00	6785.50	6785.65	6786.44	0.022105	7.81	153.56	111.21	1.17
ONE	300	2100.00	6784.00	6785.87	6786.37	6787.66	0.031866	10.74	195.45	115.46	1.46
ONE	300	2500.00	6784.00	6786.07	6786.64	6788.09	0.031632	11.42	218.88	118.57	1.47
NE	300	3900.00	6784.00	6786.66	6787.51	6789.46	0.031055	13.46	293.16	132.48	1.52
ONE	295	1200.00	6779.80	6782.27	6782.27	6783.11	0.015475	7.35	163.20	98.90	1.01
ONE	295	2100.00	6779.80	6783.07	6783.07	6784.22	0.013222	8.58	244.89	104.52	0.99
NE	295	2500.00	6779.80	6783.38	6783.38	6784.64	0.012701	9.01	277.53	106.69	0.98
NE	295	3900.00	6779.80	6784.19	6784.46	6785.94	0.013003	10.65	373.23	158.26	1.03
NE	294.5	1200.00	6777.90	6781.27	6780.46	6781.71	0.004411	5.32	227.05	90.01	0.58
NE	294.5	2100.00	6777.90	6782.40	6781.30	6783.04	0.004061	6.42	333.51	102.67	0.59
ONE	294.5	2600.00	6777.90	6782.87	6781.72	6783.62	0.004128	7.00	383.45	112.64	0.61
ONE	294.5	3900.00	6777.90	6783.86	6782.71	6784.89	0.004306	8.26	506.45	134.08	0.64
NE	290	1200.00	6777.20	6780.55	6780.11	6781.26	0.008423	6.73	178.25	77.93	0.78
ONE	290	2100.00	6777.20	6781.91	6781.16	6782.67	0.006515	6.99	300.32	102.31	0.72
ONE	290	2600.00	6777.20	6782.45	6781.62	6783.27	0.005852	7.29	357.85	110.69	0.70
NE	290	3900.00	6777.20	6783.52	6782.58	6784.56	0.005348	8.21	484.91	126.74	0.69
ONE	280	1200.00	6776.70	6779.44	6779.44	6780.58	0.013752	8.55	140.34	61.64	1.00
ONE	280	2100.00	6776.70	6780.62	6780.62	6782.04	0.012626	9.56	219.70	76.48	0.99
IE	280	2600.00	6776.70	6781.16	6781.16	6782.67	0.012390	9.86	263.75	86.48	0.99
IE	280	3900.00	6776.70	6782.25	6782.25	6783.99	0.011558	10.60	368.07	104.21	0.99
NE	265	1200.00	6774.60	6777.55	6777.61	6778.59	0.016390	8.19	146.51	78.89	1.06
E	265	2100.00	6774.60	6778.16	6778.51	6779.92	0.020599	10.65	197.35	86.76	1.23
NE	265	2600.00	6774.60	6778.50	6778.95	6780.55	0.019992	11.49	227.43	90.49	1.24
ONE	265	3900.00	6774.60	6779.32	6779.95	6781.95	0.018141	13.08	304.93	99.47	1.24
E	260	1200.00	6773.90	6775.73	6776.24	6777.46	0.046381	10.56	113.67	91.51	1.67
ONE	260	2100.00	6773.90	6776.30	6776.99	6778.66	0.041933	12.32	170.46	101.21	1.67
ONE	260	2600.00	6773.90	6776.55	6777.36	6779.30	0.041089	13.31	195.59	102.20	1.69
E	260	3900.00	6773.90	6780.03	6778.22	6780.74	0.003096	6.77	583.18	123.95	0.54
ONE	250	1200.00	6768.00	6775.18	6771.14	6775.29	0.000564	2.64	454.87	105.65	0.22
ONE	250	2100.00	6768.00	6777.08	6772.49	6777.23	0.000564	3.14	668.00	118.82	0.23
E	250	2600.00	6768.00	6778.02	6773.11	6778.19	0.000549	3.32	782.65	125.61	0.23
E	250	3900.00	6768.00	6780.22	6774.26	6780.42	0.000499	3.63	1074.41	140.02	0.23
NE	240	1200.00	6765.70	6775.17	6771.21	6775.25	0.000365	2.18	549.79	121.91	0.18
E	240	2100.00	6765.70	6777.08	6772.27	6777.19	0.000374	2.64	794.27	133.98	0.19
E	240	2600.00	6765.70	6778.02	6772.69	6778.14	0.000367	2.82	922.93	139.54	0.19
NE	240	3900.00	6765.70	6780.23	6773.64	6780.38	0.000335	3.16	1234.91	144.35	0.19
	230	1200.00	6763.00	6775.16	6768.75	6775.22	0.000225	2.13	618.79	114.25	0.15
NE	230	2100.00	6763.00	6777.06	6770.39	6777.16	0.000281	2.69	847.62	126.15	0.17
NE	230	2600.00	6763.00	6778.00	6771.17	6778.12	0.000295	2.90	968.76	132.01	0.18
	230	3900.00	6763.00	6780.21	6772.81	6780.36	0.000306	3.28	1267.61	139.17	0.19
NE	225	1200.00	6768.00	6775.07	6771.48	6775.20	0.000602	2.88	417.24	89.35	0.23
NE	225	2100.00	6768.00	6776.94	6772.54	6777.13	0.000674	3.52	596.42	102.39	0.26
	225	2600.00	6768.00	6777.86	6773.03	6778.08	0.000677	3.74	694.36	108.85	0.26
	225	3900.00	6768.00	6780.05	6774.15	6780.32	0.000622	4.14	942.12	117.16	0.26

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ONE	222	2100.00	6770.00	6776.26	6773.79	6776.96	0.000400	6.70	313.58	50.11	0.47
NE	222	2600.00	6770.00	6777.03	6774.36	6777.87	0.000432	7.39	351.73	50.13	0.49
NE	222	3900.00	6770.00	6778.80	6775.72	6780.01	0.000493	8.85	440.53	50.16	0.53
ONE	221.5	1200.00	6770.00	6773.49	6773.49	6774.81	0.002154	9.23	130.05	49.95	1.01
NE	221.5	2100.00	6770.00	6774.69	6774.69	6776.59	0.001978	11.07	189.77	49.97	1.00
NE	221.5	2600.00	6770.00	6775.27	6775.27	6777.46	0.001935	11.88	218.83	49.98	1.00
ONE	221.5	3900.00	6770.00	6776.61	6776.61	6779.50	0.001892	13.64	285.94	50.01	1.01
NE	221	1200.00	6770.00	6771.84	6772.61	6774.49	0.457717	13.07	91.80	50.03	1.70
NE	221	2100.00	6770.00	6772.82	6773.78	6776.26	0.352092	14.90	140.96	50.05	1.56
ONE	221	2600.00	6770.00	6773.33	6774.37	6777.11	0.317142	15.61	166.55	50.06	1.51
ONE	221	3900.00	6770.00	6774.54	6775.72	6779.12	0.268347	17.17	227.11	50.08	1.42
NE	215	1200.00	6758.45	6763.06	6761.06	6763.48	0.024215	5.20	230.62	50.08	0.43
ONE	215	2100.00	6758.45	6765.28	6762.24	6765.87	0.021945	6.14	342.09	50.12	0.41
NE	215	2600.00	6758.45	6766.42	6762.81	6767.08	0.021114	6.52	398.92	50.13	0.41
NE	215	3900.00	6758.45	6768.52	6764.18	6769.45	0.023592	7.73	504.47	50.17	0.43
ONE	214	1200.00	6758.40	6761.01	6761.01	6762.32	0.146827	9.19	130.60	50.04	1.00
NE	214			2 54	6762.54	6764.62	0.135303	11.58	207.30	50.07	1.00
NE	214	3100.0	[illegible]	6763.31	6763.31	6765.78	0.132974	12.63	245.49	50.08	1.01
ONE	214	4600.00	6758.40	6764.79	6764.79	6768.00	0.129444	14.39	319.73	50.11	1.00
NE	210	1200.00	6749.75	6751.51	6752.35	6754.39	0.350667	13.63	88.06	50.03	1.81
NE	210	2400.00	6749.75	6752.54	6753.89	6757.12	0.316238	17.17	139.79	50.05	1.81
ONE	210	3100.00	6749.75	6753.08	6754.66	6758.47	0.302972	18.63	166.35	50.06	1.80
ONE	210	4600.00	6749.75	6754.16	6756.14	6760.92	0.274305	20.87	220.45	50.07	1.75
NE	209	1200.00	6749.66	6752.86	6752.26	6753.73	0.010163	7.50	159.93	50.07	0.74
ONE	209	2400.00	6749.66	6754.15	6753.80	6755.92	0.013860	10.67	224.88	50.10	0.89
ONE	209	3100.00	6749.66	6754.67	6754.56	6757.04	0.016452	12.36	250.79	50.11	0.97
NE	209	4600.00	6749.66	6756.04	6756.04	6759.26	0.017131	14.39	319.64	50.14	1.00
ONE	208	1200.00	6749.53	6752.86	6752.01	6753.42	0.004235	6.02	199.49	69.95	0.63
NE	208	2400.00	6749.53	6754.40	6753.35	6755.31	0.004390	7.62	314.98	79.24	0.67
NE	208	3100.00	6749.53	6755.13	6754.00	6756.20	0.004443	8.29	374.14	83.60	0.69
ONE	208	4600.00	6749.53	6753.81	6755.19	6758.35	0.025553	17.09	269.22	75.69	1.60
NE	207	1200.00	6748.80	6751.77	6751.28	6752.50	0.009849	6.87	174.78	67.80	0.75
NE	207	2400.00	6748.80	6753.22	6752.62	6754.36	0.009751	8.59	279.34	76.50	0.79
ONE	207	3100.00	6748.80	6753.90	6753.27	6755.24	0.009750	9.31	332.80	80.58	0.81
ONE	207	4600.00	6748.80	6755.17	6754.46	6756.87	0.009555	10.44	440.45	88.23	0.82
E	206	1200.00	6748.75	6751.23	6751.23	6752.33	0.018444	8.44	142.13	64.85	1.01
ONE	206	2400.00	6748.75	6752.57	6752.57	6754.19	0.016242	10.21	235.01	72.94	1.00
ONE	206	3100.00	6748.75	6753.22	6753.22	6755.08	0.015627	10.95	283.20	76.80	1.00
E	206	4600.00	6748.75	6754.42	6754.42	6756.70	0.014667	12.12	379.53	83.99	1.00
ONE	205	1200.00	6746.75	6748.29	6749.23	6751.46	0.093851	14.29	84.00	59.23	2.11
NE	205	2400.00	6746.75	6749.38	6750.57	6753.25	0.060151	15.79	151.99	65.76	1.83
E	205	3100.00	6746.75	6749.92	6751.22	6754.12	0.052343	16.45	188.51	69.01	1.75
NE	205	4600.00	6746.75	6750.96	6752.42	6755.69	0.042544	17.46	263.49	75.25	1.64
E	204	1200.00	6746.70	6749.90	6749.18	6750.52	0.007558	6.29	190.77	69.13	0.67
E	204	2400.00	6746.70	6751.42	6750.52	6752.40	0.007693	7.93	302.71	78.21	0.71
NE	204	3100.00	6746.70	6752.13	6751.17	6753.29	0.007764	8.62	359.74	82.45	0.73
NE	204	4600.00	6746.70	6753.43	6752.36	6754.91	0.007833	9.75	471.82	90.20	0.75
	203	1200.00	6746.60	6749.77	6749.08	6750.40	0.005017	6.36	188.54	69.01	0.68
NE	203	2400.00	6746.60	6751.28	6750.42	6752.28	0.005073	8.01	299.80	78.09	0.72
NE	203	3100.00	6746.60	6751.99	6751.07	6753.16	0.005105	8.69	356.63	82.34	0.74
	203	4600.00	6746.60	6753.29	6752.27	6754.78	0.005126	9.82	468.46	90.12	0.76
NE	202	1200.00	6746.08	6749.21	6748.56	6749.86	0.005219	6.45	186.08	68.90	0.69

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ONE	202	3100.00	6746.08	6751.39	6750.55	6752.61	0.005370	8.85	350.45	81.89	0.75
ONE	202	4600.00	6746.08	6752.67	6751.75	6754.23	0.005399	10.00	460.03	89.56	0.78
ONE	200	1200.00	6745.55	6748.45	6748.03	6749.22	0.006862	7.06	169.93	67.37	0.78
ONE	200	2400.00	6745.55	6749.87	6749.37	6751.08	0.006748	8.82	272.01	75.92	0.82
ONE	200	3100.00	6745.55	6750.56	6750.02	6751.96	0.006656	9.52	325.51	80.04	0.83
ONE	200	4600.00	6745.55	6751.81	6751.21	6753.58	0.006543	10.69	430.20	87.53	0.85
ONE	199	1200.00	6745.50	6747.98	6747.98	6749.08	0.018356	8.43	142.35	64.87	1.00
ONE	199	2400.00	6745.50	6749.31	6749.31	6750.94	0.016374	10.24	234.37	72.89	1.01
ONE	199	3100.00	6745.50	6749.96	6749.96	6751.83	0.015694	10.96	282.78	76.77	1.01
ONE	199	4600.00	6745.50	6751.59	6751.16	6753.49	0.011278	11.06	415.75	86.54	0.89
ONE	198	1200.00	6743.50	6745.02	6745.96	6748.21	0.096704	14.33	83.74	60.08	2.14
ONE	198	2400.00	6743.50	6746.08	6747.29	6750.00	0.063031	15.88	151.11	67.10	1.86
ONE	198	3100.00	6743.50	6746.61	6747.92	6750.85	0.054979	16.53	187.49	70.59	1.79
ONE	198	4600.00	6743.50	6751.92	6749.11	6752.69	0.003240	7.01	656.29	105.80	0.50
ONE	197	1200.00	6743.45	6746.71	6745.93	6747.30	0.007089	6.15	194.97	69.57	0.65
ONE	197	2400.00	6743.45	6748.32	6747.27	6749.22	0.006868	7.63	314.55	79.21	0.67
ONE	197	3100.00	6743.45	6749.28	6747.92	6750.24	0.006013	7.88	393.23	84.96	0.65
ONE	197	4600.00	6743.45	6751.78	6749.11	6752.62	0.003540	7.36	624.58	99.98	0.52
ONE	196	1200.00	6743.35	6746.51	6745.84	6747.17	0.004979	6.64	188.00	68.96	0.69
ONE	196	2400.00	6743.35	6748.03	6747.21	6749.09	0.005004	8.44	299.80	78.09	0.73
ONE	196	3100.00	6743.35	6749.02	6747.87	6750.13	0.004201	8.66	380.11	84.03	0.69
ONE	196	4600.00	6743.35	6751.63	6749.11	6752.56	0.002323	8.02	619.31	99.66	0.54
ONE	195	1200.00	6742.83	6745.96	6745.33	6746.64	0.005180	6.72	185.54	68.74	0.70
ONE	195	2400.00	6742.83	6747.46	6746.69	6748.55	0.005210	8.55	295.67	77.76	0.74
ONE	195	3100.00	6742.83	6748.64	6747.35	6749.68	0.003854	8.42	391.66	84.84	0.66
ONE	195	4600.00	6742.83	6751.47	6748.58	6752.30	0.001982	7.59	655.60	101.81	0.50
ONE	194	1200.00	6742.33	6745.30	6744.83	6746.06	0.006177	7.12	175.00	67.82	0.76
ONE	194	2400.00	6742.33	6746.81	6746.19	6747.98	0.005872	8.90	283.82	76.84	0.78
ONE	194	3100.00	6742.33	6748.33	6746.85	6749.29	0.003424	8.09	408.18	86.00	0.62
ONE	194	4600.00	6742.33	6751.35	6748.08	6752.09	0.001688	7.18	694.60	104.08	0.46
ONE	193	1200.00	6742.30	6745.27	6744.79	6746.02	0.009513	7.06	174.68	67.79	0.75
ONE	193	2400.00	6742.30	6746.79	6746.14	6747.93	0.008817	8.74	284.85	76.93	0.77
ONE	193	3100.00	6742.30	6748.34	6746.80	6749.25	0.005033	7.87	411.53	86.25	0.61
ONE	193	4600.00	6742.30	6751.36	6748.01	6752.06	0.002452	6.94	699.71	104.39	0.45
ONE	192	1200.00	6742.25	6744.74	6744.74	6745.86	0.017438	8.58	143.21	64.95	0.99
ONE	192	2400.00	6742.25	6746.56	6746.09	6747.81	0.010159	9.16	271.49	75.88	0.82
ONE	192	3100.00	6742.25	6748.29	6746.75	6749.20	0.005035	7.87	411.49	86.24	0.61
ONE	192	4600.00	6742.25	6751.34	6747.96	6752.04	0.002422	6.91	702.78	104.56	0.44
ONE	191	1200.00	6740.25	6744.30	6742.74	6744.66	0.003182	4.94	251.58	74.29	0.46
ONE	191	2400.00	6740.25	6747.16	6744.09	6747.55	0.001839	5.15	489.03	91.48	0.37
ONE	191	3100.00	6740.25	6748.65	6744.75	6749.04	0.001482	5.17	632.11	100.43	0.34
ONE	191	4600.00	6740.25	6751.56	6745.96	6751.94	0.001048	5.14	949.37	117.87	0.30
ONE	190	1200.00	6740.20	6744.27	6742.69	6744.63	0.003132	4.91	252.83	74.30	0.45
ONE	190	2400.00	6740.20	6747.15	6744.04	6747.53	0.001809	5.12	491.55	91.51	0.37
ONE	190	3100.00	6740.20	6748.64	6744.71	6749.03	0.001460	5.14	634.99	100.44	0.34
ONE	190	4600.00	6740.20	6751.55	6745.91	6751.93	0.001036	5.12	952.58	117.82	0.30
ONE	189	1200.00	6740.10	6744.22	6742.59	6744.58	0.001965	4.90	256.97	74.72	0.45
ONE	189	2400.00	6740.10	6747.11	6743.96	6747.50	0.001165	5.16	498.26	92.08	0.37
ONE	189	3100.00	6740.10	6748.61	6744.62	6749.00	0.000951	5.21	642.84	101.06	0.35
ONE	189	4600.00	6740.10	6751.52	6745.86	6751.91	0.000688	5.23	962.53	118.53	0.31
ONE	188	1200.00	6739.50	6744.19	6741.99	6744.45	0.001245	4.21	300.33	78.13	0.36
ONE	188	2400.00	6739.50	6747.10	6743.36	6747.42	0.000867	4.67	553.29	95.60	0.32

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ONE	188	4600.00	6739.50	6751.52	6745.26	6751.86	0.000549	4.87	1040.76	146.43	0.28
NE	187	1200.00	6739.50	6744.12	6741.97	6744.38	0.001255	4.11	291.97	72.77	0.36
ONE	187	2400.00	6739.50	6747.03	6743.27	6747.36	0.000876	4.65	516.62	81.54	0.33
ONE	187	3100.00	6739.50	6748.52	6743.91	6748.88	0.000765	4.83	641.61	86.03	0.31
NE	187	4600.00	6739.50	6751.41	6745.13	6751.82	0.000590	5.11	903.00	95.06	0.29
ONE	186	1200.00	6739.12	6744.07	6741.66	6744.35	0.001171	4.22	284.42	64.91	0.36
ONE	186	2400.00	6739.12	6746.95	6743.09	6747.34	0.000947	4.96	484.15	73.60	0.34
NE	186	3100.00	6739.12	6748.45	6743.79	6748.86	0.000820	5.16	604.38	83.63	0.33
NE	186	4600.00	6739.12	6751.34	6745.11	6751.80	0.000594	5.42	856.05	91.08	0.29
ONE	184	1200.00	6739.10	6742.35	6742.35	6743.98	0.002525	10.26	116.95	36.00	1.00
NE	184	2400.00	6739.10	6744.61	6744.25	6746.88	0.002175	12.10	198.41	36.01	0.91
NE	184	3100.00	6739.10	6745.71	6745.22	6748.34	0.002186	13.04	237.80	36.02	0.89
ONE	184	4600.00	6739.10	6747.27	6747.05	6751.07	0.002692	15.64	294.17	36.02	0.96
NE	183	1200.00	6738.85	6741.86	6742.10	6743.76	0.003159	11.06	108.52	36.00	1.12
NE	183	2400.00	6738.85	6744.00	6744.00	6746.60	0.002631	12.93	185.54	36.01	1.00
ONE	183	3100.00	6738.85	6744.97	6744.97	6748.04	0.002704	14.08	220.24	36.02	1.00
NE	183	4600.00	6738.85	6747.24	6746.80	6750.84	0.002501	15.22	302.24	36.03	0.93
ONE	182	1200.00	6738.63	6741.54	6741.88	6743.58	0.003528	11.47	104.60	36.00	1.19
ONE	182	2400.00	6738.63	6743.48	6743.79	6746.41	0.003135	13.76	174.47	36.01	1.10
NE	182	3100.00	6738.63	6744.45	6744.74	6747.85	0.003117	14.80	209.39	36.02	1.08
NE	182	4600.00	6738.63	6746.58	6746.58	6750.59	0.002899	16.07	286.20	36.03	1.00
ONE	181	1200.00	6738.36	6741.16	6741.61	6743.36	0.003938	11.90	100.82	35.99	1.25
NE	181	2400.00	6738.36	6743.01	6743.52	6746.20	0.003538	14.35	167.26	36.00	1.17
NE	181	3100.00	6738.36	6743.94	6744.48	6747.64	0.003509	15.44	200.75	36.00	1.15
ONE	181	4600.00	6738.36	6745.84	6746.31	6750.37	0.003420	17.08	269.25	36.01	1.10
NE	180	1200.00	6738.15	6740.90	6741.40	6743.18	0.004158	12.12	99.01	35.99	1.29
NE	180	2400.00	6738.15	6743.27	6743.31	6745.90	0.002686	13.04	184.10	36.00	1.02
ONE	180	3100.00	6738.15	6744.17	6744.26	6747.35	0.002836	14.31	216.56	36.01	1.03
NE	180	4600.00	6738.15	6745.98	6746.10	6750.12	0.003024	16.33	281.72	36.01	1.03
ONE	179.5	1200.00	6738.15	6741.34	6741.34	6742.95	0.022618	10.18	117.88	37.00	1.01
ONE	179.5	2400.00	6738.15	6742.70	6743.21	6745.86	0.028857	14.26	168.32	37.00	1.18
NE	179.5	3100.00	6738.15	6743.55	6744.15	6747.29	0.027952	15.52	199.81	37.00	1.18
NE	179.5	4600.00	6738.15	6745.18	6745.96	6750.04	0.026813	17.68	260.24	37.01	1.17
ONE	179	1200.00	6735.00	6741.53	6738.13	6741.79	0.001386	4.02	298.71	49.52	0.29
NE	179	2600.00	6735.00	6743.44	6739.90	6744.12	0.002603	6.61	393.26	49.53	0.41
NE	179	3150.00	6735.00	6744.01	6740.50	6744.88	0.003032	7.48	421.53	49.60	0.45
ONE	179	4800.00	6735.00	6739.63	6742.13	6748.21	0.078806	23.51	204.19	49.50	2.04
NE	178	1200.00	6735.00	6741.48	6738.18	6741.67	0.001470	3.52	340.83	71.41	0.28
NE	178	2600.00	6735.00	6743.45	6739.94	6743.89	0.002340	5.34	487.66	79.52	0.37
ONE	178	3150.00	6735.00	6744.06	6740.49	6744.60	0.002584	5.88	538.11	84.22	0.40
NE	178	4800.00	6735.00	6745.65	6741.91	6746.44	0.003106	7.15	681.10	96.31	0.45
ONE	177	1200.00	6737.70	6741.07	6740.18	6741.61	0.008028	5.93	202.34	70.20	0.62
ONE	177	2600.00	6737.70	6742.91	6741.71	6743.81	0.008018	7.60	342.01	81.27	0.65
IE	177	3150.00	6737.70	6743.51	6742.21	6744.52	0.007930	8.04	391.98	84.88	0.66
IE	177	4800.00	6737.70	6745.09	6743.51	6746.35	0.007617	9.00	533.58	94.36	0.67
ONE	176	1200.00	6737.70	6740.70	6740.20	6741.46	0.005993	7.06	177.37	68.10	0.75
IE	176	2600.00	6737.70	6742.37	6741.77	6743.64	0.005987	9.22	299.38	78.15	0.80
IE	176	3150.00	6737.70	6742.92	6742.28	6744.34	0.005933	9.80	342.93	81.44	0.81
ONE	176	4800.00	6737.70	6744.37	6743.62	6746.17	0.005707	11.09	467.15	90.16	0.82
E	175	1200.00	6737.04	6740.07	6739.54	6740.81	0.005808	6.99	179.18	68.20	0.74
E	175	2600.00	6737.04	6741.73	6741.11	6742.98	0.005917	9.19	300.46	78.15	0.79
ONE	175	3150.00	6737.04	6742.30	6741.63	6743.70	0.005784	9.72	345.81	81.56	0.80

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ONE	174	1200.00	6736.40	6739.26	6738.90	6740.10	0.007089	7.45	167.69	67.17	0.81
NE	174	2600.00	6736.40	6741.06	6740.47	6742.33	0.006054	9.26	298.08	77.95	0.80
NE	174	3150.00	6736.40	6741.68	6740.98	6743.06	0.005702	9.68	347.50	81.67	0.79
ONE	174	4800.00	6736.40	6743.28	6742.33	6744.95	0.005085	10.67	486.35	91.30	0.78
NE	170	1200.00	6735.57	6738.43	6738.09	6739.31	0.007353	7.64	162.61	63.86	0.82
ONE	170	2600.00	6735.57	6739.88	6739.70	6741.53	0.008304	10.46	260.88	70.93	0.93
ONE	170	3150.00	6735.57	6740.33	6740.22	6742.25	0.008638	11.32	293.09	73.10	0.96
NE	170	4800.00	6735.57	6741.61	6741.61	6744.15	0.008664	13.07	390.77	79.32	1.00
ONE	124	1200.00	6734.72	6737.42	6737.10	6738.25	0.007516	7.41	167.89	70.53	0.82
ONE	124	2600.00	6734.72	6738.85	6738.62	6740.33	0.008007	9.93	275.42	79.33	0.91
NE	124	3150.00	6734.72	6739.31	6739.11	6741.00	0.008127	10.66	312.28	82.13	0.93
NE	124	4800.00	6734.72	6740.11	6740.41	6742.79	0.010651	13.44	380.22	87.06	1.09
ONE	122	1200.00	6734.50	6737.34	6736.74	6737.96	0.005190	6.39	194.28	77.02	0.69
NE	122	2600.00	6734.50	6738.88	6738.17	6739.97	0.005411	8.53	320.22	86.27	0.75
NE	122	3150.00	6734.50	6739.37	6738.64	6740.62	0.005455	9.14	363.67	89.24	0.77
ONE	122	4800.00	6734.50	6740.67	6739.88	6742.32	0.005506	10.57	484.16	97.00	0.80
NE	121	1200.00	6734.50	6737.34	6736.73	6737.94	0.009978	6.31	194.58	77.04	0.68
NE	121	2600.00	6734.50	6738.91	6738.16	6739.94	0.010101	8.32	322.62	86.44	0.73
ONE	121	3150.00	6734.50	6739.42	6738.62	6740.59	0.010056	8.87	367.55	89.50	0.74
NE	121	4800.00	6734.50	6740.75	6739.84	6742.28	0.009905	10.16	492.00	97.49	0.76
ONE	120	1200.00	6734.50	6736.73	6736.73	6737.76	0.022899	8.22	148.82	73.39	0.99
ONE	120	2600.00	6734.50	6738.16	6738.16	6739.75	0.019399	10.29	259.72	81.96	0.99
NE	120	3150.00	6734.50	6738.62	6738.62	6740.40	0.018799	10.89	298.05	84.71	0.99
NE	120	4800.00	6734.50	6739.84	6739.84	6742.08	0.017411	12.27	405.89	92.04	0.99
ONE	115	1200.00	6730.50	6731.57	6732.73	6736.48	0.276957	17.87	67.82	66.44	3.08
NE	115	2600.00	6730.50	6732.50	6734.16	6738.60	0.155415	19.99	132.28	72.02	2.55
NE	115	3150.00	6730.50	6732.83	6734.62	6739.25	0.135031	20.53	156.45	74.01	2.43
ONE	115	4800.00	6730.50	6733.72	6735.84	6740.99	0.103177	21.94	224.36	79.32	2.23
NE	110	1200.00	6730.34	6733.21	6732.56	6733.79	0.010009	6.12	196.17	76.91	0.67
NE	110	2600.00	6730.34	6734.81	6733.97	6735.79	0.010000	7.94	327.55	86.40	0.72
ONE	110	3250.00	6730.34	6735.42	6734.51	6736.55	0.010009	8.54	380.68	89.96	0.73
NE	110	5100.00	6730.34	6736.88	6735.84	6738.38	0.010002	9.84	518.21	98.57	0.76

HYDRAULIC CALCULATIONS

DESIGN DATA

PRELIMINARY DESIGN BAFFLE CHUTE DROP STRUCTURE

PRELIMINARY DESIGN RIPRAP RUN DOWN STRUCTURE

PRELIMINARY DESIGN BASIN 122 OUTFALL

WORKSHEET FOR TRAPEZOIDAL CHANNELS
SWALE #1, SECTION #1
SWALE #1, SECTION #2
SWALE #2, SECTION #1
SWALE #2, SECTION #2
SWALE #3, SECTION #1

WORKSHEET FOR CIRCULAR CHANNELS
S.D. AT DP-N4, BASIN 121
S.D. AT DP-N10
S.D. AT DP-N11
S.D. AT DP-N12
S.D. AT DP-N13
S.D. AT DP-N14
S.D. SUB-BASIN 145-1 OUTFALL
S.D. SUB-BASIN 145-2 OUTFALL
S.D. AT DP-N2
S.D. AT DP-N3

WORKSHEETS FOR RECTANGULAR CHANNELS
R.C.B. AT DP-N1
R.C.B. AT DP-N5
R.C.B. AT DP-N6
R.C.B. AT DP-N7
R.C.B. AT D-N8

Client: RIDGEVIEW Job No: 2910.90

Project: MDDP By: JRB Chk. By: _____ Date: 12/6/02

Subject: BAFFLE CHUTE DROP Sheet No: 2 of 2

J·R ENGINEERING
A Subsidiary of Westrian

DOWN STREAM OF JUNCTION

Q_{100} = 3134 INTERIM CONDITION

Q_{100} = 2633 DEV. CONDITION

NOTE 2/3 Q CAN BE USED FOR DESIGN EXCEPT FOR WALL HT

USE 3000 cfs

$q = 60$ cfs/ft OF WIDTH

$$d_c = \sqrt[3]{\frac{(60)^2}{32.2}} = 4.81$$

$H = (0.8)(4.81) = 3.85'$ USE 3'-11" (3.92)

$$h_w = (0.8)(3)\sqrt[3]{\frac{(3134/50)^2}{32.2}} = 11.88'$$

BAFFLE BASE THICKNESS

$$H/2 + 0.2H = \frac{3.85}{2} + (0.2)3.85$$

$$= 2.695' \text{ USE } 2.75'$$

BAFFLE SPACING

MAX. $(4)(H) = 15.4'$

USE 12.75', 1½ BAFFLE BELOW FLOW LINE - OK

Client: RIDGEVIEW Job No: 2904.90

Project: MDDP By: JRB Chk. By: _____ Date: 12/6/02

Subject: BAFFLE CHUTE DROP Sheet No: 1 of 2

J·R ENGINEERING
A Subsidiary of Westrian

CHUTE TO BE LOCATED AT JUNCTION OF NORTH DIVERSION AND MAIN CHANNEL

UPSTREAM PORTION

Q_{100} = 2863 cfs INTERIM CONDITION

Q_{100} = 2477 cfs DEV. CONDITION

USE 2863 cfs

$q = Q/W = 2863/50'\text{ WIDTH} = 57.26 < 60 \text{ cfs OK}$

$$d_c = \sqrt[3]{q^2/g} = \sqrt[3]{\frac{57.26^2}{32.2}} = 4.66'$$

$H = (0.8)\,4.66 = 3.73'$ USE 3.75 BAFFLE HT.

$h_w = (3)(H) = (3)(3.73) = 11.2'$ NORMAL WALL HT

MAX. BAFFLE SPACING

$(\text{SLOPE})(H_{MAX}) = (4)(3.75) = 14.92'$

USE 11.24' < 14.92' OK

BAFFLE BASE THICKNESS

$H/2 + 0.2H = \frac{3.75}{2} + 0.2(3.75) = 2.625'$

USE 2.67'

Hydraulic Engineering Circular No. 15

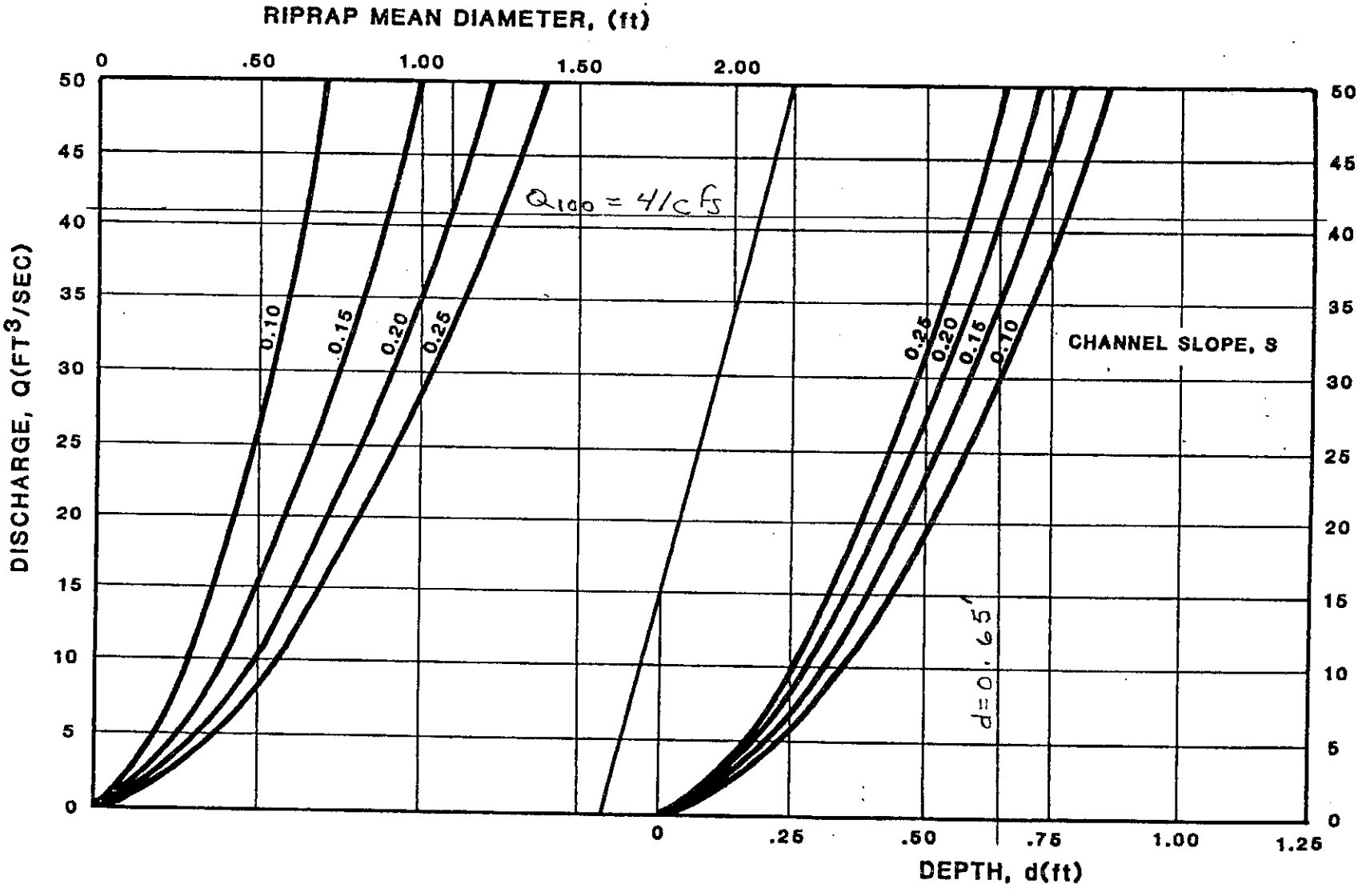
U.S. Department
of Transportation
**Federal Highway
Administration**

Publication No. FHWA-IP-87-7

April 1988

DESIGN OF ROADSIDE CHANNELS WITH FLEXIBLE LININGS

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virgina 22101-2296



SUB-BASIN OS 145-1 RIPRIP RUNDOWN

Chart 18

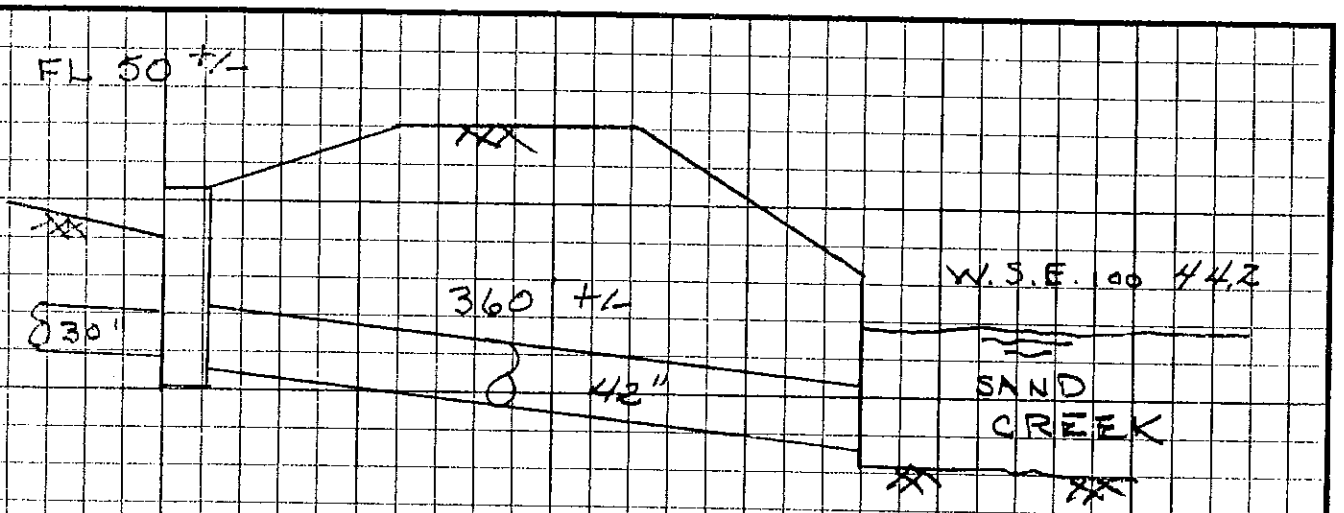
Chart 18. Steep slope riprap design, B=6, Z=3.

Client: RIDGE VIEW Job No: 29104.90

Project: MDDP By: JRB Chk. By: _____ Date: 12/10/02

Subject: BASIN #122 OUTFALL Sheet No: 1 of 1

J·R ENGINEERING
A Subsidiary of Westrian



SUBBASIN Q_{100} = 69cfs

ESTIMATE LOSSES

ENTRANCE 35cfs IN 30"

$1.5 V^2/2g$ = 1.2'

S_f = 0.009 H_L = 50' x 0.009 = 0.45'

ENTRANCE 69cfs IN 42"

$1.5 V^2/2g$ = 1.2'

S_f = 0.0048 H_L = 360' x 0.0048 = 1.8'

INLET WSE 49.0

ENT. - 1.2

H_L - 0.45

ENT. - 1.2

H_L - 1.8

44.35 > 44.2 OK

STORM DRAIN SUB-BASIN 122 OUTFALL
Worksheet for Circular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	SD SUB-BASIN122 OUTFALL
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.004800	ft/ft
Diameter	42.00	in
Discharge	69.00	cfs

Results		
Depth	2.84	ft
Flow Area	8.35	ft^2
Wetted Perimeter	7.84	ft
Top Width	2.74	ft
Critical Depth	2.60	ft
Percent Full	81.06	
Critical Slope	0.005767	ft/ft
Velocity	8.26	ft/s
Velocity Head	1.06	ft
Specific Energy	3.90	ft
Froude Number	0.83	
Maximum Discharge	74.98	cfs
Full Flow Capacity	69.70	cfs
Full Flow Slope	0.004704	ft/ft
Flow is subcritical.		

SWALE #1, SECTION #1
Worksheet for Trapezoidal Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	NORTHWEST BOUNDARY
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.032	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	6.00	ft
Discharge	258.00	cfs

Results		
Depth	3.24	ft
Flow Area	50.85	ft²
Wetted Perimeter	26.47	ft
Top Width	25.42	ft
Critical Depth	2.58	ft
Critical Slope	0.013289	ft/ft
Velocity	5.07	ft/s
Velocity Head	0.40	ft
Specific Energy	3.64	ft
Froude Number	0.63	
Flow is subcritical.		

SWALE #1, SECTION #2
Worksheet for Trapezoidal Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	NORTHWEST BOUNDARY SWALE
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.032	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	12.00	ft
Discharge	537.00	cfs

Results		
Depth	3.81	ft
Flow Area	89.39	ft²
Wetted Perimeter	36.12	ft
Top Width	34.88	ft
Critical Depth	3.06	ft
Critical Slope	0.012097	ft/ft
Velocity	6.01	ft/s
Velocity Head	0.56	ft
Specific Energy	4.37	ft
Froude Number	0.66	
Flow is subcritical.		

SWALE #2, SECTION #1
Worksheet for Trapezoidal Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	NORTHEAST BOUNDARY
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.032	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	4.00	ft
Discharge	58.00	cfs

Results		
Depth	1.78	ft
Flow Area	16.67	ft²
Wetted Perimeter	15.28	ft
Top Width	14.70	ft
Critical Depth	1.34	ft
Critical Slope	0.016232	ft/ft
Velocity	3.48	ft/s
Velocity Head	0.19	ft
Specific Energy	1.97	ft
Froude Number	0.58	
Flow is subcritical.		

SWALE #2, SECTION #2
Worksheet for Trapezoidal Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	NORTH BOUNDARY SWALE
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.032	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	6.00	ft
Discharge	87.00	cfs

Results		
Depth	1.93	ft
Flow Area	22.81	ft²
Wetted Perimeter	18.23	ft
Top Width	17.60	ft
Critical Depth	1.46	ft
Critical Slope	0.015430	ft/ft
Velocity	3.81	ft/s
Velocity Head	0.23	ft
Specific Energy	2.16	ft
Froude Number	0.59	
Flow is subcritical.		

SWALE # 3, SECTION #1
Worksheet for Trapezoidal Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	WEST BOUNDARY
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.012000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	2.00	ft
Discharge	9.60	cfs

Results		
Depth	0.77	ft
Flow Area	3.34	ft²
Wetted Perimeter	6.89	ft
Top Width	6.64	ft
Critical Depth	0.65	ft
Critical Slope	0.024688	ft/ft
Velocity	2.87	ft/s
Velocity Head	0.13	ft
Specific Energy	0.90	ft
Froude Number	0.71	
Flow is subcritical.		

STORM DRAIN DP-N4, 1/2 OF SUB-BASIN 121
Worksheet for Circular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	SD AT DP-N4
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Diameter	30.00	in
Discharge	26.00	cfs

Results		
Depth	1.44	ft
Flow Area	2.94	ft^2
Wetted Perimeter	4.32	ft
Top Width	2.47	ft
Critical Depth	1.74	ft
Percent Full	57.79	
Critical Slope	0.005835	ft/ft
Velocity	8.84	ft/s
Velocity Head	1.22	ft
Specific Energy	2.66	ft
Froude Number	1.43	
Maximum Discharge	44.12	cfs
Full Flow Capacity	41.01	cfs
Full Flow Slope	0.004018	ft/ft
Flow is supercritical.		

STORM DRAIN DP-N10, 1/2 OF SUB-BASIN 121
Worksheet for Circular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	SD AT DP-N10
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Diameter	30.00	in
Discharge	26.00	cfs

Results		
Depth	1.44	ft
Flow Area	2.94	ft²
Wetted Perimeter	4.32	ft
Top Width	2.47	ft
Critical Depth	1.74	ft
Percent Full	57.79	
Critical Slope	0.005835	ft/ft
Velocity	8.84	ft/s
Velocity Head	1.22	ft
Specific Energy	2.66	ft
Froude Number	1.43	
Maximum Discharge	44.12	cfs
Full Flow Capacity	41.01	cfs
Full Flow Slope	0.004018	ft/ft
Flow is supercritical.		

STORM DRAIN AT DP-N11
Worksheet for Circular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	SD AT DP-N11
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Diameter	36.00	in
Discharge	39.00	cfs

Results		
Depth	1.65	ft
Flow Area	3.98	ft^2
Wetted Perimeter	5.01	ft
Top Width	2.99	ft
Critical Depth	2.03	ft
Percent Full	54.94	
Critical Slope	0.005320	ft/ft
Velocity	9.80	ft/s
Velocity Head	1.49	ft
Specific Energy	3.14	ft
Froude Number	1.50	
Maximum Discharge	71.74	cfs
Full Flow Capacity	66.69	cfs
Full Flow Slope	0.003419	ft/ft
Flow is supercritical.		

STORM DRAIN AT DP-N12
Worksheet for Circular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	SD AT DP-N12
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Diameter	36.00	in
Discharge	50.00	cfs

Results		
Depth	1.94	ft
Flow Area	4.83	ft²
Wetted Perimeter	5.60	ft
Top Width	2.87	ft
Critical Depth	2.30	ft
Percent Full	64.60	
Critical Slope	0.006421	ft/ft
Velocity	10.35	ft/s
Velocity Head	1.67	ft
Specific Energy	3.60	ft
Froude Number	1.41	
Maximum Discharge	71.74	cfs
Full Flow Capacity	66.69	cfs
Full Flow Slope	0.005620	ft/ft
Flow is supercritical.		

STORM DRAIN AT DP-N13
Worksheet for Circular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	STORM DRAIN AT DP-N13
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Diameter	30.00	in
Discharge	34.00	cfs

Results		
Depth	1.74	ft
Flow Area	3.64	ft^2
Wetted Perimeter	4.93	ft
Top Width	2.30	ft
Critical Depth	1.98	ft
Percent Full	69.47	
Critical Slope	0.007318	ft/ft
Velocity	9.34	ft/s
Velocity Head	1.36	ft
Specific Energy	3.09	ft
Froude Number	1.31	
Maximum Discharge	44.12	cfs
Full Flow Capacity	41.01	cfs
Full Flow Slope	0.006872	ft/ft
Flow is supercritical.		

STORM DRAIN AT DP-N14
Worksheet for Circular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	STORM DRAIN AT DP- N14
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Diameter	36.00	in
Discharge	55.00	cfs

Results		
Depth	2.08	ft
Flow Area	5.22	ft²
Wetted Perimeter	5.89	ft
Top Width	2.77	ft
Critical Depth	2.41	ft
Percent Full	69.20	
Critical Slope	0.007077	ft/ft
Velocity	10.54	ft/s
Velocity Head	1.73	ft
Specific Energy	3.80	ft
Froude Number	1.35	
Maximum Discharge	71.74	cfs
Full Flow Capacity	66.69	cfs
Full Flow Slope	0.006801	ft/ft
Flow is supercritical.		

SUB-BASIN 145-2 OUTFALL SD
Worksheet for Circular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	SUB-BASIN 145-2 OUTFALL SD
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.010000	ft/ft
Diameter	42.00	in
Discharge	81.00	cfs

Results		
Depth	1.87	ft
Flow Area	5.22	ft²
Wetted Perimeter	5.73	ft
Top Width	3.49	ft
Critical Depth	2.81	ft
Percent Full	53.36	
Critical Slope	0.003228	ft/ft
Velocity	15.51	ft/s
Velocity Head	3.74	ft
Specific Energy	5.61	ft
Froude Number	2.24	
Maximum Discharge	156.32	cfs
Full Flow Capacity	145.32	cfs
Full Flow Slope	0.003107	ft/ft
Flow is supercritical.		

STORM DRAIN AT DP-N2
Worksheet for Circular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	SD AT DP-N2
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Diameter	54.00	in
Discharge	170.00	cfs

Results		
Depth	3.23	ft
Flow Area	12.22	ft²
Wetted Perimeter	9.10	ft
Top Width	4.05	ft
Critical Depth	3.80	ft
Percent Full	71.77	
Critical Slope	0.007118	ft/ft
Velocity	13.91	ft/s
Velocity Head	3.01	ft
Specific Energy	6.24	ft
Froude Number	1.41	
Maximum Discharge	211.53	cfs
Full Flow Capacity	196.64	cfs
Full Flow Slope	0.007474	ft/ft
Flow is supercritical.		

STORM DRAIN AT DP-N3
Worksheet for Circular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	SD AT DP-N3
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Diameter	66.00	in
Discharge	235.00	cfs

Results		
Depth	3.39	ft
Flow Area	15.37	ft^2
Wetted Perimeter	9.93	ft
Top Width	5.35	ft
Critical Depth	4.28	ft
Percent Full	61.64	
Critical Slope	0.005412	ft/ft
Velocity	15.29	ft/s
Velocity Head	3.63	ft
Specific Energy	7.02	ft
Froude Number	1.59	
Maximum Discharge	361.21	cfs
Full Flow Capacity	335.79	cfs
Full Flow Slope	0.004898	ft/ft
Flow is supercritical.		

RCB ALONG BLACK FOREST ROAD
Worksheet for Rectangular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\dp-n1.fm2
Worksheet	RCB AT DP-N1
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Bottom Width	9.00	ft
Discharge	537.00	cfs

Results		
Depth	4.35	ft
Flow Area	39.14	ft²
Wetted Perimeter	17.70	ft
Top Width	9.00	ft
Critical Depth	4.80	ft
Critical Slope	0.003843	ft/ft
Velocity	13.72	ft/s
Velocity Head	2.93	ft
Specific Energy	7.27	ft
Froude Number	1.16	
Flow is supercritical.		

RCB AT DP-N5
Worksheet for Rectangular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\black fo.fm2
Worksheet	RCB AT DP-N5
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Bottom Width	9.00	ft
Discharge	536.00	cfs

Results		
Depth	4.34	ft
Flow Area	39.09	ft²
Wetted Perimeter	17.69	ft
Top Width	9.00	ft
Critical Depth	4.79	ft
Critical Slope	0.003842	ft/ft
Velocity	13.71	ft/s
Velocity Head	2.92	ft
Specific Energy	7.27	ft
Froude Number	1.16	
Flow is supercritical.		

RCB AT DP-N6
Worksheet for Rectangular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\black fo.fm2
Worksheet	RCB AT DP-N6
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Bottom Width	12.00	ft
Discharge	751.00	cfs

Results		
Depth	4.23	ft
Flow Area	50.72	ft²
Wetted Perimeter	20.45	ft
Top Width	12.00	ft
Critical Depth	4.96	ft
Critical Slope	0.003224	ft/ft
Velocity	14.81	ft/s
Velocity Head	3.41	ft
Specific Energy	7.63	ft
Froude Number	1.27	
Flow is supercritical.		

RCB AT DP-N7
Worksheet for Rectangular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\black fo.fm2
Worksheet	RCB AT DP-N7
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Bottom Width	12.00	ft
Discharge	774.00	cfs

Results		
Depth	4.32	ft
Flow Area	51.83	ft²
Wetted Perimeter	20.64	ft
Top Width	12.00	ft
Critical Depth	5.06	ft
Critical Slope	0.003241	ft/ft
Velocity	14.93	ft/s
Velocity Head	3.47	ft
Specific Energy	7.78	ft
Froude Number	1.27	
Flow is supercritical.		

RCB AT DP-N8
Worksheet for Rectangular Channel

Project Description	
Project File	x:\2910000.all\2910490\culvertmaster\black fo.fm2
Worksheet	RCB AT DP-N8
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Bottom Width	12.00	ft
Discharge	851.00	cfs

Results		
Depth	4.63	ft
Flow Area	55.51	ft²
Wetted Perimeter	21.25	ft
Top Width	12.00	ft
Critical Depth	5.39	ft
Critical Slope	0.003301	ft/ft
Velocity	15.33	ft/s
Velocity Head	3.65	ft
Specific Energy	8.28	ft
Froude Number	1.26	
Flow is supercritical.		

ESTIMATED PROBABLE CONSTRUCTION COST SPREADSHEETS

SAND CREEK MAIN CHANNEL IMPROVEMENTS

Phase I Sand Creek Channel Improvements

Phase II Sand Creek Channel Improvements

Proposed Dublin Boulevard Crossing Of Sand Creek

SAND CREEK TRIBUTARY IMPROVEMENTS

Proposed North Diversion Channel TR20 DP-147 To DP-148

Proposed Diversion Swale #2 To Convey Runoff From
Drainage Basin 142 To The Proposed North Diversion Swale

Proposed Storm Drainage Facilities Basin 145

Proposed R.C.B. Along Black Forest Road And
Shimmering Creek Drive

Proposed Swale #1, Basins 145 And 146, Diverts Flow To
Proposed R.C.B. Above

BASIN 122 OUTFALL

ARTERIAL INLETS AND STORM DRAINS
OVER 36" DIAMETER

STORM DRAINAGE FACILITIES TRIBUTARY TO PHASE I

Phase I Sand Creek Channel Improvements
Reimbursable

ITEM	UNITS	UNIT COST	COST
Lower 3.5' Drop			
Conc. Cut-off wall	64 cy	$ 400.00 /cy	$ 25,600.00
Riprap, type VH, Upstream	967 cy	$ 35.00 /cy	$ 33,845.00
Riprap, Type VH, Downstream	265 cy	$ 35.00 /cy	$ 9,275.00
subtotal	*(REIMBURSABLE)*		**$ 68,720.00**
Upper 3.5' Drop			
Conc. Cut-off wall	89 cy	$ 400.00 /cy	$ 35,600.00
Riprap, type VH, Upstream	304 cy	$ 35.00 /cy	$ 10,640.00
subtotal	*(REIMBURSABLE)*		**$ 46,240.00**
Check Structure #1			
Conc. Cut-off wall	111 cy	$ 400.00 /cy	$ 44,400.00
Riprap, type H,	1349 cy	$ 37.00 /cy	$ 49,913.00
Riprap, Type M	464 cy	$ 35.00 /cy	$ 16,240.00
Fabric	387 sy	$ 2.00 /sy	$ 774.00
Compacted Fill	329 cy	$ 5.00 /cy	$ 1,645.00
Excavation	2442 cy	$ 3.00 /cy	$ 7,326.00
Bedding	251 cy	$ 8.00 /cy	$ 2,008.00
Topsoil	322 cy	$ 12.00 /cy	$ 3,864.00
subtotal	*(REIMBURSABLE)*		**$ 126,170.00**
Check Structure #2			
Conc. Cut-off wall	126 cy	$ 400.00 /cy	$ 50,400.00
Riprap, type H,	1770 cy	$ 37.00 /cy	$ 65,490.00
Riprap, Type M	388 cy	$ 35.00 /cy	$ 13,580.00
Fabric	371 sy	$ 2.00 /sy	$ 742.00
Compacted Fill	441 cy	$ 5.00 /cy	$ 2,205.00
Excavation	2958 cy	$ 3.00 /cy	$ 8,874.00
Bedding	233 cy	$ 8.00 /cy	$ 1,864.00
Topsoil	270 cy	$ 12.00 /cy	$ 3,240.00
subtotal	*(REIMBURSABLE)*		**$ 146,395.00**

Phase I Sand Creek Channel Improvements
Reimbursable

ITEM	UNITS	UNIT COST	COST
Check Structure #3			
Conc. Cut-off wall	78 cy	$ 400.00 /cy	$ 31,200.00
Riprap, type H	703 cy	$ 37.00 /cy	$ 26,011.00
Riprap, Type M	358 cy	$ 35.00 /cy	$ 12,530.00
Fabric	237 sy	$ 2.00 /sy	$ 474.00
Compacted Fill	246 cy	$ 5.00 /cy	$ 1,230.00
Excavation	1605 cy	$ 3.00 /cy	$ 4,815.00
Bedding	183 cy	$ 8.00 /cy	$ 1,464.00
Topsoil	220 cy	$ 12.00 /cy	$ 2,640.00
subtotal	***(REIMBURSABLE)***		**$ 80,364.00**
Check Structure #4			
Conc. Cut-off wall	59 cy	$ 400.00 /cy	$ 23,600.00
Riprap, type H	526 cy	$ 37.00 /cy	$ 19,462.00
Riprap, Type M	268 cy	$ 35.00 /cy	$ 9,380.00
Fabric	177 sy	$ 2.00 /sy	$ 354.00
Compacted Fill	184 cy	$ 5.00 /cy	$ 920.00
Excavation	1200 cy	$ 3.00 /cy	$ 3,600.00
Bedding	137 cy	$ 8.00 /cy	$ 1,096.00
Topsoil	165 cy	$ 12.00 /cy	$ 1,980.00
subtotal	***(REIMBURSABLE)***		**$ 60,392.00**
Check Structure #5			
Conc. Cut-off wall	97 cy	$ 400.00 /cy	$ 38,800.00
Riprap, type H	1357 cy	$ 37.00 /cy	$ 50,209.00
Riprap, Type M	298 cy	$ 35.00 /cy	$ 10,430.00
Fabric	284 sy	$ 2.00 /sy	$ 568.00
Compacted Fill	338 cy	$ 5.00 /cy	$ 1,690.00
Excavation	2267 cy	$ 3.00 /cy	$ 6,801.00
Bedding	178 cy	$ 8.00 /cy	$ 1,424.00
Topsoil	207 cy	$ 12.00 /cy	$ 2,484.00
subtotal	***(REIMBURSABLE)***		**$ 112,406.00**

Phase I Sand Creek Channel Improvements
Reimbursable

ITEM		UNITS	UNIT COST		COST
Check Structure #6					
Conc. Cut-off wall		47 cy	$ 400.00 /cy	$	18,800.00
Riprap, type H		423 cy	$ 37.00 /cy	$	15,651.00
Riprap, Type M		215 cy	$ 35.00 /cy	$	7,525.00
Fabric		143 sy	$ 2.00 /sy	$	286.00
Compacted Fill		148 cy	$ 5.00 /cy	$	740.00
Excavation		965 cy	$ 3.00 /cy	$	2,895.00
Bedding		110 cy	$ 8.00 /cy	$	880.00
Topsoil		87 cy	$ 12.00 /cy	$	1,044.00
	subtotal	*(REIMBURSABLE)*		**$**	**47,821.00**
Check Structure #7					
Conc. Cut-off wall		86 cy	$ 400.00 /cy	$	34,400.00
Riprap, type H		773 cy	$ 37.00 /cy	$	28,601.00
Riprap, Type M		393 cy	$ 35.00 /cy	$	13,755.00
Fabric		261 sy	$ 2.00 /sy	$	522.00
Compacted Fill		271 cy	$ 5.00 /cy	$	1,355.00
Excavation		1764 cy	$ 3.00 /cy	$	5,292.00
Bedding		202 cy	$ 8.00 /cy	$	1,616.00
Topsoil		242 cy	$ 12.00 /cy	$	2,904.00
	subtotal	*(REIMBURSABLE)*		**$**	**88,445.00**
Check Structure #8					
Conc. Cut-off wall		126 cy	$ 400.00 /cy	$	50,400.00
Riprap, type H		1134 cy	$ 37.00 /cy	$	41,958.00
Riprap, Type M		578 cy	$ 35.00 /cy	$	20,230.00
Fabric		382 sy	$ 2.00 /sy	$	764.00
Compacted Fill		397 cy	$ 5.00 /cy	$	1,985.00
Excavation		2589 cy	$ 3.00 /cy	$	7,767.00
Bedding		296 cy	$ 8.00 /cy	$	2,368.00
Topsoil		356 cy	$ 12.00 /cy	$	4,272.00
	subtotal	*(REIMBURSABLE)*		**$**	**129,744.00**

Phase I Sand Creek Channel Improvements
Reimbursable

ITEM	UNITS	UNIT COST	COST
Check Structure #9			
Conc. Cut-off wall	101 cy	$ 400.00 /cy	$ 40,400.00
Riprap, type H	904 cy	$ 37.00 /cy	$ 33,448.00
Riprap, Type M	460 cy	$ 35.00 /cy	$ 16,100.00
Fabric	305 sy	$ 2.00 /sy	$ 610.00
Compacted Fill	317 cy	$ 5.00 /cy	$ 1,585.00
Excavation	2063 cy	$ 3.00 /cy	$ 6,189.00
Bedding	236 cy	$ 8.00 /cy	$ 1,888.00
Topsoil	284 cy	$ 12.00 /cy	$ 3,408.00
subtotal	*(REIMBURSABLE)*		**$ 103,628.00**
Check Structure #10			
Conc. Cut-off wall	39 cy	$ 400.00 /cy	$ 15,600.00
Riprap, type H	0 cy	$ 37.00 /cy	$ -
Riprap, Type M	248 cy	$ 35.00 /cy	$ 8,680.00
Fabric	138 sy	$ 2.00 /sy	$ 276.00
Compacted Fill	70 cy	$ 5.00 /cy	$ 350.00
Excavation	815 cy	$ 3.00 /cy	$ 2,445.00
Bedding	180 cy	$ 8.00 /cy	$ 1,440.00
Topsoil	120 cy	$ 12.00 /cy	$ 1,440.00
subtotal	*(REIMBURSABLE)*		**$ 30,231.00**
Grouted Boulder Drop Structure			
36" + Grouted Boulders	700 cy	$ 100.00 /cy	$ 70,000.00
Riprap, type H	224 cy	$ 37.00 /cy	$ 8,288.00
Bedding	45 cy	$ 8.00 /cy	$ 360.00
Conc. Cut-off Walls	48 cy	$ 400.00 /cy	$ 19,200.00
Topsoil	339 cy	$ 12.00 /sy	$ 4,068.00
subtotal	*(REIMBURSABLE)*		**$ 101,916.00**
Channel Side Slope Protection			
Riprap, Type VH	1811 cy	$ 39.00 /cy	$ 70,629.00
Riprap, Type M	7698 cy	$ 35.00 /cy	$ 269,430.00
Bedding	2012 cy	$ 8.00 /cy	$ 16,096.00
Topsoil	3019 cy	$ 12.00 /sy	$ 36,228.00
subtotal	*(REIMBURSABLE)*		**$ 392,383.00**
TOTAL	*(REIMBURSABLE)*		**$ 1,534,855.00**
Add 15% For Engineering & Contingencies			**$ 230,228.25**
TOTAL PROJECT COST	*(REIMBURSABLE)*		**$ 1,765,083.25**

Phase II Sand Creek Channel Improvements
Reimbursable

ITEM	UNITS		UNIT COST		COST
Earthwork, South of Dublin					
Excavation	18695 cy	$	2.00 /cy	$	37,390.00
Earthwork, North of Dublin					
Excavation	98650 cy	$	2.00 /cy	$	197,300.00
Subtotal	**(REIMBURSABLE)**			**$**	**234,690.00**
PHASE IIA					
Drop Structure #2: 2 - 8" Vertical Drops (110 lf)					
Excavation	725 cy	$	2.00 /cy	$	1,450.00
Concrete cutoff walls	33 cy	$	280.00 /cy	$	9,240.00
Reinforcing Steel	2400 lbs	$	0.55 /lbs	$	1,320.00
Riprap, Type M	110 cy	$	40.00 /cy	$	4,400.00
Riprap, Type VH	585 cy	$	42.00 /cy	$	24,570.00
Bedding	88 cy	$	8.00 /cy	$	704.00
Fabric	220 sy	$	2.00 /sy	$	440.00
Drain	50 lf	$	5.00 /lf	$	250.00
Subtotal	**(REIMBURSABLE)**			**$**	**42,374.00**
Drop Structure #3: 2 - 8" Vertical Drops (111 lf)					
Excavation	725 cy	$	2.00 /cy	$	1,450.00
Concrete cutoff walls	45 cy	$	280.00 /cy	$	12,600.00
Reinforcing Steel	2500 lbs	$	0.55 /lbs	$	1,375.00
Riprap, Type M	110 cy	$	40.00 /cy	$	4,400.00
Riprap, Type VH	590 cy	$	42.00 /cy	$	24,780.00
Bedding	90 cy	$	8.00 /cy	$	720.00
Fabric	220 sy	$	2.00 /sy	$	440.00
Drain	50 lf	$	5.00 /lf	$	250.00
Subtotal	**(REIMBURSABLE)**			**$**	**46,015.00**
Drop Structure #4: 2' Vertical Drop (128 lf)					
Excavation	850 cy	$	2.00 /cy	$	1,700.00
Concrete cutoff walls	42 cy	$	280.00 /cy	$	11,760.00
Reinforcing Steel	1900 lbs	$	0.55 /lbs	$	1,045.00
Riprap, Type M	125 cy	$	40.00 /cy	$	5,000.00
Riprap, Type VH	680 cy	$	42.00 /cy	$	28,560.00
Bedding	100 cy	$	8.00 /cy	$	800.00
Fabric	220 sy	$	2.00 /sy	$	440.00
Drain	50 lf	$	5.00 /lf	$	250.00
Subtotal	**(REIMBURSABLE)**			**$**	**49,555.00**

Drop Structure #5: 2' Vertical Drop (114 lf)						
Excavation	745	cy	$	2.00 /cy	$	1,490.00
Concrete cutoff walls	38	cy	$	280.00 /cy	$	10,640.00
Reinforcing Steel	1600	lbs	$	0.55 /lbs	$	880.00
Riprap, Type M	112	cy	$	40.00 /cy	$	4,480.00
Riprap, Type VH	610	cy	$	42.00 /cy	$	25,620.00
Bedding	95	cy	$	8.00 /cy	$	760.00
Fabric	220	sy	$	2.00 /sy	$	440.00
Drain	50	lf	$	5.00 /lf	$	250.00
Subtotal			**(REIMBURSABLE)**		**$**	**44,560.00**
Main Channel Bank Protection						
Riprap, Type M - 2.75' ave. depth	3787	cy	$	40.00 /cy	$	151,480.00
Bedding, 8" depth	920	cy	$	8.00 /cy	$	7,360.00
Subtotal			**(REIMBURSABLE)**		**$**	**158,840.00**
PHASE IIB						
Drop Structure #6: 2' Vertical Drop (112 lf)						
Excavation	740	cy	$	2.00 /cy	$	1,480.00
Concrete cutoff walls	37	cy	$	280.00 /cy	$	10,360.00
Reinforcing Steel	2100	lbs	$	0.55 /lbs	$	1,155.00
Riprap, Type M	110	cy	$	40.00 /cy	$	4,400.00
Riprap, Type VH	595	cy	$	42.00 /cy	$	24,990.00
Bedding	90	cy	$	8.00 /cy	$	720.00
Fabric	220	sy	$	2.00 /sy	$	440.00
Drain	50	lf	$	5.00 /lf	$	250.00
Subtotal			**(REIMBURSABLE)**		**$**	**43,795.00**
Baffle Chute Drop Structure, 50' wide						
Slab Concrete	350	cy	$	280.00 /cy	$	98,000.00
Wall Concrete	133	cy	$	280.00 /cy	$	37,240.00
Toe Wall & Key Wall Concrete	53	cy	$	260.00 /cy	$	13,780.00
Baffle Concrete	76	cy	$	300.00 /cy	$	22,800.00
Wing Walls & Footings	160	cy	$	280.00 /cy	$	44,800.00
Subgrade Prep	80	sy	$	2.00 /sy	$	160.00
Reinforcing Steel	75000	lbs	$	0.55 /lbs	$	41,250.00
Riprap, Type H	175	cy	$	40.00 /cy	$	7,000.00
Riprap, Type L	72	cy	$	42.00 /cy	$	3,024.00
Bedding, 8" depth	25	cy	$	8.00 /cy	$	200.00
Low Permeability Soil , 1' depth	129	cy	$	8.00 /cy	$	1,032.00
Subtotal			**(REIMBURSABLE)**		**$**	**269,286.00**
Concrete Diversion Channel to Drop Chute Structure, 18' Wide						
Slab Concrete	31	cy	$	280.00 /cy	$	8,680.00
Wall Concrete	32	cy	$	280.00 /cy	$	8,960.00
Toe Wall Concrete	7	cy	$	260.00 /cy	$	1,820.00
Wing Walls & Footings	32	cy	$	280.00 /cy	$	8,960.00
Subgrade Prep	235	sy	$	2.00 /sy	$	470.00
Riprap, Type L	60	cy	$	42.00 /cy	$	2,520.00
Bedding, 8" depth	22	cy	$	8.00 /cy	$	176.00
Low Permeability Soil , 1' depth	36	cy	$	8.00 /cy	$	288.00
Subtotal			**(REIMBURSABLE)**		**$**	**31,874.00**

Main Channel Bank Protection					
Riprap, Type M - 2.75' ave. depth	2209 cy	$	40.00 /cy	$	88,360.00
Bedding, 8" depth	538 cy	$	8.00 /cy	$	4,304.00
Subtotal	**(REIMBURSABLE)**			**$**	**144,748.00**
TOTAL	**(REIMBURSABLE)**			**$**	**1,145,652.00**
Add 15% for Engineering & Contingencies				**$**	**171,847.80**
TOTAL PROJECT COST	**(REIMBURSABLE)**			**$**	**1,317,499.80**

North Diversion Reimbursable

ITEM	UNITS		UNIT COST		COST
Earthwork					
Excavation	24400 cy	$	2.00 /cy	$	48,800.00
Subtotal	**(REIMBURSABLE)**			**$**	**48,800.00**
Drop Structure #W1: 4' Vertical Drop (73 lf)					
Excavation	465 cy	$	2.00 /cy	$	930.00
Concrete cutoff walls	60 cy	$	280.00 /cy	$	16,800.00
Reinforcing Steel	2900 lbs	$	0.55 /lbs	$	1,595.00
Riprap, Type M	18 cy	$	40.00 /cy	$	720.00
Riprap, Type VH	385 cy	$	42.00 /cy	$	16,170.00
Bedding	60 cy	$	8.00 /cy	$	480.00
Fabric	80 sy	$	2.00 /sy	$	160.00
Drain	18 lf	$	5.00 /lf	$	90.00
Subtotal	**(REIMBURSABLE)**			**$**	**36,945.00**
Drop Structure #W2: 4' Vertical Drop (75.5 lf)					
Excavation	725 cy	$	2.00 /cy	$	1,450.00
Concrete cutoff walls	60 cy	$	280.00 /cy	$	16,800.00
Reinforcing Steel	3000 lbs	$	0.55 /lbs	$	1,650.00
Riprap, Type M	19 cy	$	40.00 /cy	$	760.00
Riprap, Type VH	400 cy	$	42.00 /cy	$	16,800.00
Bedding	60 cy	$	8.00 /cy	$	480.00
Fabric	80 sy	$	2.00 /sy	$	160.00
Drain	18 lf	$	5.00 /lf	$	90.00
Subtotal	**(REIMBURSABLE)**			**$**	**38,190.00**
Check Structure					
Excavation	120 cy	$	2.00 /cy	$	240.00
Riprap, Type M	105 cy	$	40.00 /cy	$	4,200.00
Bedding	20 cy	$	8.00 /cy	$	160.00
Fabric	90 sy	$	2.00 /sy	$	180.00
Subtotal	**(REIMBURSABLE)**			**$**	**4,780.00**
Main Channel Bank Protection					
Riprap, Type M - 2.75' ave. depth	835 cy	$	40.00 /cy	$	33,400.00
Bedding, 8" depth	202 cy	$	8.00 /cy	$	1,616.00
Subtotal	**(REIMBURSABLE)**			**$**	**78,226.00**
TOTAL	**(REIMBURSABLE)**			**$**	**206,941.00**
Add 15% for Engineering & Contingencies				**$**	**31,041.15**
TOTAL PROJECT COST	**(REIMBURSABLE)**			**$**	**237,982.15**

RCB Dublin Blvd Crossing

ITEM	UNITS	UNIT COST	COST
Sand Creek RCB (191 lf)			
3-cells 16' W X 15' H			
Bottom Slab Concrete	467 cy	$ 300.00 /cy	$ 140,100.00
Top Slab Concrete	460 cy	$ 300.00 /cy	$ 138,000.00
Wall Concrete	382 cy	$ 280.00 /cy	$ 106,960.00
Head and Toe Walls	44 cy	$ 300.00 /cy	$ 13,200.00
Structural Excavation	830 cy	$ 18.00 /cy	$ 14,940.00
Structural Backfill	1750 cy	$ 20.00 /cy	$ 35,000.00
Subgrade Prep	900 sy	$ 10.00 /sy	$ 9,000.00
Reinforcing Steel	184200 lbs	$ 0.55 /lbs	$ 101,310.00
Subtotal	***(REIMBURSABLE)***		**$ 558,510.00**
Pedestrian Walk (330 LF)			
Slab Concrete	180 cy	$ 300.00 /cy	$ 54,000.00
Footing Concrete	5 cy	$ 280.00 /cy	$ 1,400.00
Structural Backfill	1100 cy	$ 20.00 /cy	$ 22,000.00
Subgrade Prep	230 sy	$ 6.00 /sy	$ 1,380.00
Reinforcing Steel	3000 lbs	$ 0.55 /lbs	$ 1,650.00
Subtotal	***(REIMBURSABLE)***		**$ 80,430.00**
Trail/Maintenance Access Roads (2900 lf)			
Class II Base, 6" depth	840 cy	$ 12.00 /cy	$ 10,080.00
Subgrade Prep	1000 cy	$ 6.00 /cy	$ 6,000.00
Low Permeability Soil, *8' dep	2650 cy	$ 8.00 /cy	$ 21,200.00
Subtotal	***(REIMBURSABLE)***		**$ 37,280.00**
WINGWALL I-W (60.75 LF)			
Wall Concrete	23 cy	$ 280.00 /cy	$ 6,440.00
Toe & Footing Concrete	52 cy	$ 300.00 /cy	$ 15,600.00
Structural Backfill	54 cy	$ 20.00 /cy	$ 1,080.00
Subgrade Prep	25 sy	$ 6.00 /sy	$ 150.00
Reinforcing Steel	19500 lbs	$ 0.55 /lbs	$ 10,725.00
Subtotal	***(REIMBURSABLE)***		**$ 33,995.00**
WINGWALL I-E1 (58 LF)			
Wall Concrete	12 cy	$ 290.00 /cy	$ 3,480.00
Toe & Footing Concrete	9 cy	$ 280.00 /cy	$ 2,520.00
Structural Backfill	22 cy	$ 20.00 /cy	$ 440.00

*Assumed depth - To be field determined

RCB Dublin Blvd Crossing

ITEM	UNITS	UNIT COST	COST
Subgrade Prep	150 sy	$ 6.00 /sy	$ 900.00
Reinforcing Steel	1800 lbs	$ 0.55 /lbs	$ 990.00
Subtotal	*(REIMBURSABLE)*		**$ 8,330.00**
WINGWALL I-E2 (122 LF)			
Wall Concrete	80 cy	$ 290.00 /cy	$ 23,200.00
Toe & Footing Concrete	117 cy	$ 280.00 /cy	$ 32,760.00
Structural Backfill	152 cy	$ 20.00 /cy	$ 3,040.00
Subgrade Prep	130 sy	$ 6.00 /sy	$ 780.00
Reinforcing Steel	39000 lbs	$ 0.55 /lbs	$ 21,450.00
Subtotal	*(REIMBURSABLE)*		**$ 81,230.00**
WINGWALL O-W (63.5 LF)			
Wall Concrete	37 cy	$ 290.00 /cy	$ 10,730.00
Toe & Footing Concrete	113 cy	$ 280.00 /cy	$ 31,640.00
Structural Backfill	81 cy	$ 20.00 /cy	$ 1,620.00
Subgrade Prep	30 sy	$ 6.00 /sy	$ 180.00
Reinforcing Steel	20300 lbs	$ 0.55 /lbs	$ 11,165.00
Subtotal	*(REIMBURSABLE)*		**$ 55,335.00**
WINGWALL O-E1 (96 LF)			
Wall Concrete	33 cy	$ 290.00 /cy	$ 9,570.00
Toe & Footing Concrete	35 cy	$ 280.00 /cy	$ 9,800.00
Structural Backfill	160 cy	$ 20.00 /cy	$ 3,200.00
Subgrade Prep	70 sy	$ 10.00 /sy	$ 700.00
Reinforcing Steel	3000 lbs	$ 0.55 /lbs	$ 1,650.00
Subtotal	*(REIMBURSABLE)*		**$ 24,920.00**
WINGWALL O-E2 (67.5 LF)			
Wall Concrete	34 cy	$ 290.00 /cy	$ 9,860.00
Toe & Footing Concrete	65 cy	$ 280.00 /cy	$ 18,200.00
Structural Backfill	80 cy	$ 20.00 /cy	$ 1,600.00
Subgrade Prep	170 sy	$ 10.00 /sy	$ 1,700.00
Reinforcing Steel	21600 lbs	$ 0.55 /lbs	$ 11,880.00
Subtotal	*(REIMBURSABLE)*		**$ 43,240.00**
RCB OUTLET SPLASH POOL 5' depth of "VH" Riprap			
Type VH 5' depth	1400 cy	$ 40.00 /cy	$ 56,000.00
Bedding Material, 8" depth	185 cy	$ 8.00 /cy	$ 1,480.00
Subgrade Prep	900 sy	$ 10.00 /sy	$ 9,000.00
Subtotal	*(REIMBURSABLE)*		**$ 57,480.00**

TOTAL		**$ 980,750.00**
TOTAL NON-REIMBURSABLE		
TOTAL REIMBURSABLE		**$ 980,750.00**
Add 15 % for Engineering & Contingencies		**$ 147,112.50**
TOTAL PROJECT COST	*(REIMBURSABLE)*	**$ 1,127,862.50**

Black Forest Road Storm Drain

Public Drainage Facilities Beginning at North End (Reimbursable)

ITEM	UNITS		UNIT COST		COST
Swale #1 - 66" RCP, Inlet, Headwalls, Wing Walls, and Concrete Cutoff Walls					
Wall Concrete	28	cy	$ 280.00	/cy	$ 7,840.00
Footing & Toe Concrete	79	cy	$ 280.00	/cy	$ 22,120.00
Bedding	70	cy	$ 8.00	/ea	$ 560.00
Riprap, Type H	405	cy	$ 40.00	/cy	$ 16,200.00
Earthwork	1	ea	$ 6,000.00	/ls	$ 6,000.00
Pipes					
60" RCP	87	lf	$ 140.00	/lf	$ 12,180.00
66" RCP	221	lf	$ 160.00	/lf	$ 35,360.00
72" RCP	937	lf	$ 200.00	/lf	$ 187,400.00
78" RCP	471	lf	$ 300.00	/lf	$ 141,300.00
Bends/Wyes/Manholes					
Bend (66")	1	ea	$ 2,000.00	/ea	$ 2,000.00
Bends (78")	4	ea	$ 2,400.00	/ea	$ 9,600.00
Bends (72")	4	ea	$ 2,200.00	/ea	$ 8,800.00
Bends (60")	1	ea	$ 1,800.00	/ea	$ 1,800.00
Wye (78")	1	ea	$ 3,200.00	/ea	$ 3,200.00
Wye (72")	2	ea	$ 3,000.00	/ea	$ 6,000.00
Type III Manholes	4	ea	$ 4,800.00	/ea	$ 19,200.00
Storm Drainage Junction Box					
Box	1	ls	$ 25,000.00	/ls	$ 25,000.00
6' X 12' Reinforced Concrete Box					
RCB	716	lf	$ 840.00	/lf	$ 601,440.00
Reinforced Concrete Box Wingwalls & Headwalls					
Wall Concrete	19	cy	$ 280.00	/cy	$ 5,320.00
Footing & Toe Concrete	20	cy	$ 280.00	/cy	$ 5,600.00
Earthwork	1	ls	$ 3,000.00	/ls	$ 3,000.00
Riprap (VH)	328	ea	$ 40.00	/ea	$ 13,120.00
Bedding	66	cy	$ 8.00	/cy	$ 528.00
Check Structures - 3 Required					
Reinforced Concrete	27	cy	$ 470.00	/cy	$ 12,690.00
Riprap (VH)	110	cy	$ 40.00	/cy	$ 4,400.00
Bedding 6" Depth	30	cy	$ 8.00	/cy	$ 240.00
Final Grading	1400	sy	$ 6.00	/ea	$ 8,400.00
Erosion Fabric	1400	sy	$ 2.00	/cy	$ 2,800.00
Subtotal					**$ 1,162,098.00**
15% Engineering & Contingencies					**$ 173,225.40**
REINBURSABLE TOTAL					**$ 1,335,323.40**

Basins 122 Outfall, Non-Reimbursable

Storm Drain, Conveys Flow from Sub-basin 122 to Sand Creek, So. of Dublin						
42" RCP	350	lf	$	75.00	/lf	$ 26,250.00
TOTAL	**(NON-REIMBURSABLE)**					**$ 26,250.00**

Arterial Inlets and Storm Drains Over 36" Dia. Non-Reimbursable

Storm Drain in Dublin						
36" RCP	46	lf	$	60.00	/lf	$ 2,760.00
36" RCP bends	0	ea	$	1,150.00	/ea	$ 0.00
Black Forest Inlets						
6' Inlet	1	ea	$	3,200.00	/ea	$ 3,200.00
8' Inlet	2	ea	$	3,800.00	/ea	$ 7,600.00
18' Inlet	1	ea	$	5,600.00	/ea	$ 5,600.00
Dublin Inlets						
8' Inlet	3	ea	$	3,800.00	/ea	$ 11,400.00
10' Inlet	1	ea	$	4,200.00	/ea	$ 4,200.00
12' Inlet	1	ea	$	4,800.00	/ea	$ 4,800.00
18' Inlet	1	ea	$	5,600.00	/ea	$ 5,600.00
Subtotal	**(REIMBURSABLE)**					**$ 45,160.00**
TOTAL	**(NON-REIMBURSABLE)**					**$ 45,160.00**

Reimbursable Storm Tributary to Phase 1

ITEM	UNITS		UNIT COST			COST
Filing No. 30						
48" RCP	785	lf	$	90.00	/lf	$ 70,650.00
Riprap Pad	1	ea	$	5,000.00	/ea	$ 5,000.00
Bedding	1613	cy	$	8.00	/cy	$ 12,904.00
Filter Fabric	2419	sf	$	2.00	/sf	$ 4,838.00
subtotal	**(REIMBURSABLE)**					**$ 93,392.00**
Filing No. 32						
48" RCP	151	lf	$	90.00	/lf	$ 13,590.00
Riprap Pad	2	ea	$	5,000.00	/ea	$ 10,000.00
Bedding	3226	cy	$	8.00	/cy	$ 25,808.00
Filter Fabric	4838	sf	$	2.00	/sf	$ 9,676.00
subtotal	**(REIMBURSABLE)**					**$ 59,074.00**
Filing No. 33						
54" RCP	777	lf	$	100.00	/lf	$ 77,700.00
subtotal	**(REIMBURSABLE)**					**$ 77,700.00**
Filing No. 34						
60" RCP	770	lf	$	120.00	/lf	$ 92,400.00
66" RCP	382	lf	$	160.00	/lf	$ 61,120.00
Riprap Pad	1	ea	$	5,000.00	/ea	$ 5,000.00
Bedding	1613	cy	$	8.00	/cy	$ 12,904.00

Filter Fabric		2419	sf	$	2.00	/sf	$ 4,838.00
	subtotal		**(REIMBURSABLE)**				$ **176,262.00**
Filing No. 35							
60" RCP		14	lf	$	120.00	/lf	$ 1,680.00
66" RCP		699	lf	$	160.00	/lf	$ 111,840.00
72" RCP		712	lf	$	210.00	/lf	$ 149,520.00
Riprap Pad		1	ea	$	5,000.00	/ea	$ 5,000.00
Bedding		1613	cy	$	8.00	/cy	$ 12,904.00
Filter Fabric		2419	sf	$	2.00	/sf	$ 4,838.00
	subtotal		**(REIMBURSABLE)**				$ **285,782.00**
Filing No. 13							
54" RCP		290	lf	$	100.00	/lf	$ 29,000.00
	subtotal		**(REIMBURSABLE)**				$ **29,000.00**
	TOTAL		**(REIMBURSABLE)**				$ **721,210.00**
	15% Engineering & Contingencies						$ **108,181.50**
	REINBURSABLE TOTAL						$ **829,391.50**

GREENHAVEN FILING No. 1 & 2

CONSTRUCTION COST OPINION

Public Drainage Facilities Reimbursable, Filing No. 1

Item	Description	Quantity	Unit Cost	Cost
1.	48" RCP Pipe	520 LF	$ 90/LF	$ 46,800.00
2.	60" RCP Pipe	270 LF	$ 140/LF	$ 37,800.00
3.	48" RCP Bend	2 EA	$ 1,550/EA	$ 3,100.00
4.	60" RCP Bend	1 EA	$ 2,000/EA	$ 4,000.00
5.	Type 1 MH	2 EA	$ 3,500/EA	$ 7,000.00
6.	Channel Fabric	1,400 SY	$ 5/SY	$ 7,000.00
7.	Type H Riprap	420 CY	$ 40/CY	$ 16,800.00
8.	Fabric	250 SY	$ 2/SY	$ 500.00
9.	Bedding	40 CY	$ 8/CY	$ 320.00
			SubTotal	**$123,320.00**

Offsite Swale 1 to North of Site

Item	Description	Quantity	Unit Cost	Cost
1.	Grading	55,369 CY	$1.50/CY	$ 83,054.00
2.	Seed & Mulch	1,723 SY	$ 2/SY	$ 3,446.00
3.	Channel Fabric	1,745 SY	$ 5/SY	$ 8,725.00
			SubTotal	**$ 95,225.00**
			Total	**$ 230,045.00**

Subject to Ridgeview MDDP approval

Public Drainage Facilities Reimbursable, Filing No. 2

(To be verified at the time of Final Platting for Filing No. 2)

Item	Description	Quantity	Unit Cost	Cost
1.	30" RCP Pipe	210 LF	$ 55/LF	$ 11,550.00
2.	30" RCP Bend	2 EA	$ 900/EA	$ 1,800.00
3.	42" RCP Pipe	710 LF	$ 75/LF	$ 53,250.00
4.	42" RCP Bend	6 EA	$ 1,350/EA	$ 8,100.00
5.	48" RCP Pipe	920 LF	$ 90/LF	$ 82,800.00
6.	48" RCP Bend	3 EA	$ 1,550/EA	$ 4,650.00
7.	8' D-10R Inlet	1 EA	$ 6,000/EA	$ 6,000.00
8.	12' D-10R Inlet	1 EA	$ 7,000/EA	$ 7,000.00
9.	Type 1 MH	3 EA	$ 3,500/EA	$ 10,500.00
			Total	**$ 185,650.00**

Public Drainage Facilities Non-Reimbursable, Filing No. 1

Item	Description	Quantity	Unit Cost	Cost
1.	18" RCP Pipe	105 LF	$ 30/LF	$ 3,150.00
2.	24" RCP Pipe	60 LF	$ 45/LF	$ 2,700.00
3.	30" RCP Pipe	200 LF	$ 55/LF	$ 11,000.00
4.	36" RCP Pipe	230 LF	$ 65/LF	$ 14,950.00
5.	18" RCP Bend	1 EA	$ 750/EA	$ 750.00
6.	30" RCP Bend	2 EA	$ 1,000/EA	$ 2,000.00
7.	36" RCP Bend	2 EA	$ 1,100/EA	$ 2,200.00
8.	Type 1 MH	1 EA	$ 3,500/EA	$ 3,500.00
9.	4' D-10R Inlet	1 EA	$ 5,000/EA	$ 5,000.00
10.	6' D-10R Inlet	1 EA	$ 5,500/EA	$ 5,500.00
11.	12' D-10R Inlet	1 EA	$ 7,000/EA	$ 7,000.00
12.	20' D-10R Inlet	2 EA	$ 9,000/EA	$ 18,000.00
			Total	**$ 75,750.00**

Public Drainage Facilities Non-Reimbursable, Filing No. 2

Item	Description	Quantity	Unit Cost	Cost
1.	24" RCP Pipe	50 LF	$ 45/LF	$ 2,250.00
2.	30" RCP Pipe	110 LF	$ 55/LF	$ 6,500.00
3.	30" RCP Wye	1 EA	$ 1,150/EA	$ 1,150.00
4.	4' D-10R Inlet	1 EA	$ 5,000/EA	$ 5,000.00
5.	6' D-10R Inlet	1 EA	$ 5,500/EA	$ 5,500.00
			Total	**$ 20,400.00**

DRAINAGE FEES

The existing site is in the Sand Creek Basin. 2004 Drainage fees due on the plat for Filing No. 1 are as follows:

DRAINAGE FEES:	21.9 acres	x	$7,362.00	=	$161,227.80
BRIDGE FEES:	21.9 acres	x	$ 437.00	=	$ 9,570.30
POND FEES:					
LAND :	21.9 acres	x	$ 494.00	=	$ 10,818.60
FACILITIES:	21.9 acres	x	$1,637.00	=	$ 35,850.30
SURCHARGE:	21.9 acres	x	$ 820.00	=	$ 17,958.00
				TOTAL	**$235,425.00**

EROSION CONTROL COST OPINION

225 EACH – Straw Bale Barrier @ $4.00/Bale	$ 1,000.00
4 EACH – Inlet Protection @ $20.00/Inlet	$ 80.00
2 EACH – Vehicle Tracking Control @ $500.00/Entrance	$ 1,000.00
3,850 LF – Silt Fence @ $2.00/LF	$ 7,700.00
40 ACRE – of Reseeding @ $500.00/Acre	$20,500.00
25% Maintenance and Replacement	$ 7,570.00
	$37,850.00

RIDGEVIEW FILING NO. 26.

CONSTRUCTION COST OPINION

Public Drainage Facilities (Non-Reimbursable)

Item	Description	Quantity	Unit Cost		Cost
1.	4' D-10-R Inlet	2 EACH	$3500/EA	$	3,500.00
2.	6' D-10-R Inlet	4 EACH	$4300/EA	$	17,200.00
3.	10' D-10-R Inlet	2 EACH	$5600/EA	$	11,200.00
4.	5' Curb Opening	2 EACH	$500/LS	$	500.00
5.	18" R.C.P.	226 L.F.	$25/ L.F.	$	5650.00
6.	24" R.C.P.	492 L.F.	$38/ L.F.	$	18,696.00
7.	27" R.C.P.	285 L.F.	$50/L.F.	$	14,250.00
8.	30" R.C.P.	82 L.F.	$50/L.F.	$	4,100.00
9.	36" R.C.P.	215 L.F.	$60/L.F.	$	12,900.00
10.	42" R.C.P.	62 L.F.	$70/L.F.	$	4,340.00
11.	30" F.E.S.	1 EACH	$120/EA	$	120.00
12.	4' DIA. RISER	1 EACH	$2500/EA	$	2,500.00
13.	4' DIA OUTFALL STRUCTURE	1 EACH	$2500/EA	$	2,500.00
14.	W.Y.E. (24"X24"X18")	1 EACH	$1,100/EA	$	1,100.00
15.	W.Y.E. (30"X24"X18")	1 EACH	$1,100/EA	$	1,100.00
16.	30" X 24" REDUCER	1 EACH	$1,000/EA	$	1,000.00
17.	30"X 18" REDUCER	1 EACH	$1,000/EA	$	1,000.00
18.	BENDS (27")	2 EACH	$750/EA	$	1,500.00
19.	BENDS (24")	2 EACH	$700/EA	$	1,400.00
20.	BENDS (18")	2 EACH	$550/EA	$	1,100.00
21.	RIPRAP (M)	190 C.Y.	$40/C.Y.	$	7,600.00
	Sub-Total			$	113,256.00
	15% Engineering & Contingencies			$	16,988.40
	TOTAL			**$**	**130,244.40**

Item	Description	Quantity	Unit Cost	Cost
Storm Drain, Conveys flow from Sub-Basin 122 to Sand Creek, So. of Dublin				
1.	42" RCP	350 lf	$75.00/LF	$26,250.00
	15% Engineering & Contingencies			$3,937.50
	TOTAL:			**$30,187.50**

TOTAL (NON-REIMBURSIBLE)	**$160,431.90**

SAND CREEK D.B.P.S. POND #2

SAND CREEK D.B.P.S. POND #2 COST ESTIMATE

SAND CREEK D.B.P.S. POND #2 SURCHARGE ANALYSIS

DRAINAGE BOARD MINUTES, DECEMBER 1998

ITEM NO.: 3
December 17, 1998 Drainage Board

PUBLIC WORKS GROUP
City Engineering Unit

CITY OF COLORADO SPRINGS

DATE: December 2, 1998

TO: Bruce Thorson, Stormwater Manager

FROM: Tim Mitros, Senior Civil Engineer

RE: Sand Creek Drainage Fee Adjustment for Ridgeview Subdivision

ACTION REQUESTED

Include several 100-year systems in the Sand Creek Drainage Basin Planning Study and raise the Sand Creek Drainage Fee accordingly.

BACKGROUND

Please find attached documentation from URS Greiner Woodward Clyde pertaining to the Sand Creek DBPS. After completing a MDDP for the Ridgeview Subdivision, URS concluded that there are several 100-year systems that should be considered reimbursable. URS's submittal recommends additional reimbursable improvements of $3,591,538 with an increase in the Basin Fee of $194 per acre. However, in order to be consistent with the Sand Creek DBPS, I recommend changing the amount shown in the submittal for contingencies from 15% to 5%. This changes the reimbursable amount to $3,304,215 and a corresponding increase in the Sand Creek Drainage Basin Fee of $178 per acre.

RECOMMENDATION

Include in the Sand Creek Drainage Basin Planning Study the 100-year systems shown in URS's submittal in the amount of $3,304,215. Raise the Drainage Basin Fee $178 to $5,730 per acre.

Subdivision Engineering Review, 101 West Costilla, Suite 113 • TEL 719-385-5979 FAX 578-6161
Mailing Address: Post Office Box 1575, Mail Code 1110 • Colorado Springs, Colorado 80901-1575

URS Greiner Woodward Clyde
A Division of URS Corporation

8415 Explorer Drive, Suite 110
Colorado Springs, CO 80920
Tel: 719.531.0001
Fax: 719.531.0007
Offices Worldwide

November 5, 1998

Mr. Tim Mitros
City of Colorado Springs, Stormwater Division
101 West Costilla St
Colorado Springs, CO 80903

Re: **Sand Creek Drainage Fee Adjustment for Ridgeview Subdivision**
URSG Project No. 6742271

Dear Tim:

Enclosed is a summary of the costs associated with the proposed revision of the Sand Creek drainage fee per our conversations. The request for the revision to the fee is based upon the Master Development Drainage Plan for Ridgeview Subdivision, approved November 5, 1998. Several side drainageways that enter the main stem of Sand Creek within or just downstream of Ridgeview were not included in the fee calculations. Similarly, several 100-year stormwater facilities that collect the major storm prior to discharging to the main channel were not included in the fee calculations. We believe that these costs should be included as a reimbursable cost. The proposed increase in the Sand Creek Drainage Fee to cover these additional facilities is $194/ Ac, a net increase of 3.49%.

If there are any questions, or if we may be of further assistance, please feel free to call us at any time.

Sincerely,

URS Greiner Woodward Clyde, Inc.

Charles Cothern, PE
Project Engineer

cc: Peter Martz, Ridgeview Development

RECOMMEND DRAINAGE FEE ADJUSTMENT OF $ 3,304,215 with a corresponding increase in the SAND CREEK Drainage Basin FEE OF $ 178/Acre.

Tim Mitros for City Engineering

RIDGEVIEW AT STETSON HILLS
DRAINAGE FEE ADJUSTMENT CALCULATION

URSG JOB No. 6742271

05-Nov-98

IMPROVEMENT DESCRIPTION	ESTIMATED COST	
100-YEAR STORM SEWER FACILITIES*		
STETSON HILLS BLVD CROSSINGS	$ ~~471,018~~	434,160
DUBLIN BLVD & PETERSON RD CROSSINGS	~~74,625~~	68,655
100-YEAR STORM SEWERS IN TUTT, CHARLOTTE, & TOMICHE TR	~~2,560,375~~	2,354,625
OPEN CHANNELS NOT SPECIFIED IN DBPS	~~485,623~~	446,775
TOTAL COST FOR FEE ADJUSTMENT CALCULATION	~~$3,591,536~~	3,304,215

TOTAL UNPLATTED ACREAGE WITHIN BASIN**	18559 Ac	
ESTIMATED INCREASE IN SAND CREEK DRAINAGE BASIN FEE	$ ~~194~~ /Ac	178 /Ac
1998 SAND CREEK DRAINAGE FEE (EXISTING)	$ 5,552	
PERCENT INCREASE OVER 1998 DRAINAGE FEE	~~3.49%~~	3.21 %

NEW FEE - # 5,730

COMMENTS

*THESE COST ESTIMATES ARE TAKEN DIRECTLY FROM THE RIDGVIEW MDDP APPROVED NOVEMBER 5, 1998, LESS COSTS CALLED OUT IN THE DBPS SEE ATTACHED MDDP COST ESTIMATE

**BASED ON TOTAL UNPLATTED ACREAGE WITHIN THE BASIN FROM THE 1996 SPRINGS RANCH DRAINAGE FEE ADJUSTMENT CALCULATION (18809 Ac) LESS THE TOTAL ACREAGE PLATTED IN 1997 AND IN 1998 TO DATE (MID OCTOBER), AS PROVIDED BY THE CITY DEVELOPMENT REVIEW UNIT / PLANNING GROUP

ENGINEER'S ESTIMATE OF PROBABLE COST
RIDGEVIEW DEVELOPMENT - MDDP

DESCRIPTION	QUANTITY	UNIT	UNIT COST	EXTENSION	Include in fee increase?	IN DBPS?
STETSON HILLS BLVD 100-YR CROSSINGS						
Twin 54" RCP/ 84" RCP Crossing w/ Junction Boxes	1	EA	$ 282,660	$ 282,660	Y	N
8' x 8' RCBC	120	LF	375	45,000	Y	N
Headwalls & Wingwalls	30	CY	300	9,000	Y	N
72" RCP	120	LF	200	$ 24,000	Y	N
72" RCP Flared End Sections	2	EA	2,000	4,000	Y	N
FOUR 10' x 10' RCBC	150	LF	2,500	~~375,000~~	N	Y
Headwalls & Wingwalls	35	CY	300	~~10,500~~	N	Y
48" RCP	120	LF	90	10,800	Y	N
48" Flared End Sections	2	EA	1,035	2,070	Y	N
SUBTOTAL				$ 763,030	377,530	
5 % ~~15%~~ CONTINGENCY				114,455	18,877	
10% ENGINEERING				76,303	37,753	
SUBTOTAL, STETSON HILLS 100-YR CROSSINGS				$ 953,788	$ 434,160	
DUBLIN BLVD & PETERSON RD 100-YR CROSSINGS						
36" CMP	240	LF	$ 75	$ ~~18,000~~	N	N
36" CMP Flared End Sections	4	EA	650	~~2,000~~	N	N
60" RCP	120	LF	125	15,000	Y	N
Headwalls & Wingwalls	25	CY	300	7,500	Y	N
10'x10' RCBC	120	LF	125	15,000	Y	N
Headwalls & Wingwalls	74	CY	300	22,200	Y	N
TRIPLE 10' x 12' RCBC	120	LF	1,650	~~198,000~~	N	Y
Headwalls & Wingwalls	74	CY	300	~~22,200~~	N	Y
TRIPLE 10' x 13' RCBC	120	LF	1,660	~~199,200~~	N	Y
Headwalls & Wingwalls	74	CY	300	~~22,200~~	N	Y
SUBTOTAL				$ 521,900	59,700	
5% ~~15%~~ CONTINGENCY				78,285	2,985	
10% ENGINEERING				52,190	5,970	
SUBTOTAL, DUBLIN BLVD & PETERSON RD 100-YR CROSSINGS				$ 652,375	$ 68,655	
100-YEAR STORM SEWERS						
66-inch RCP	7700	LF	$ 200	$ 1,540,000		
60-inch RCP	1700	LF	175	297,500		
54-inch RCP	1400	LF	150	210,000		
SUBTOTAL				$ 2,047,500	Y	N
5% ~~15%~~ CONTINGENCY				102375 ~~307,125~~		
10% ENGINEERING				204,750		
SUBTOTAL, 100-YEAR STORM SEWERS				~~$ 2,559,375~~	Y	N
					$ 2,354,625	

ENGINEER'S ESTIMATE OF PROBABLE COST
RIDGEVIEW DEVELOPMENT - MDDP

DESCRIPTION	QUANTITY	UNIT	UNIT COST	EXTENSION	Include in	IN DBPS?
100-YEAR OPEN CHANNELS						
North Boundary Diversion	1000	LF	$ 110	$ 110,000	Y	N
Dublin	500	LF	95	47,500	Y	N
Peterson	2100	LF	110	231,000	Y	N
Basin 136-SC Minor Tributary	3800	LF	125	~~475,000~~	N	Y
SUBTOTAL				$ 863,500	388,500	
5% ~~15%~~ CONTINGENCY				129,525	19,425	
10% ENGINEERING				86,350	38,850	
SUBTOTAL, 100-YEAR OPEN CHANNELS				**$ 1,079,375**	$446,775	
SAND CREEK IMPROVEMENTS						
Phase I						
Grade Control	6	EA	$ 25,000	$ 150,000		
Slope Stabilization	1500	LF	125	187,500		
Phase 2						
Grade Control	5	EA	25,000	125,000		
Slope Stabilization	1250	LF	125	156,250		
Phase 3						
Grade Control	2	EA	25,000	50,000		
Slope Stabilization	500	LF	125	62,500		
SUBTOTAL				$ 731,250	N	Y
15% CONTINGENCY				109,688		
10% ENGINEERING				73,125		
SUBTOTAL, SAND CREEK IMPROVEMENTS				**$ 914,063**		
DETENTION POND NO. 2						
Pro-rated from Pond #1	1	EA	$ 1,872,720	**$ 1,872,720**	N	Y
TOTAL ESTIMATED DRAINAGE IMPROVEMENTS COST				**$ 7,554,801**		

Sand Creek DBPS Pond #2 - Skysox

Assumptions-

1 Cost estimates were prepared based upon preliminary design provided to JR Engineering by Richard Wray of Kiowa Engineering.

2 This cost estimate was prepared by comparing the actual costs related to the recently completed DBPS pond #1 provided by City Engineering

3 Land costs were assumed to be equal to the current park land dedication/land value for land outside the floodplain.

4 Land costs were assumed to be 20% of the current park land dedication fee for land within the floodplain

5 Pond #1 and Pond #2 are essentially equal in size. Pond #1 is 240 acre-ft and pond #2 is 243 acre-ft(DBPS) and 216 acre-ft in revised preliminary design

Pond 2 Construction Cost

pond construction cost estimate	$	**1,861,185**
associated channel improvement cost estimate	$	**895,605**

Pond 2 Land Costs

	Acres	Cost/Acre		
Land outside floodplain	14.2	$ 42,137	$	598,345
Land within floodplain	22.1	$ 8,427	$	186,246
		Total	$	**784,591**

Total Land and Construction $ 3,541,381

Sand Creek Detention Basin No. 2 (Skysox)
Construction Cost Estimate

Item	Quantity	Unit	Cost	Total
Earthwork				
Mobilization	1	LS	$ 25,000.00	$ 25,000
Clear and Grub	1	LS	$ 10,000.00	$ 10,000
Strip and Stockpile	20000	CY	$ 0.80	$ 16,000
Earthwork (Cut to Fill)	381800	CY	$ 1.00	$ 381,800
Replace Topsoil	20000	CY	$ 0.90	$ 18,000
Gravel Access Road	1750	TN	$ 8.00	$ 14,000
subtotal				*$ 464,800*
Erosion Control				
Vehicle Tracking Pad	2	EA	$ 1,000.00	$ 2,000
Silt Fence	5000	LF	$ 1.25	$ 6,250
Straw Bales	150	EA	$ 3.50	$ 525
subtotal				*$ 8,775*
Pond Facilities				
180' wide spillway-				
3' Type H RipRap	800	CY	$ 37.00	$ 29,600
4" Type II Bedding	89	CY	$ 8.00	$ 712
Mirafi Fabric	800	SY	$ 2.00	$ 1,600
Structural Excavation	1500	CY	$ 6.50	$ 9,750
Soil Cement	17000	CY	$ 45.00	$ 765,000
Portland Cement Concrete	2300	TN	$ 120.00	$ 276,000
subtotal				*$ 1,082,662*
Revegetation				
Seed & Mulch	36	AC	$ 500.00	$ 18,000
Slope Protection Mat	6500	SY	$ 1.50	$ 9,750
subtotal				*$ 27,750*
Pond 2 Construction Cost Estimate				$ 1,583,987
10% Engineering				$ 158,399
2.5% Construction Staking				$ 39,600
5% Contingencies				$ 79,199
Grand Total				**$ 1,861,185**

Sand Creek Detention Basin No. 2 (Skysox) Channel Improvements
Construction Cost Estimate

Item	Quantity	Unit	Cost	Total
Upstream Facilities				
Grouted Boulder Drop 1-				
3' Grouted Type H RipRap	756	CY	$ 60.00	$ 45,360
4" Type II Bedding	84	CY	$ 8.00	$ 672
Mirafi	755	SY	$ 2.00	$ 1,510
Excavation	1500	CY	$ 3.00	$ 4,500
Grouted Boulder Drop 2-				
3' Grouted Type H RipRap	980	CY	$ 60.00	$ 58,800
4" Type II Bedding	109	CY	$ 8.00	$ 872
Mirafi	980	SY	$ 2.00	$ 1,960
Excavation	2000	CY	$ 3.00	$ 6,000
subtotal				*$ 119,674*
Outfall				
2-8' X 20' CBC's-				
Slab Concrete	593	CY	$ 300.00	$ 177,900
Wall Concrete	160	EA	$ 280.00	$ 44,800
Reinforcing Steel	205364	LBS	$ 0.55	$ 112,950
subtotal				*$ 463,284*
Downstream Facilities				
Demo and Remove existing Check	1	EA	$ 5,000.00	$ 5,000
Grouted Boulder Drop 3-				
3' Grouted Type H RipRap	1222	CY	$ 60.00	$ 73,320
4" Type II Bedding	136	CY	$ 8.00	$ 1,088
Mirafi	1222	SY	$ 2.00	$ 2,444
Excavation	2450	CY	$ 3.00	$ 7,350
Grouted Bank Lining-				
2' Grouted Type M RipRap	355	CY	$ 50.00	$ 17,750
4" Type II Bedding	59	CY	$ 8.00	$ 472
Mirafi	533	SY	$ 2.00	$ 1,066
Excavation	700	CY	$ 3.00	$ 2,100
Soil/RipRap Bank Lining-				
2' Type M RipRap	1485	CY	$ 35.00	$ 51,975
4" Type II Bedding	248	CY	$ 8.00	$ 1,984
Mirafi	2230	SY	$ 2.00	$ 4,460
Excavation	3000	CY	$ 3.00	$ 9,000
subtotal				*$ 178,009*
Revegetation				
Seed & Mulch	2.5	AC	$ 500.00	$ 1,250
subtotal				*$ 1,250*
Pond 2 Channel Construction Cost Estimate				$ 762,217
10% Engineering				$ 76,222
2.5% Construction Staking				$ 19,055
5% Contingencies				$ 38,111
Grand Total				**$ 895,605**

Kiowa Engineering Corporation

February 26, 2004

Mr.Dave Mijares
JR Engineering
4310 Arrowswest Drive
Colorado Springs, Colorado 80907

RE: Sand Creek Detention Basin No. 2, Springs Ranch, Colorado Springs, Colorado

Dear Dave:

I am in receipt of you cost estimate for the Sand Creek Detention Basin No. 2. The cost estimate as prepared appears to reasonably reflect the construction cost for the detention facility and its appurtenances. The unit costs applied are similar to those experienced when the Sand Creek Detention Basin 1 was built. As you are aware, the cost estimate will need to be refined as the detention basin moves into the final design phase.

Should you require additional information, please do not hesitate to contact me.

Sincerely yours,
KIOWA ENGINEERING CORPORATION

Richard N. Wray
Principal

0226rnw1.doc

Post-it® Fax Note 7671	Date 2/26	# of pages ▶ 1
To Dave Mijares	From Rich Wray	
Co./Dept. JR	Co. Kiowa	
Phone #	Phone #	
Fax #	Fax #	

SURCHARGE CALCULATION PER URS RIDGEVIEW MDDP

BASE YEAR	YEAR BUILT	ACERAGE		FEES COLLECTED						TOTAL FEES COLLECTED	THEORETICAL SURCHARGE	POND COST	DIFFERENCE (COST - FEES)
		OUTSIDE RV	INSIDE RV	OUTSIDE RV			INSIDE RV						
				POND	LAND	TOTAL	POND	LAND	TOTAL				
1	1999	95	47	$ -	$ -	$ -	$ 62,557	$ 15,745	$ 78,302	$ 78,302	$ 32,571	$ 2,273,423	$ 2,162,550
2	2000	95	47	$ -	$ -	$ -	$ 62,557	$ 15,745	$ 156,604	$ 156,604	$ 65,142	$ 2,273,423	$ 2,051,677
3	2001	95	47	$ -	$ -	$ -	$ 62,557	$ 15,745	$ 234,906	$ 234,906	$ 97,713	$ 2,273,423	$ 1,940,804
4	2002	95	46.7	$ -	$ -	$ -	$ 62,158	$ 15,645	$ 312,708	$ 312,708	$ 130,076	$ 2,273,423	$ 1,830,639
5	2003	95	46.7	$ -	$ -	$ -	$ 62,158	$ 15,645	$ 390,510	$ 390,510	$ 162,439	$ 2,273,423	$ 1,720,473
6	2004	95	46.7	$ -	$ -	$ -	$ 62,158	$ 15,645	$ 468,313	$ 468,313	$ 194,802	$ 2,273,423	$ 1,610,308
7	2005	95	46.7	$ 126,445	$ 31,825	$ 158,270	$ 62,158	$ 15,645	$ 546,115	$ 704,385	$ 227,165	$ 2,273,423	$ 1,341,873
8	2006	95	46.7	$ 126,445	$ 31,825	$ 316,540	$ 62,158	$ 15,645	$ 623,917	$ 940,457	$ 259,529	$ 2,273,423	$ 1,073,438
9	2007	95	46.7	$ 126,445	$ 31,825	$ 474,810	$ 62,158	$ 15,645	$ 701,719	$ 1,176,529	$ 291,892	$ 2,273,423	$ 805,002
10	2008	95	46.7	$ 126,445	$ 31,825	$ 633,080	$ 62,158	$ 15,645	$ 779,521	$ 1,412,601	$ 324,255	$ 2,273,423	$ 536,567
11	2009	95	46.7	$ 126,445	$ 31,825	$ 791,350	$ 62,158	$ 15,645	$ 857,324	$ 1,648,674	$ 356,618	$ 2,273,423	$ 268,132
13	2011	95	59.6	$ 126,445	$ 31,825	$ 1,107,890	$ 79,328	$ 19,966	$ 1,034,419	$ 2,142,309	$ 430,284	$ 2,273,423	$ (299,170)
14	2012	95	59.6	$ 126,445	$ 31,825	$ 1,266,160	$ 79,328	$ 19,966	$ 1,133,713	$ 2,399,873	$ 471,587	$ 2,273,423	$ (598,037)
15	2013	95	59.6	$ 126,445	$ 31,825	$ 1,424,430	$ 79,328	$ 19,966	$ 1,233,007	$ 2,657,437	$ 512,889	$ 2,273,423	$ (896,903)
16	2014	95	59.6	$ 126,445	$ 31,825	$ 1,582,700	$ 79,328	$ 19,966	$ 1,332,300	$ 2,915,000	$ 554,192	$ 2,273,423	$ (1,195,769)

CALCULATED YEARS PER URS MDDP

FUNDING AVAILABLE BASED ON ACTUAL RIDGEVIEW DEVELOPMENT

BASE YEAR	YEAR BUILT	BASIN POND FEES*	SURCHARGE FEE*	OUTSIDE RV		INSIDE RV				TOTAL FEES COLLECTED	POND COST	DIFFERENCE (COST - FEES)
				ACERAGE	FEES	ACERAGE	FEES	SURCHARGE	TOTAL FEES			
1	1999	$ 1,736	$ 693	95	$ -	60	$ 104,160	$ 41,580	$ 145,740	$ 145,740	$ 2,645,776	$ 2,500,036
2	2000	$ 1,840	$ 714	95	$ -	73	$ 134,320	$ 52,122	$ 186,442	$ 332,182	$ 2,645,776	$ 2,313,594
3	2001	$ 1,925	$ 750	95	$ -	249	$ 479,325	$ 186,750	$ 666,075	$ 998,257	$ 2,645,776	$ 1,647,519
4	2002	$ 1,991	$ 773	95	$ -	234	$ 465,894	$ 180,882	$ 646,776	$ 1,645,033	$ 2,645,776	$ 1,000,743
5	2003	$ 2,059	$ 796	95	$ -	119	$ 245,021	$ 94,724	$ 339,745	$ 1,984,778	$ 2,645,776	$ 660,998
6	2004	$ 2,131	$ 820	95	$ -	114	$ 242,934	$ 93,480	$ 336,414	$ 2,321,192	$ 2,645,776	$ 324,584
7	2005	$ 2,195	$ 845	95	$ 208,525	46.7	$ 102,507	$ 39,462	$ 141,968	$ 2,671,685	$ 2,778,065	$ 106,380
8	2006	$ 2,261	$ 870	95	$ 214,795	46.7	$ 105,589	$ 40,629	$ 146,218	$ 3,032,698	$ 2,916,968	$ (115,730)
10	2008	$ 2,399	$ 923	95	$ 227,905	48.9	$ 117,311	$ 45,135	$ 162,446	$ 3,794,911	$ 3,215,957	$ (578,954)
11	2009	$ 2,471		95	$ 234,745		$ -		$ -	$ 4,029,656	$ 3,376,755	$ (652,901)
12	2010	$ 2,545		95	$ 241,775		$ -		$ -	$ 4,271,431	$ 3,545,593	$ (725,838)
13	2011	$ 2,621		95	$ 248,995		$ -		$ -	$ 4,520,426	$ 3,722,873	$ (797,553)
14	2012	$ 2,700		95	$ 256,500		$ -		$ -	$ 4,776,926	$ 3,909,016	$ (867,910)
15	2013	$ 2,781		95	$ 264,195		$ -		$ -	$ 5,041,121	$ 4,104,467	$ (936,654)
16	2014	$ 2,864		95	$ 272,080		$ -		$ -	$ 5,313,201	$ 4,309,690	$ (1,003,511)

TARGET YEARS PER KIOWA 2002 ANALYSIS

*ACTUAL FEES UTILIZED FOR YEARS 1999-2004, ADJUSTED 3% ANNUALY FOR 2005 AND BEYOND
*POND COST ADJUSTED 5% ANNUALLY FOR 2005 AND BEYOND

FUNDING AVAILABLE BASED ON ACTUAL RIDGEVIEW DEVELOPMENT WITHOUT RIDGEVIEW BASIN FEES 1999-2004

BASE YEAR	YEAR BUILT	BASIN POND FEES*	SURCHARGE FEE*	OUTSIDE RV		INSIDE RV				TOTAL FEES COLLECTED	POND COST	DIFFERENCE (COST - FEES)
				ACERAGE	FEES	ACERAGE	FEES	SURCHARGE	TOTAL FEES			
1	1999	$ 1,736	$ 693	95	$ -	60	$ -	$ 41,580	$ 41,580	$ 41,580	$ 2,645,776	$ 2,604,196
2	2000	$ 1,840	$ 714	95	$ -	73	$ -	$ 52,122	$ 52,122	$ 93,702	$ 2,645,776	$ 2,552,074
3	2001	$ 1,925	$ 750	95	$ -	249	$ -	$ 186,750	$ 186,750	$ 280,452	$ 2,645,776	$ 2,365,324
4	2002	$ 1,991	$ 773	95	$ -	234	$ -	$ 180,882	$ 180,882	$ 461,334	$ 2,645,776	$ 2,184,442
5	2003	$ 2,059	$ 796	95	$ -	119	$ -	$ 94,724	$ 94,724	$ 556,058	$ 2,645,776	$ 2,089,718
6	2004	$ 2,131	$ 820	95	$ -	114	$ -	$ 93,480	$ 93,480	$ 649,538	$ 2,645,776	$ 1,996,238
7	2005	$ 2,195	$ 845	95	$ 208,525	46.7	$ 102,507	$ 39,462	$ 141,968	$ 1,000,031	$ 2,778,065	$ 1,778,034
8	2006	$ 2,261	$ 870	95	$ 214,795	46.7	$ 105,589	$ 40,629	$ 146,218	$ 1,361,044	$ 2,916,968	$ 1,555,924
10	2008	$ 2,399	$ 923	95	$ 227,905	48.9	$ 117,311	$ 45,135	$ 162,446	$ 2,123,257	$ 3,215,957	$ 1,092,700
11	2009	$ 2,471		95	$ 234,745		$ -		$ -	$ 2,358,002	$ 3,376,755	$ 1,018,753
12	2010	$ 2,545		95	$ 241,775		$ -		$ -	$ 2,599,777	$ 3,545,593	$ 945,816
13	2011	$ 2,621		95	$ 248,995		$ -		$ -	$ 2,848,772	$ 3,722,873	$ 874,101
14	2012	$ 2,700		95	$ 256,500		$ -		$ -	$ 3,105,272	$ 3,909,016	$ 803,744
15	2013	$ 2,781		95	$ 264,195		$ -		$ -	$ 3,369,467	$ 4,104,467	$ 735,000
16	2014	$ 2,864		95	$ 272,080		$ -		$ -	$ 3,641,547	$ 4,309,690	$ 668,143

TARGET YEARS PER KIOWA 2002 ANALYSIS

*ACTUAL FEES UTILIZED FOR YEARS 1999-2004, ADJUSTED 3% ANNUALY FOR 2005 AND BEYOND
*POND COST ADJUSTED 5% ANNUALLY FOR 2005 AND BEYOND

DRAINAGE MAPS

EXHIBIT MAP PROPOSED D.B.P.S. IMPROVEMENTS

D.B.P.S. DRAINAGE PLAN

RIDGEVIEW SUBDIVISION, EASTERLY PORTION,
MASTER DEVELOPMENT DRAINAGE PLAN
(AMENDMENT NO. 1), NOVEMBER 1999

RIDGEVIEW SUBDIVISION, EASTERLY PORTION,
MASTER DEVELOPMENT DRAINAGE PLAN
AMENDMENT NO. II, DEC. 2002

RIDGEVIEW, NORTHEAST PORTION
PRELIMINARY DRAINAGE PLAN

REIMBURSABLE COST ESTIMATE SOUTHERLY PORTION

SAND CREEK NORTH CAREFREE TO SKYSOX STADIUM,
HYDROLOGY ANALYSIS, THRESHOLD BASIN IDENTIFICATION,
BY KIOWA ENGINEERING CORPORATION, FEBRUARY 2002.

SAND CREEK POND #2 TRIBUTARY BASIN/PLATTED
DEVELOPMENT ANALYSIS

INCLUDED SEPARATE:

M.D.D.P. – PRELIMINARY CONSTRUCTION PLANS,
PHASE II SAND CREEK CHANNEL IMPROVEMENTS
SHEETS 1 THROUGH 12