RICH-HAVEN SPECIFIC PLAN

ONTARIO, CALIFORNIA

HYDROLOGY REPORT

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ENGINEERING & CONSULTING

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I. INTRODUCTION

The Rich-Haven Specific Plan includes approximately 584.2 gross acres of land in the southwestern portion of the City of Ontario, within the Ontario Ranch (formerly known as 'New Model Colony' or NMC). The project site, hereafter referred to as Rich-Haven, is bounded to the north by Riverside Drive, Colony High School, and SCE Mira Loma substation, to the east by Hamner Avenue, to the West by Haven Avenue, and to the south by Old Edison Road. Under the specific plan, Rich-Haven is to be developed as a cohesive community that incorporates diverse land uses that include residential of various densities, industrial, mixed-use, open space non recreation, and open space parkland (See ***Figure 1*** herein).

Figure 1. Rich-Haven Specific Plan Vicinity Map (Source: City Council Approved Specific Plan Amendment (File No. PSPA19-006): May 18, 2021 Resolution No's 2021-047)

The Rich-Haven Specific Plan was first approved by the City Council on December 4th, 2007, and has since been amended multiple times that oversaw changes in its planned land uses and coverage. The latest amendment was adopted on May 18th, 2021; notable changes of which

include an increase of 72.1 acres in the project's land coverage and changes in planned land uses that reflect the current market trend. These changes redefine the hydrologic patterns of the project site, which was previously evaluated in the 2012 City of Ontario's Master Plan of Drainage (hereafter, MPoD, unless stated otherwise) for sizing and planning of storm drain facilities. It is therefore important to validate the adequacy of the planned and constructed master-planned storm drain facilities in supporting developments within the amended Rich-Haven Specific Plan area. Consequently, the purpose of this study is to assess the hydrologic changes of the project and its implications on the planned storm drain facilities, using the MPoD study as comparison baseline (See ***Exhibit 1*** in **Appendix A**).

II. RICH-HAVEN WATERSHED

According to the 2012 MPoD, The Rich-Haven Specific Plan area is located within Drainage Area X, which covers approximately 4.5 square miles (2,880 acres). Drainage Area X is tributary to the County Line Channel, which is owned and maintained by the San Bernardino County Flood Control District and runs along the southerly edge of Ontario Ranch.

Rich-Haven is located within the northeastern portion of Drainage Area X, which is described as the following land area. The upstream or study area of drainage area X is bounded to the north by SR60, to the east by Milliken/Hamner Avenue, to the west by the approximate westerly edge of landscape buffer of Haven Avenue, and to the south by old Edison Avenue, covering a total of 1,062 acres (See ***Exhibit 2*** in **Appendix A**). Drainage among this sub watershed is further divided into three separate subareas, the drainage of each subarea will be intercepted and conveyed by the regional backbone drainage system as outlined below.

PROPOSED DRAINAGE FACILITIES

Drainage from the Rich-Haven project area will be conveyed by three main planned backbone storm drain lines, namely: 1**) Haven Avenue Storm Drain**, **2) Mill Creek Avenue Storm Drain**, and **3) Milliken Avenue Storm Drain**, all of which drain from north to south and connect to the County Line Channel (See ***Exhibit 2*** in **Appendix A**). Description of each backbone storm drain lines and its current implementation status are outlined as follows.

1. Haven Avenue Storm Drain

Haven Avenue Storm Drain (hereafter, Haven SD) is a network of storm drain lines 48" to 84"in size, with a mainline (HAVN-X-1) that runs north from Bellegrave Avenue to Riverside Drive along Haven Avenue and branches to storm drain line (HAVN-X-2, -X3, and -X4) and several unnamed laterals that extend from planned/future development within Rich-Haven (See ***Figure 2*** under Section C for Planning Area (PA) designation).

Storm Drain Line	Location	Construction status as of writing
HAVN-X-1	Runs north from Bellegrave Avenue to Riverside Drive along Haven Avenue	Partially constructed to southerly lot line of Rich-Haven Planning Area 3 (PA-3) (Public Park). See ***Figure 2***.
HAVN-X-2	Branches westerly off HAVN-X-1 in Ontario Ranch Road	Constructed
HAVN-X-3 (Twinkle Storm Drain)	Branches from HAVN-X-1 through PA 5 and drains portions of PA 1, 2, 3, 4, and Colony High school	Constructed to north lot line of Rich-Haven PA 5, not constructed north of PA 5

Storm Drain Line	Location	Construction status as of writing
HAVN-X-4	Branches easterly off HAVN-X-1 in Chino Avenue and drains portion of PA 1	Not Constructed

2. *Mill Creek Avenue Storm Drain*

Mill Creek Avenue Storm Drain (hereafter, Mill Creek SD) is a network of storm drain pipes ranging in size from 48" to a 10' x 8' box , with a mainline (MLCR-X-1) that runs north from Bellegrave Avenue to Chino Avenue along Mill Creek Avenue, and extends to the east in Chino Avenue. MLCR-X-1 branches to MLCR-X-4, -5, and -6 and minor laterals that extend from planned/future development within Rich-Haven along Mill Creek Avenue (See ***Figure 2*** under Section C for Planning Area (PA) designation).

Storm Drain Line	Location	Construction status as of writing
MLCR-X-1	Runs north from Bellegrave Avenue to Chino Avenue along Mill Creek Avenue and turns east along Chino Avenue	Constructed north from Bellegrave Avenue to Eucalyptus (outside of Rich-Haven limit)
MLCR-X-4	Branches easterly off MLCR-X-1 in Ontario Ranch Road and drains PA 7	Constructed
MLCR-X-5	Branches westerly off MCLR-X-1 in Ontario Ranch Road and drains PA 6	Constructed
MLCR-X-6	Branches easterly off MLCR-X-1 in SCE access road and drains SCE Mira Loma Substation	Not Constructed

3. *Milliken Avenue Storm Drain*

Milliken Avenue Storm Drain (hereafter, Milliken Avenue SD) is a main line storm drain that varies in size from 36" to 54" that drains south from Ontario Ranch Road to Bellegrave Avenue along Hamner Avenue (also known as Milliken Avenue). Storm drain laterals extend from planned development within a minor portion of the southeastern area of Rich-Haven.

Storm Drain Line	Location	Construction status as of writing
MLKN-X-1	Runs north from Bellegrave Avenue to Riverside Drive along Milliken/Hamner Avenue	Constructed

STORM DRAIN FACILITIES DRAINAGE AREA

The tributary drainage area for each regional backbone drainage system per 2012 MPoD (Master Plan of Drainage) is summarized in the following table:

Drainage System	Tributary drainage area (MPoD 2012)
Haven Storm drain	352.2 acres
Mill Creek Storm drain	659.9 acres
Milliken Storm drain	50.0acres

LAND USE

The current designated land uses within the Rich-Haven area are outlined in the proposed Rich-Haven Specific Plan (See ***Figure 2*** herein). These updated land uses are compared to the land uses approved by the City Council under the 2010's City of Ontario's Revised Land Use Plan, which were used as the basis of hydrologic study for the 2012 MPoD.

Figure 2. Proposed Rich-Haven Specific Plan- Proposed land uses and Planning Area Designation

A summary of the land use change is shown as follows, with references to the planning areas within the Rich-Haven area (also See ***Exhibit 1*** in **Appendix A**).

PLANNING AREA/ PROJECT NAME	LAND USES	
	2010 CITY'S REVISED LAND USE PLAN	**PROPOSED RICH-HAVEN SPECIFIC PLAN LAND USES**
PA-1A	Residential (2.1-5DU/AC)	Residential (0-5 DU/AC)
PA-1B	Residential (2.1-5DU/AC)	Residential (5.1-12DU/AC)
PA-1C	Residential (2.1-5DU/AC) & Commercial	Residential (12.1-25DU/AC)
PA-2	Open Space- Non Recreation	Open Space- Non Recreation
PA-3/ Sports Park	Public Park & Open Space-Non Recreation	Public Park
PA-4A/ MCBC- Colonial	Open Space- Non Recreation	Light Industrial
PA-4B/ Colonial	Residential (2.1-5DU/AC)	Residential (5.1-12DU/AC)
PA-4C	Residential (11.1-25DU/AC)	Public Park
PA-5A and -5C/ Neuhouse	Residential (11.1-25DU/AC)	Residential (12.1-25DU/AC)
PA-5B/ MCBC-VanderEyk	Residential (11.1-25DU/AC)	Light Industrial
PA-5D/ VanderEyk	Residential (11.1-25DU/AC)	Residential (12.1-25DU/AC)
PA-5E and -5F/ SCE Easement	Open Space- Non Recreation	Open Space- Non Recreation
PA-6A/ Canvas Park	Mixed Use	Residential – Stand Alone
PA-6B/ Randall North	Mixed Use	Light Industrial
PA-6C	Open Space- Non Recreation	Open Space- Non Recreation
PA-6D/ Randall North	Open Space- Non Recreation	Commercial
PA-7A/ Visser Demody	Mixed Use	Light Industrial
PA-7B/ Visser Richland	Mixed Use	Commercial
PA-8A/ Community College & Wood Investments	Mixed Use	Mixed Use

PLANNING AREA/ PROJECT NAME	LAND USES	
	2010 CITY'S REVISED LAND USE PLAN	PROPOSED RICH-HAVEN SPECIFIC PLAN LAND USES
PA-8B/ Pietersma	Mixed Use	Residential - Stand Alone Commercial
PA-9A/ Regions South	Mixed Use & Open Space-Non Recreation	Residential - Stand Alone, Open Space- Non Recreation, & Commercial
PA-9B/ Randall South	Mixed Use & Open Space-Non Recreation	Residential - Stand Alone, Open Space- Non Recreation, & Commercial

III. HYDROLOGY AND HYDRAULICS

2012 MPOD STUDY

The ultimate condition hydrology of the Rich-Haven area was evaluated in the 2012 City's MPoD, with designated land uses that align with the Revised Land Use Plan adopted by the City Council in January 2010 (Refer to **Appendix A, *Exhibit 1***).

However, the proposed land uses in some planning areas under the proposed Rich-Haven Specific Plan are generally denser or more impervious than the previously planned land use under the City's 2010 Revised Land Use Plan, such as the conversion of a low-density residential land use to high-density residential land use (See Section II.C- Land Use). Land use with more impervious areas typically generate higher peak flow with a shorter time of concentration. In addition, the tributary drainage areas of the master-planned regional backbone storm drainage systems have also changed since the MPoD study. Altogether, these changes present important implications in the planning and sizing of storm drain facilities, which necessitates a hydrology and hydraulic study.

STUDY OBJECTIVES

The overarching goal of this study is to ensure that there will be no significant adverse impacts to down stream storm drain facilities within the study area as a result of this project. Towards this goal, three objectives are further scoped, in order, as below:

1. *Hydrology analysis*
   - Reassess the hydrologic characteristics of the Rich-Haven area based on its latest proposed land uses and changes in the master-planned storm drain watersheds (Haven SD, Mill Creek SD, and Millken/Hamner SD watersheds).

2. *Peak flow mitigation analysis*
   - Determine the properties within Rich-Haven that may require peak flow mitigation.
   - Designate the allowable mainline peak flow within each storm drain mainline at storm drain connection point for each property.

3. *Hydraulic Analysis*
   - Based on the preceding analyses, identify the storm drain mainline(s) that requires further hydraulic analysis.
   - Analyze the proposed/existing storm drain for hydraulic capacity as needed

HYDROLOGY ANALYSIS

The following subsection outlines the hydrologic study components.

1. Hydrologic Study Approach

A main objective of this study is to update the 2012 MPoD hydrology analysis with updated inputs that reflect the latest Rich-Haven Specific Plan and any changes that may have occurred.

To ensure accurate comparison between this study and the 2012 MPoD study, a detailed review of the latter's hydrologic calculations was conducted to identify and preserve information that remains unchanged since the was completed. These include hydrologic data for existing development that were included as part of the 2012 MPoD study, planned storm drain facilities and its location.

Hydrologic parameters from planning areas and storm drains within Rich-Haven that were constructed, and changes in tributary area of the regional storm drains since the MPoD study are also incorporated into this study to reflect the latest conditions of the Rich-Haven to the maximum extent possible.

The following table summarizes the items in the 2012 MPoD that were reused in this study.

Item	Description
Hydrologic Node 5115	Confluenced Peak Flow rate, Max Loss Rate, and associated Tc from upstream-most drainage area of Rich-Haven Drainage Area
Hydrologic Node 5210	Confluenced Peak Flow rate, Max Loss Rate, and associated Tc from the Mira Loma SCE Substation Drainage Area
Hydrologic Nodes 5115, 5141, 5215, 5248, 5300, 5305, and 5330	Hydrologic nodes for the Mill Creek Storm Drain Drainage Area
Hydrologic Nodes 4070, 4080, 4075, 4120, 4170, 4171, and 4200	Hydrologic nodes for the Haven Storm Drain Drainage Area
Hydrologic Nodes 6050	Hydrologic node for the Milliken Storm Drain Drainage Area

The following table summarizes the parameters of projects within Rich-Haven area used in this study:

Item	Description
Hydrologic Nodes 4070 and 4080	Confluenced Peak Flow rate, Max Loss Rate, and associated Tc at referenced node per TTM 20526, PA 1 project (Node 508 and 312, respectively)
Hydrologic Node 416	Confluenced Peak Flow rate, Max Loss Rate, and associated Tc at referenced node per TM 20530, PA 5D (Vander Eyk) Project (Node 312)

Item	Description
Hydrologic Node 440	Hydrologic node at referenced node per TTM 20081, PA 6A (Regions North) project (Node 505)
Hydrologic Nodes 445, 450, and 4170	Pre-confluenced Peak Flow rate, Max Loss Rate, and associated Tc at referenced node per TTM 20081, PA 6A (Regions North) project (Node 5001, 5002, and 4170, respectively)
Hydrologic Nodes 455	Pre-confluenced Peak Flow rate, Max Loss Rate, and associated Tc at referenced node per PM19978, New Haven Commercial Development project (not part of Rich-Haven areas) (Node 37)
Hydrologic Nodes 465	Pre-confluenced Peak Flow rate, Max Loss Rate, and associated Tc at referenced node per TM20076, New Haven Residential Development project (not part of Rich-Haven areas) (Node 20)
Hydrologic Nodes 460 and 4171	Pre-confluenced Peak Flow rate, Max Loss Rate, and associated Tc at referenced node per TM 20449, PA 9A (Regions South) Project (Node 517 and 415, respectively)

2. *San Bernardino County Hydrology Methodology*

The hydrology methodologies accepted by the City of Ontario are documented in the San Bernardino County's Hydrology Manual (1986) and subsequent addenda. Two methods are primarily used:

a) Rational Method
b) Unit Hydrograph Method

Peak flow and time of concentration are typically the outcomes of interest from these methods. Selection of methodology is dependent on the drainage size to be studied. Rational method is typically used for drainage area that is approximately 1 square mile (640 acres) or less, beyond which the method may become less reliable due to the higher variation in point precipitation over a larger area. Unit hydrograph is then used for continuation of drainage study beyond 1 square mile, using the time of concentration estimated by Rational Method and area-averaged point rainfall over the entire drainage area as inputs.

The 2012 MDoP used both methods for its hydrology analysis, starting off with Rational Method for all drainage area studies, and switching to the Unit Hydrograph Method should the drainage area exceed 1 square mile.

This study adopts similar methodology basis as the MDoP, however, due to the relatively smaller drainage area of the Rich-Haven (i.e. ~644 acres for the largest sub drainage are), only Rational method is used.

3. *Implementation of Rational Method Analysis*

The Rational Method for this study is implemented using RSBC software, 2018 version, developed by Civil Design® Corporation and Joseph E. Bonadiman and Associates Inc. RSBC software is accepted by the County of San Bernardino for hydrologic study purposes. The software implements the various modeling approaches of the County's Rational Method as documented in the County's Hydrology Manual, which includes initial subarea time of concentration estimation, subarea addition, pipe and street flow time, and confluence analysis of adjoining streams.

4. *Hydrologic Study Criteria*

The parameters used for this study adhere to the 100-year storm study criteria used in MDoP and are summarized as follows.

Storm Return Frequency	100-yr
1-hour rainfall depth	1.2 in
Log-Log Slope for Rational Method Hydrology Studies	0.6
AMC Condition	II

PEAK FLOW RATE MITIGATION ANALYSIS

Peak flow mitigation is typically required if the peak flow rate as determined by this report's hydrology analysis exceeds the existing/proposed storm drain capacities. The individual developers of each planning area will be responsible for complying with mainline storm drain allowable flow rates as designated in this report or determining other methods of not adversely impacting the storm drain system capacity.

This study aims to determine an allowable peak flow Q for various planning areas, represented by the allowable peak flow at different points of the storm drain main line in relation to times of concentration, taking into account the existing and planned built-out conditions of the Rich-Haven area.

HYDRAULIC ANALYSIS

Hydraulic study of a drainage system acts as validation of the engineering design of the drainage system. This level of study typically is conducted with the availability of more detailed information, which include outputs from the preceding analyses.

Hydraulic parameters of the planned regional backbone storm drainage systems, such as the hydraulic grade line (HGL) and velocity, are shown on various approved storm drain improvement plans for the City of Ontario. The hydrologic data used for the hydraulic design of these storm drains are derived from different sources. For instance, the Haven Storm Drain hydraulic design is based upon the 2012 MPoD's hydrologic outputs. Whereas

the Mill Creek Storm Drain hydraulic design is based upon a combination of hydrologic outputs from 2007 MPoD's hydrologic outputs and approved final engineering studies from developed planning areas within Rich-Haven, and the Huitt-Zollars Mill Creek Hydraulic Study dated July 11th, 2022, which when looked at holisitically, allows for possible reconfiguration of storm drain to accommodate field conditions and updated design constraints.

The hydraulic parameters as shown approved storm drain plans may be utilized to assess the need for conducting a, updated hydraulic analysis of the proposed storm drain system. For example, if the peak flow along the mainline as estimated by the updated hydrology analysis remains consistently lower than the peak flow shown on the existing approved storm drain plans throughout all segments of the main lines, it can be inferred that the updated HGL will be lower than the existing HGL and any adverse impacts to the downstream storm drain(s) in the study area are not anticipated. Therefore, a hydraulic analysis of the subject storm drain is not provided in this study. However, if any of the storm drain segments is expected to convey a higher flow than shown on the existing storm drain plan, a detailed hydraulic analysis will be provided in this study to ensure that adequate capacity of the proposed storm drain to handle the updated hydrologic conditions.

The outcomes from this hydraulic analysis serve to determine the critical section along the storm drain mainline in terms of water surface elevation, which must not rise above 6" below finished surface or lip of catch basin for a 100-year storm, per the City of Ontario's storm drain design goals.

IV. FINDINGS/RECOMMENDATIONS

HYDROLOGY ANALYSIS

1. *Modeling approach*

This study's hydrology modeling approach varied slightly from that of the MPoD. The subarea addition approach, as used extensively in MPoD, is sensitive to the subarea size definition, which may either discount flow contribution of a subarea entirely or significantly amplify the estimated flow addition. This shortcoming is also acknowledged by the County's Hydrology Manual (Section D.11, Step 5). For example, an estimated 101 cfs from 53 acres of drainage area (out of a total of 660 acres) was not accounted in the MPoD's Mill Creek SD peak flow (within the study area) as a result of using the subarea addition approach (See Nodes 5116, 5117, 5141, 5215, 5248, 5300, and 5330 in MDoP Hydrology Calculations). While this modeling approach is generally accepted for planning level study such as Master Drainage Plan, it may not be suitable for storm drain design.

To circumvent this issue, this study used confluence analysis (County's Hydrology Manual, Section D.8) for any major subarea flow addition to the mainline, such as flow contribution from a Planning Area. Confluence analysis is a deliberate method that estimates the peak flow contribution of two or more streams joining at a physical location but at different times of concentration. This method allows for more specific understanding of the mainline flow contribution of a particular area, from which mitigation of peak flow can be determined . Peak flow estimated from confluence analysis is also generally higher than simple subarea

addition, as the former may partially discount peak flow based on time of concentration of the adjoining streams, but never the entire flow as the latter may discount as mentioned above.

The estimated peak flow from this study is presumed to be comparable to MPoD for further analysis of the planned storm drain system.

2. *Haven SD*

Although the drainage delineation for Haven SD (within Rich-Haven) has changed since the MPoD study, its tributary drainage area has remained the same (353 acres vs 352 acres at node 4200). However, the peak flow generated within the Haven SD has increased from 504 cfs to 603 cfs, a 101 cfs (20%) increase, at the downstream most point of the Haven SD watershed node 4200 (See **Appendix A-** ***Exhibit 3*** and **Appendix B**- Hydrology Calculations for more information). This increase in peak flow is attributed to the densification and increase of impervious area of PA-1B, -1C, and -4B as a result of their new proposed land uses (denser residential uses). Exceedance of MPoD's peak flow is observed at the confluence of HAVN-X-3 and the main line HAVN-X-1. HAVN-X-3 conveys a significant stormwater flow rate (121cfs) from PA-1—including runoff from the existing detention basin at the southwest corner of Colony High School—and all runoff from PA-4B before joining the mainline.

3. *Mill Creek SD*

Mill Creek SD (within Rich-Haven) shares a watershed boundary with Haven SD and Milliken SD. The tributary drainage area of Mill Creek SD is reduced slightly from 660 acres to 644 acres since the MPoD study. This reduction is presumably carried over from the neighborhood edge adjustment of properties within the adjacent Haven SD and Milliken SD watershed, and the redirection of flow from PA-4B and 5C from Mill Creek SD watershed to Haven SD watershed. In the context of the large scope of the study, this acreage change is negligible.

The peak flow generated within the Mill Creek SD increased from 1,021cfs per the MPoD to 1,160cfs in this study, a 139 cfs (14%) increase, at node 5330, the downstream most point of the Mill Creek SD watershed study area (See **Appendices A** and **B**). This increase in peak flow is due to the addition of flow contribution from a portion of PA-1 that was to be conveyed by Haven SD (in 2012 MPoD) and the increase of impervious area of PA-4A, -5B, 6B, -6D, -7A, and -7B, as a result of the new proposed land uses (Industrial and commercial use). The initial exceedance of MPoD's peak flow is observed at the joining of the storm drain lateral from PA-1 to the mainline node 5115, which propagates downstream and gradually add up with the addition of runoff from storm drain laterals from PA-4A, -5B, -6B, -7A, -7B, -8A, -8B, -9A and -9B (See **Appendix A-** ***Exhibit 3*** and **Appendix B**- Hydrology Calculations for more information).

4. *Milliken SD*

Milliken SD (within Rich-Haven) does not have any changes in land use, drainage area, or planned storm drain. A slightly larger area of 52 acres (vs. 50 acre in MPoD) as measured in this study's CAD file is due to adjustment for neighborhood edge and the linework precision between the CAD drawing and its MPoD counterpart. This difference is considered negligible for drainage study of this level. The peak flow at the downstream most point of the Milliken SD is estimated at 73.3 cfs per the MPoD study node 6050.

Since the input data remains the same, the Milliken SD watershed was not studied.

PEAK STORM FLOW RATE MITIGATION ANALYSIS

Based on the hydrology analysis result, the peak flow rate from certain planning areas withinin the Haven SD and Mill Creek drainage area needs to be mitigated to ensure adequate storm water conveyance and flood protection along the mainlines upstream of the County Line Channel. The acceptable flow rate is defined by the allowable peak flow rate, $\mathbf{Q_{allow}}$, along the mainline, which is determined by an iterative modeling approach of the preceding hydrology analysis by assigning a controlled flow rate contribution from the planning area(s) that would ultimately require peak flow mitigation to prevent significant adverse impacts to the downstream storm drain facilities.

The allowable flow rate along the mainline as designated by this report shall not be exceeded when flow is added from the planning areas requiring peak flow mitigation, as supported by a confluence analysis of the main line with the adjoining stream from each planning area. Planning area-specific studies may be performed to demonstrate that no adverse impact to the storm drain system is caused.

5. *Haven SD*

Peak flow mitigation solutions shall be ideally implemented within PA-1, which is the upstream-most portion of the Haven SD drainage area within Rich-Haven. PA-1 contributes significant flow to the Haven SD, both directly to HAVN-X-1 and indirectly through HAVN-X-3. The large land area of PA-1 also provides for flexible peak flow mitigation options, as compared to the planning areas downstream, which are either under construction or built-out. In addition, the existing detention basin at the southwest corner of Colony High School, is an ideal peak flow mitigation solution if remaining. Refer to ***Exhibit 3*** in **Appendix A** for locations of potential flow mitigation solutions and allowable flowrates along the Haven SD mainline.

6. *Mill Creek SD*

Peak flow rate shall be mitigated within PA-4A, -5B, -6B, -7B, -8A, -8B, -9A and -9B, which are deemed to be the main contributors to the increase in peak flow along the mainline.

Refer to ***Exhibit 3*** in **Appendix A** for location of potential peak flow mitigation facilities and allowable flow rates in the Mill Creek SD mainline.

7. *Milliken SD*

Peak flow mitigation is not required for Milliken SD, considering that the Milliken SD watershed remains unchanged since the MPoD study.

HYDRAULIC ANALYSIS

8. *Haven SD*

Based on the existing approved storm drain plans for Haven SD and the allowable flow rates from the preceding peak flow mitigation analysis, it is observed that the allowable flow rates are consistently lower than the flow rates shown on the existing approved storm drain plans throughout all segments of the Haven SD, as summarized in the following table (See ***Exhibit 4*** in **Appendix A**).

Stationing on SD	Node on Exhibit 3	Q in Storm Drain Plan	Allowable Q in Exhibit 3
114+75.39	4070	160 cfs	73 cfs
108+13.69	4075	189 cfs	100 cfs
98+15.73	4120	422 cfs	250 cfs
74+85.76	4170	504 cfs	411 cfs
62+13.65	4171	504 cfs	504 cfs
61+34.99	4200	553 cfs	504 cfs

Based upon the above allowable Q, the existing/proposed Haven SD will have capacity to adequately convey the updated flow.

9. *Mill Creek SD*

As certain segments of the Mill Creek SD will be experiencing higher peak flow as compared to the approved storm drain plans regardless of the implementation of peak flow mitigation (See ***Exhibit 3*** in **Appendix A**), a detailed updated hydraulic analysis is provided in this report for Mill Creek SD.

Hydraulic analysis of Mill Creek storm drain is an extension to the supporting study for the 2022 Mill Creek Storm Drain Delta 4 (M-1183) prepared by Huitt-Zollars Inc, for the construction of Mill Creek storm drain segment between Ontario Ranch Road and Chino Avenue to incorporate the whole Rich-Haven area. The input file for WSPGW—a commercial software package for analyzing hydraulic capacity of storm drains—from Huitt-Zollars Inc's study was utilized and modified with peak flow output as yielded by this study's hydrology analysis.

The hydraulic analysis of the Mill Creek SD was conducted using the $\mathbf{Q_{allow}}$ as determined in the preceding peak flow mitigation analysis. Peak flow contribution from each planning

area requiring mitigation is determined as the difference between the peak flow immediately upstream of the point of confluence and the $\mathbf{Q_{allow}}$ at the point of confluence.

The hydraulic grade line (HGL) analysis indicates that the $\mathbf{Q_{allow}}$ is adequate in ensuring the adequate flood protection within the mainline upstream of County Line Channel (See **Appendix A**- ***Exhibit 5*** and **Appendix C**-Hydraulic Calcs). Any deviation that causes exceedance of the $\mathbf{Q_{allow}}$ shall be supported by a similar analysis that ensure less than significant impacts to the storm drain facilities.

10. Milliken SD

Since peak flow mitigation is not required for Milliken SD, a hydraulic analysis of the storm drain is not conducted.

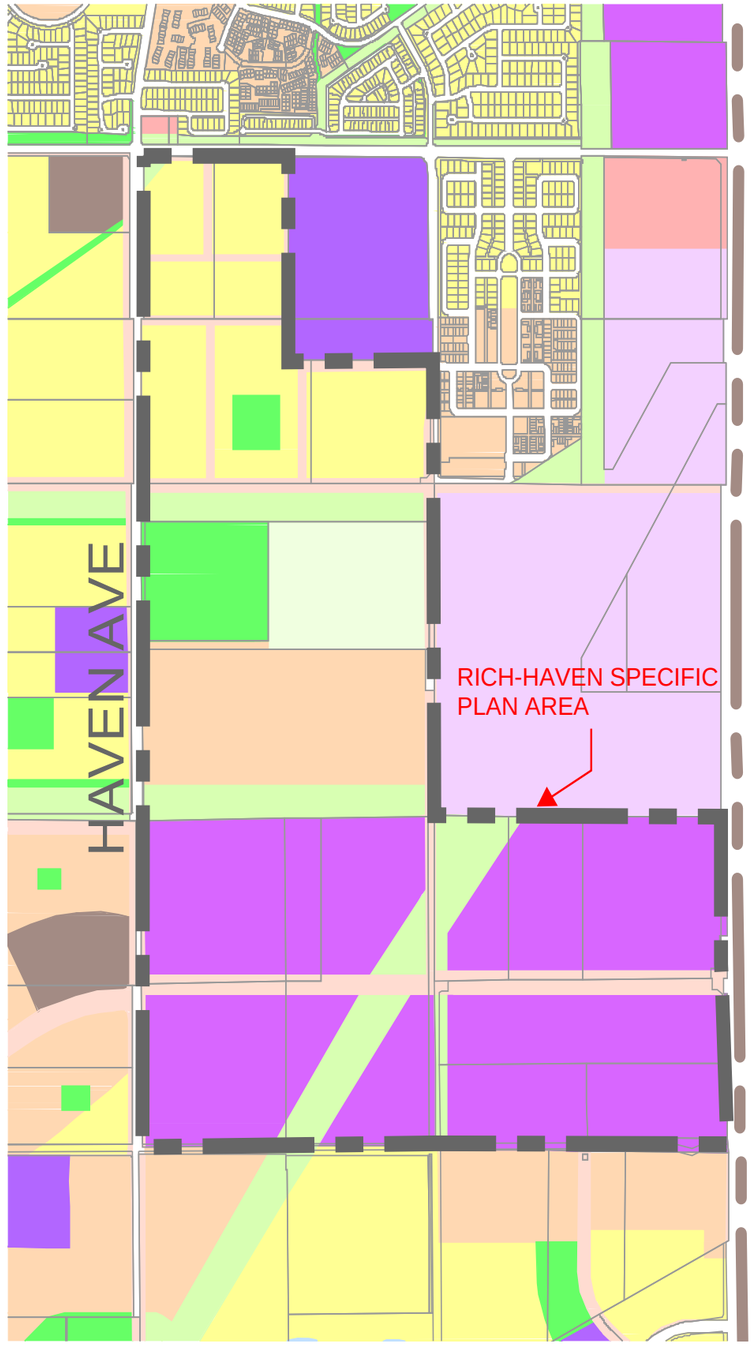
V. CONCLUSION

This report has determined where peak storm flow rates in mainline storm drain systems have increased with the updated Rich-Haven Specific Plan land uses and watersheds. Furthermore, it has also be determined where the existing/proposed storm drain facilities will have capacity deficiencies due to the proposed project. To reduce storm flows to a level that will be adequately conveyed by the mainline storm drain system, an allowable flow rate has been provided for each applicable property within the study area. The designated property owners shall mitigate their storm water discharges to not exceed their allowable mainline flow rates as provided herein, to prevent any significant adverse impacts to the downstream storm drain facilities in the study area. Any increase to the allowable flow rate may require additional planning area-specific analysis to ensure adequate flood control protection is provided.

VI. REFERENCES

1. Hydraulics Report for Mill Creek Storm Drain Delta 4 (M-1183), HZ Project No. R310721.02 (July 2022)
2. TM 20529 & 20530, Colonial & Vander Eyk, Ontario, California, Preliminary Hydrology Report (July 2022)
3. TM 20449, Regions South, Ontario, California, Preliminary Hydrology Report (July 2022)
4. TTM 20526, Ontario, California, Preliminary Hydrology Report (March 2022)
5. PM19978, Ontario, California, Hydrology Report (March 2019)
6. Drainage Report for Onsite Improvement Plan, Tentative Tract Map No. 20081, City of Ontario, California (February 2019)
7. Drainage Report for New Haven in New Model Colony, Tract 20076, City of Ontario, California (November 2017)
8. Master Plan of Drainage, City of Ontario, Final Report (March 2012)
9. San Bernardino County, Hydrology Manual (1986)

APPENDIX A
EXHIBITS AND HYDROLGY MAP



NOT TO SCALE

Residential
- Low Density (2.1-5DU/AC)
- Low - Medium Density (5.1-11DU/AC)
- Medium Density (11.1-25DU/AC)

Other
- Open Space - Non Recreation
- Open Space - Parkland

Mixed Use
- Mixed Use

2012 MASTER PLAN OF DRAINAGE
LAND USES

*ADOPTED BY CITY COUNCIL ON JANUARY 27, 2010

LEGEND
- Project Boundary
- Access Point
- Potential Fire Station

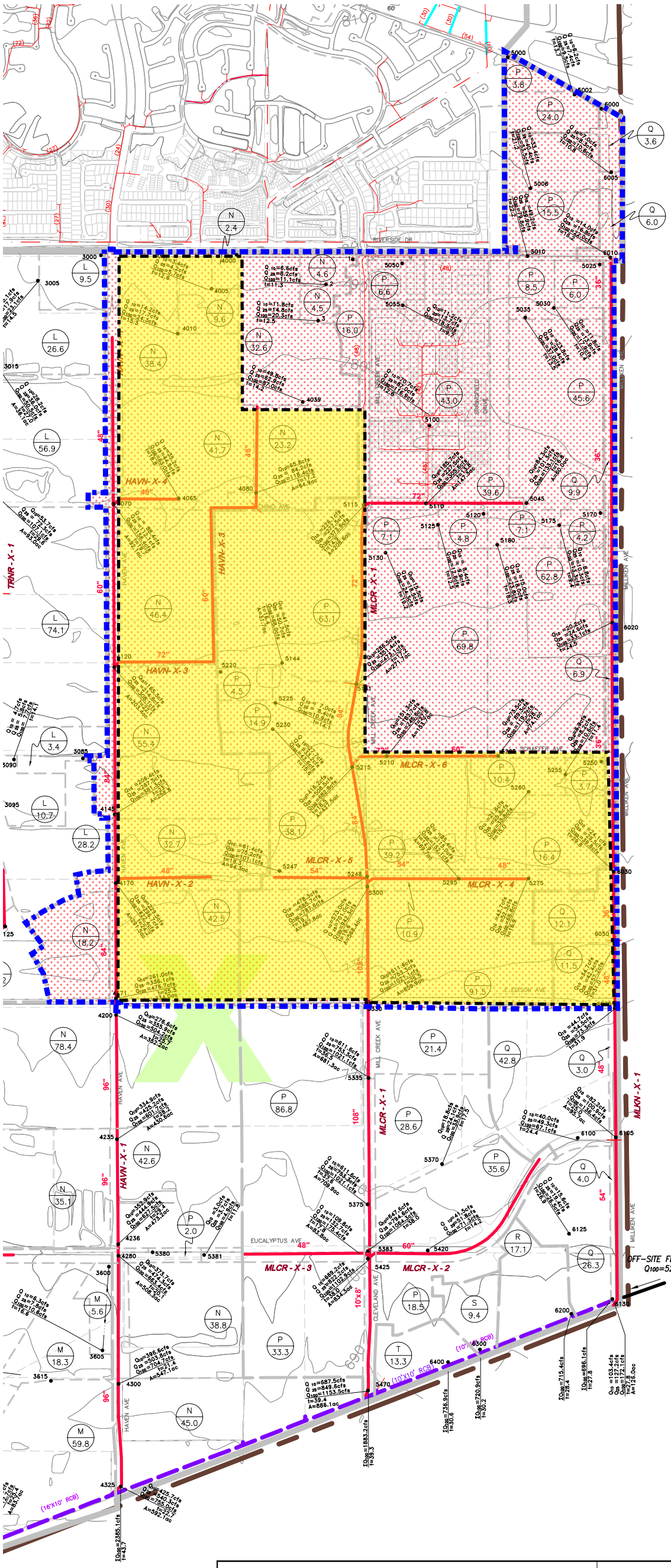
RESIDENTIAL
- 0 - 5 DU/AC
- 5.1 - 12 DU/AC
- 12.1 - 25 DU/AC
- Regional Commercial
- Stand Alone Residential Overlay
- Mixed Use Overlay
- Light Industrial

OPEN SPACE
- Potential Park Location
- Trails / Linear Park / Open Space
- Open Space - Non Recreation
- Neighborhood Edge / Arterial Landscape
- Public Park

NOT TO SCALE

PROPOSED RICH-HAVEN SPECIFIC PLAN
PLANNNING AREA AND PROPOSED LAND USE

EXHIBIT 1
MPoD LAND USES VS. RICH-HAVEN SPECIFIC PLAN LAND USES



SCALE 1" =1200'

800 400 0 800 2400

LEGEND

- COUNTY LIMITS
- CITY LIMITS
- X" / XXXX-X-X — PLANNED STORM DRAIN, SIZE AND LINE ID
- DRAINAGE AREA BOUNDARY
- DRAINAGE SYSTEM BOUNDARY
- MINOR DRAINAGE BOUNDARY
- (X) — EXISTING CITY STORM DRAIN AND SIZE (IN INCHES)
- CHINO AIRPORT — EXISTING COUNTY OPEN CHANNEL
- EXISTING COUNTY STORM DRAIN AND SIZE (IN INCHES)
- X — DRAINAGE AREA #
- DRAINAGE SYSTEM NAME — WLKR-XII-3 — SYSTEM IDENTIFICATION
  - DRAINAGE AREA NUMBER
  - LINE NUMBER
- X / X.X — AREA DESIGNATION, AREA ACREAGE (IN ACRES)

Q_{10} =861.0cfs
Q_{25} =981.1cfs
Q_{100}=1213.7cfs
t=36.1
A=942.7ac

PEAK FLOW RATE
TIME OF CONCENTRATION
AREA

MPoD RICH-HAVEN WATERSHED (1,062.1 ACRES)

RICH-HAVEN PROJECT AREA (584.2 ACRES)

EXHIBIT 2

MARKED UP

MARCH 2012

REVISIONS

CITY OF ONTARIO

MASTER PLAN OF DRAINAGE

HYDROLOGY MAP

NEW MODEL COLONY

HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

LEGEND

- P / 8.88 — SUBAREA DESIGNATION (N=HAVEN SD; P= MILL CREEK SD; Q= MILLIKEN/HAMNER SD); SUBAREA ACREAGE
- 101 / 888.8 / *878.8 — NODE NUMBER (MDP IN 1000s, RHSP IN 100s); FLOWLINE ELEVATION; *INDICATES INVERT ELEVATION
- MAJOR WATERSHED BOUNDARY
- PLANNING AREA WATERSHED BOUNDARY
- MINOR WATERSHED BOUNDARY
- STORM DRAIN (CONSTRUCTED)
- STORM DRAIN (UNDER CONSTRUCTION)
- STORM DRAIN (PROPOSED)
- CONSTRUCTED PROJECT/UNDER CONSTRUCTION
- PLANNING AREA POTENTIALLY REQUIRING Q ALLOWABLE MITIGATION
- EX. DETENTION BASIN

HAVEN AVENUE STORM DRAIN

100-YEAR, 1-HOUR STORM Q, PEAK FLOW SUMMARY

NODE	STUDY SCENARIO	AREA (AC)	Q (CFS)	ΔQ (%) RELATIVE TO MPoD	T_C (MIN)
	HAVEN STORM DRAIN MAINLINE (HAV-X1)				
4070	MPoD	92	156	–	14.9
	RHSP	68	122	-22.3%	14.7
	RHSP Q_{ALLOW}	68	73	-53.3%	–
4075	MPoD	109	172	–	17.1
	RHSP	87	123	-28.7%	16.9
	RHSP Q_{ALLOW}	87	100	-42.1%	–
4080	MPoD	65	118	–	18.5
	RHSP	69	122	+2.9%	18.5
	RHSP Q_{ALLOW}	69	73	-38.3%	–
4120	MPoD	203	308	–	19.7
	RHSP	202	347	+12.5%	18.6
	RHSP Q_{ALLOW}	202	250	-19.0%	–
4170	MPoD	292	422	–	19.6
	RHSP	297	509	+20.4%	19.6
	RHSP Q_{ALLOW}	297	411	-2.8%	–
4171	MPoD	334	476	–	20.3
	RHSP	333	569	+19.4%	19.3
	RHSP Q_{ALLOW}	331	504	+5.0%	–
4200	MPoD	352	504	–	20.9
	RHSP	353	603	+19.5%	20.3
	RHSP Q_{ALLOW}	353	504	+0.0%	–

MILL CREEK AVENUE STORM DRAIN

100-YEAR, 1-HOUR STORM Q, PEAK FLOW SUMMARY

NODE	STUDY SCENARIO	AREA (AC)	Q (CFS)	ΔQ (%) RELATIVE TO MPoD	T_C (MIN)
	MILL CREEK STORM DRAIN MAINLINE (MLCR-X1 OR MILLC-A1)				
5115	MPoD	209	374	–	14.9
	RHSP	226	413	+10.6%	14.7
	RHSP Q_{ALLOW}	226	413	+10.6%	–
5141	MPoD	271	482	–	17.1
	RHSP	258	482	+1.9%	16.9
	RHSP Q_{ALLOW}	258	–	+1.9%	–
5215	MPoD	428	683	–	18.5
	RHSP	440	751	+10.0%	18.5
	RHSP Q_{ALLOW}	440	717	+5.0%	–
5248	MPoD	488	788	–	19.7
	RHSP	472	818	+3.8%	18.6
	RHSP Q_{ALLOW}	472	766	-2.8%	–
5300	MPoD	568	942	–	19.6
	RHSP	549	976	+3.5%	19.6
	RHSP Q_{ALLOW}	549	881	-6.5%	–
5305	MPoD	591	942	–	20.3
	RHSP	572	1,017	+7.9%	19.3
	RHSP Q_{ALLOW}	572	909	-3.6%	–
5330	MPoD	660	1,021	–	20.9
	RHSP	644	1,160	+13.6%	20.3
	RHSP Q_{ALLOW}	644	1,023	+0.1%	–

200' 0' 100' 200'

SCALE: 1" = 200'

2022-09-12

EXHIBIT 3

PROPOSED HYDROLOGY MAP

RICH-HAVEN SPECIFIC PLAN

X ENGINEERING & CONSULTING, INC.
6 Hutton Centre Drive, Suite 650
Santa Ana, California 92707
949.522.7100 | xengineeringinc.com

SHEET INDEX MAP

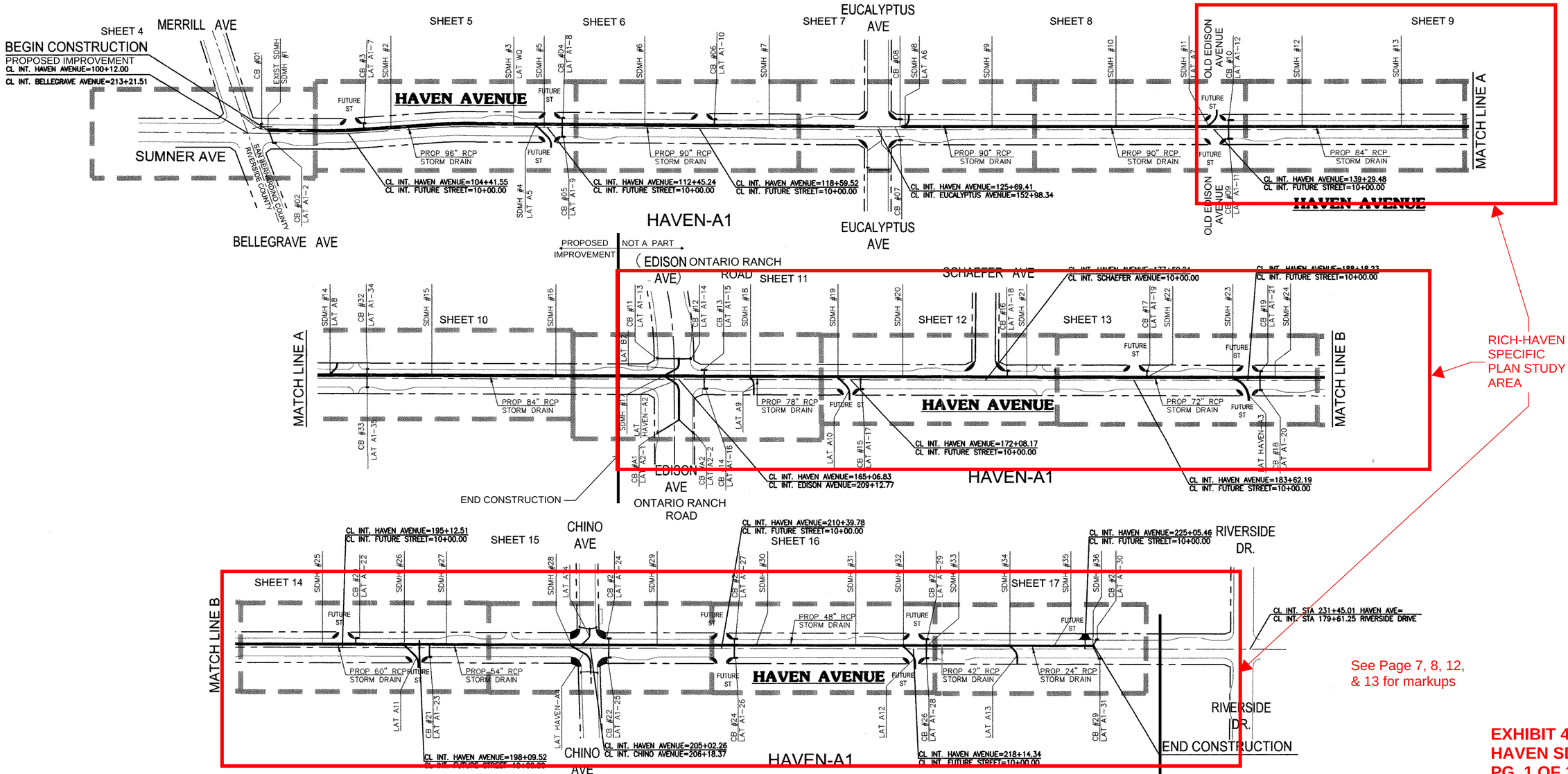


EXHIBIT 4
HAVEN SD
PG. 1 OF 13

NOTE:

THE NAMES OF THE STORM DRAIN SYSTEM SHOWN ON THESE PLANS ARE BASED ON THE CITY OF ONTARIO MASTER PLAN OF DRAINAGE (DATED 2010). THE CITY'S MASTER PLAN OF DRAINAGE (MPD) FOR NEW MODEL COLONY (DATED MARCH, 2012) REVISED THE STORM DRAIN (SD) LINE NAMES.
THE TABLE BELOW SHOWS THE PREVIOUS NAME CONVENTION (SHOWN ON THESE PLANS), AND THE CORRESPONDING NAMES PER THE 2012 MPD.

STORM DRAIN LINE NAME TABLE:

LINE NAME:	2010 MPD	2012 MPD
HAVEN AVENUE MAIN LINE	HAVEN-A1	HAVN-X-1
LATERAL AT EDISON AVE.	LAT HAVEN-A2	HAVN-X-2
LATERAL AT S.D. STA. 97+79	LAT HAVEN-A3	HAVN-X-3
LATERAL AT CHINO AVE.	LAT HAVEN-A4	HAVN-X-4

NOT A PART

GRAPHIC SCALE
200 0 100 200 400 800
(IN FEET)
1 inch = 200 ft.

RECORD DRAWINGS

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SHEETS: 3-8, 10, 11, 18-20, & 22

REGISTERED PROFESSIONAL ENGINEER — GEOFFREY T. OKAMOTO — No. 46049 — Expiration 12-31-20 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — CHARLES WILBUR LOCKMAN — No. 42485 — Exp. 03/31/16 — CIVIL — STATE OF CALIFORNIA

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REVISIONS			
MARK	DATE	BY	APPROVED/RCE No.
1	11/4/19	HZ	RCE CA 46049

DESIGNED BY: DATE:
DRAWN BY: DATE:
CHECKED BY: H W W D DATE: 7/30/14

CITY OF ONTARIO

RECOMMENDED BY:
BRYAN LIRLEY, P.E./ PRINCIPAL ENGINEER DATE
ACCEPTED BY:
KHOI DO, P.E./ CITY ENGINEER DATE

BENCH MARK No. S.P.S.N 00789 ELEVATION. 785.572
SAN BERNARDINO COUNTY BENCHMARK LOCATED AT THE INTERSECTION OF TURNER & RIVERSIDE AVENUES, 1/4 COR. SEC. 2/11, T2S, R7W. 2" BRASS DISK STAMPED "T2S, R7W, 1/4, S2, S11" "LS 3258" SET FLUSH IN A.C.
NGVD29 / 1990 ADJ.

TMAD TAYLOR & GAINES
901 Via Piemonte, Suite 400
Ontario, California 91764
Phone: 909.477.6915 Fax: 909.477.6916
www.ttgcorp.com

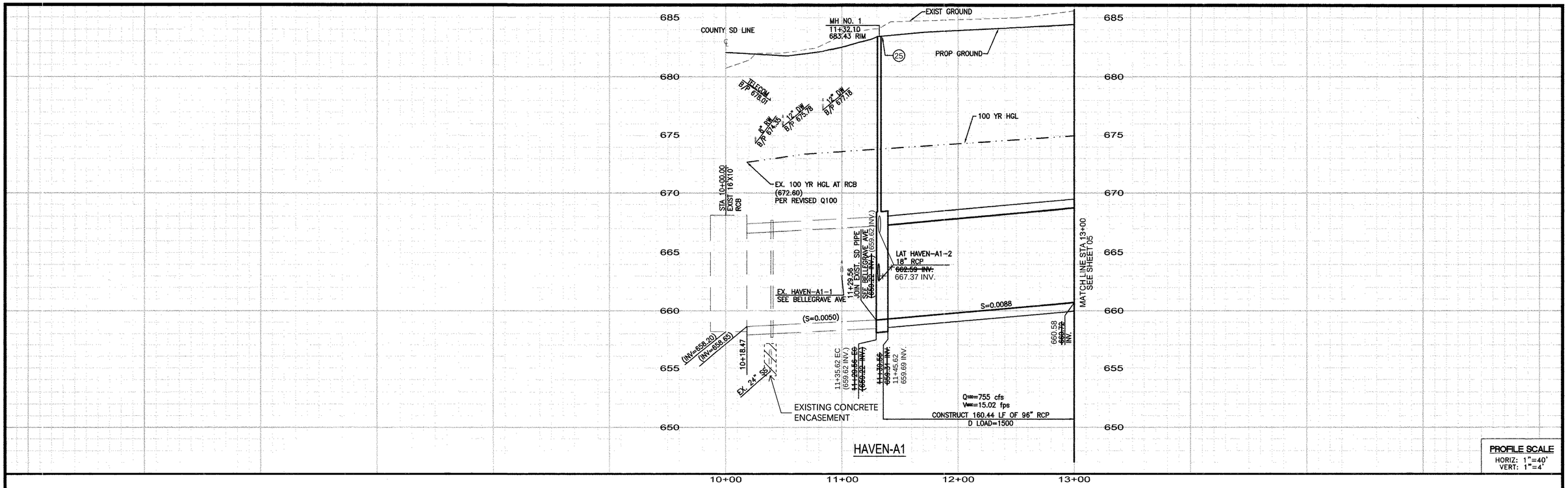
CHARLES W. LOCKMAN 42485 RCE No. 07/07/2014 DATE

STORM DRAIN IMPROVEMENT PLAN AND PROFILE
HAVEN AVENUE
SHEET INDEX MAP

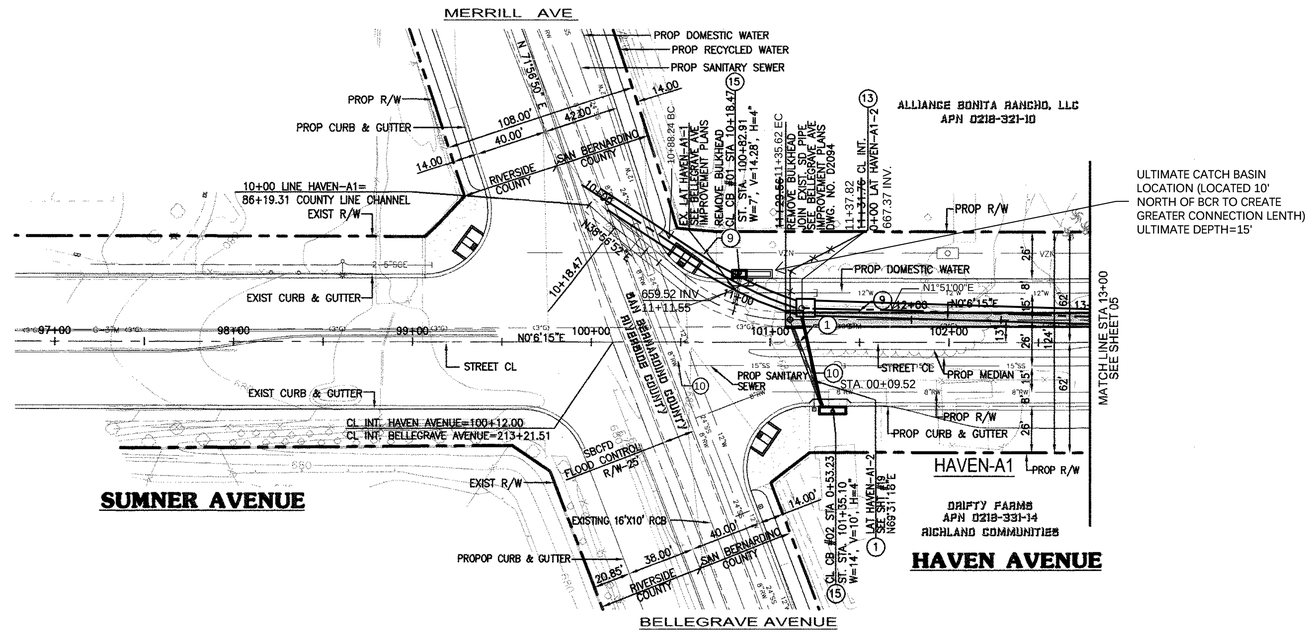
M-442

SHEET 3 OF 22
CONTRACT
ACCOUNT
DWG. NO. D13603

N:\60\CAD\TMAD Projects\2010\60110-011-00\Improvement Plans\Storm Drain\HAVEN\D10011sd03f.dwg - LAST PLOTTED ON Tue 07/08/14 - 10:47AM BY pshu



PROFILE SCALE
HORIZ: 1"=40'
VERT: 1"=4'



STORM DRAIN CONSTRUCTION NOTES

1. CONSTRUCT 18" RCP (D-LOAD PER PROFILE).
9. CONSTRUCT 96" RCP (D-LOAD PER PROFILE).
13. CONSTRUCT MANHOLE NO. 2 PER CITY OF ONTARIO STD. DWG. 3008.
15. CATCH BASIN NO. 2 PER CITY OF ONTARIO STD. DWG. 3003 (W PER PLANS)
10. CONSTRUCT BRICK & MORTAR BULKHEAD SEE SHEET 17.
25. CONSTRUCT MANHOLE CONE TO PROPOSED GRADE AND EXTEND MANHOLE BY RINGS TO THE EXISTING GROUND.

RECORD DRAWINGS

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REGISTERED PROFESSIONAL ENGINEER
JEFFREY T OKAMOTO
No. 46049
Expiration
12-31-20
CIVIL
STATE OF CALIFORNIA

EXHIBIT 4
HAVEN SD
PG. 2 OF 13

GRAPHIC SCALE
40 0 20 40 80 120
(IN FEET)
1 inch = 40 ft.

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CHARLES WILBUR LOCKMAN
No. 42485
Exp. 03/31/16
CIVIL
STATE OF CALIFORNIA

REVISIONS			
MARK	DATE	BY	APPROVED/RCE No.
1	11/4/19	HZ	RCE CA 46049

DESIGNED BY:
DATE:
DRAWN BY:
DATE:
CHECKED BY: HN WD
DATE: 7/30/14

CITY OF ONTARIO

RECOMMENDED BY:

BRYAN LIRLEY, P.E./ PRINCIPAL ENGINEER DATE

ACCEPTED BY:

KHOI DO, P.E./ CITY ENGINEER DATE

BENCH MARK No. S.P.S.N 00789 ELEVATION. 785.572

SAN BERNARDINO COUNTY BENCHMARK LOCATED AT THE INTERSECTION OF TURNER & RIVERSIDE AVENUES, 1/4 COR. SEC. 2/11, T2S, R7W. 2" BRASS DISK STAMPED "T2S, R7W, 1/4, S2, S11" "LS 3258" SET FLUSH IN A.C.

NGVD29 / 1990 ADJ.

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Ontario, California 91764
Phone: 909.477.6915 Fax: 909.477.6916
www.ttgcorp.com

CHARLES W. LOCKMAN 42485 07/07/2014
RCE No. DATE

STORM DRAIN IMPROVEMENT PLAN & PROFILE

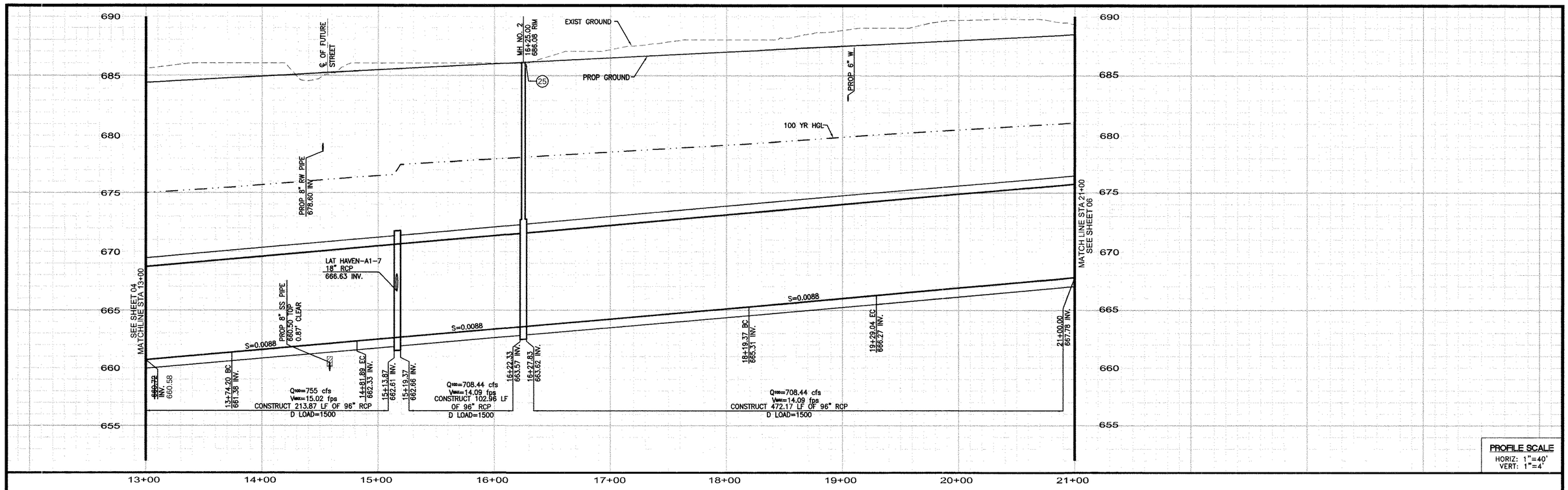
HAVEN AVENUE (LINE A-1)

FROM BELLEGRAVE AVE TO 270' ± N/O BELLEGRAVE AVE

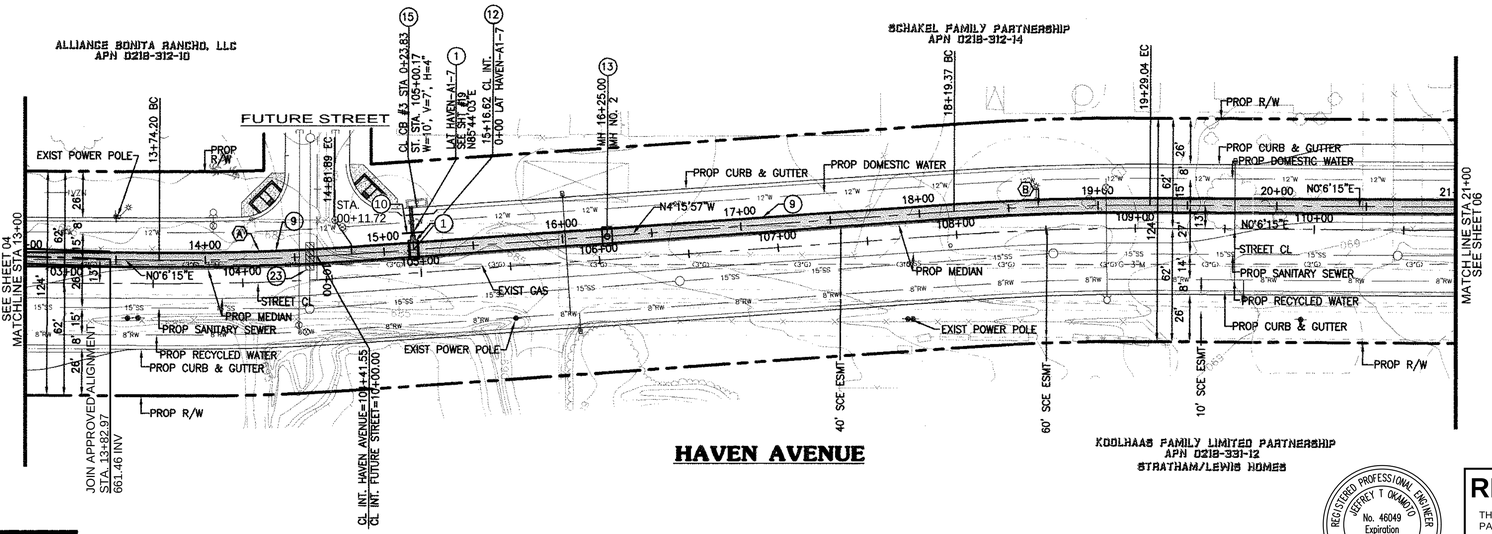
M-442

SHEET 4 OF 22
CONTRACT
ACCOUNT
DWG. NO. D13604

N:\EXCAD\TMAD Projects\2010\6810-011-00\Improvement Plans\Storm Drain\HAVEN\D10011sd01pp.dwg - LAST PLOTTED ON Tue 07/08/14 - 10:48AM BY pshu



PROFILE SCALE
HORIZ: 1"=40'
VERT: 1"=4'



STORM DRAIN CONSTRUCTION NOTES

1. CONSTRUCT 18" RCP (D-LOAD PER PROFILE).
9. CONSTRUCT 96" RCP (D-LOAD PER PROFILE).
10. CONSTRUCT BRICK & MORTAR BULKHEAD SEE SHEET 17.
12. CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN 340-2.
13. CONSTRUCT MANHOLE NO. 2 PER CITY OF ONTARIO STD. DWG. 3008.
15. CATCH BASIN NO. 2 PER CITY OF ONTARIO STD. DWG. 3003 (W PER PLANS)
23. CONSTRUCT CONCRETE ENCASEMENT PER CITY OF ONTARIO STD. 2102 CASE 3
25. CONSTRUCT MANHOLE CONE TO PROPOSED GRADE AND EXTEND MANHOLE BY RINGS TO THE EXISTING GROUND.

CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
A	4°22'12"	1412.00'	107.69'	53.87'
B	4°22'12"	1438.00'	109.68'	54.87'

EXHIBIT 4
HAVEN SD
PG. 3 OF 13

RECORD DRAWINGS

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REGISTERED PROFESSIONAL ENGINEER
JEFFREY T OKAMOTO
No. 46049
Expiration 12-31-20
CIVIL
STATE OF CALIFORNIA

GRAPHIC SCALE
40 0 20 40 80 120
(IN FEET)
1 inch = 40 ft.

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REGISTERED PROFESSIONAL ENGINEER
CHARLES WILBUR LOCKMAN
No. 42485
Exp. 03/31/16
CIVIL
STATE OF CALIFORNIA

REVISIONS			
MARK	DATE	BY	APPROVED/RCE No.
1	11/4/19	HZ	RCE CA 46049

DESIGNED BY:
DATE:
DRAWN BY:
DATE:
CHECKED BY: HN WO
DATE: 7/30/14

CITY OF ONTARIO

RECOMMENDED BY:
BRYAN LIRLEY, P.E./ PRINCIPAL ENGINEER DATE
ACCEPTED BY:
KHOI DO, P.E./ CITY ENGINEER DATE

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NGVD29 / 1990 ADJ.

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www.ttgcorp.com
CHARLES W. LOCKMAN 42485 RCE No. 07/07/2014 DATE

STORM DRAIN IMPROVEMENT PLAN & PROFILE

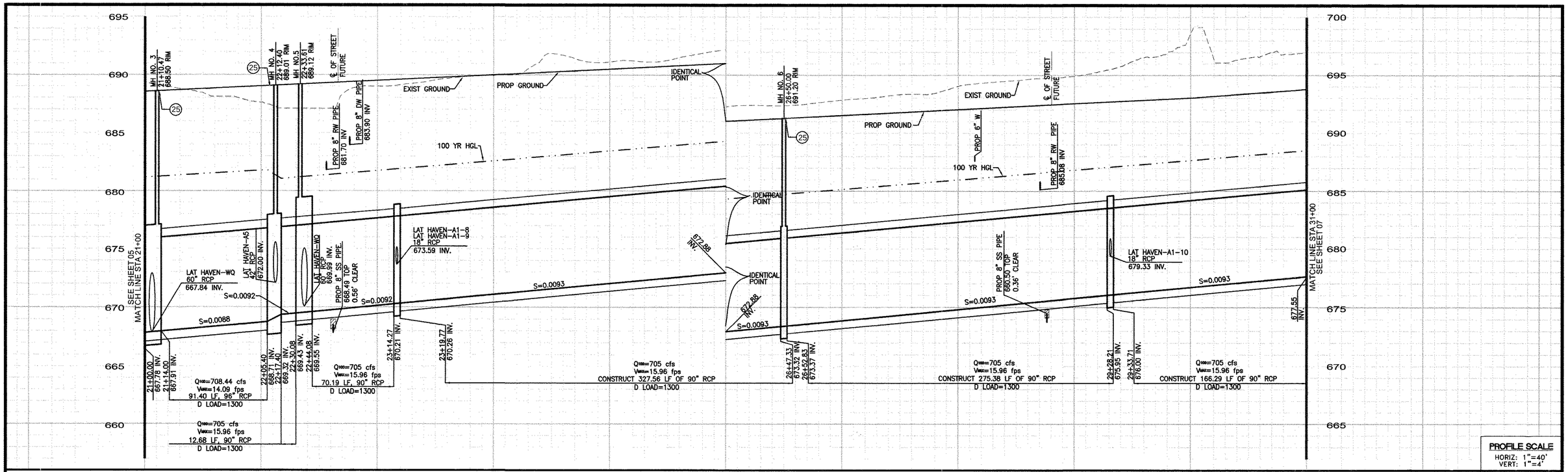
HAVEN AVENUE (HAVEN-A1)

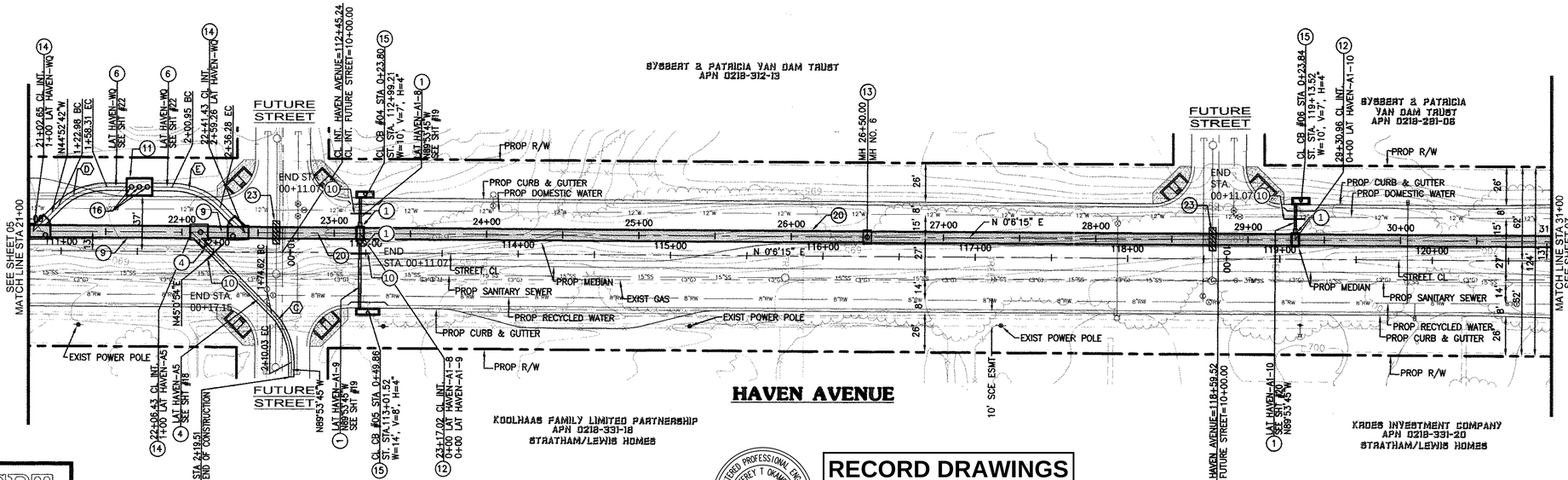
FROM 270' ± N/O BELLEGRAVE AVE TO 1,070' ± N/O BELLEGRAVE AVE

M-442

SHEET 5 OF 22
CONTRACT
ACCOUNT
DWG. NO. D13605

N:\60.CAD\TMAD Projects\20100\6010-011-001\Improvement Plans\Storm Drain\HAVEN\010011sd05pp.dwg - LAST PLOTTED ON Tue 07/08/14 - 10:48AM BY pshu





PROFILE SCALE
HORIZ: 1"=40'
VERT: 1"=4'

STORM DRAIN CONSTRUCTION NOTES

1. CONSTRUCT 18" RCP (D-LOAD PER PROFILE).
4. CONSTRUCT 42" RCP (D-LOAD PER PROFILE).
6. CONSTRUCT 60" RCP (D-LOAD PER PROFILE).
9. CONSTRUCT 96" RCP (D-LOAD PER PROFILE).
10. CONSTRUCT BRICK & MORTAR BULKHEAD SEE SHEET 17.
11. CONSTRUCT WATER QUALITY STRUCTURE (NSBB 11-16-114 WITH MINIMUM 30" MANHOLES).
12. CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN 340-2.
13. CONSTRUCT MANHOLE NO. 2 PER CITY OF ONTARIO STD. DWG. 3008.
14. CONSTRUCT MANHOLE PIPE TO PIPE (LARGE SIDE INLET) PER SPPWC STD. PLAN 322-2.
15. CATCH BASIN NO. 2 PER CITY OF ONTARIO STD. DWG. 3003 (W PER PLANS)
16. CONSTRUCT MANHOLE-CONCRETE BOX STORM DRAIN PER SPPWC STD. PLAN 323-2.
20. CONSTRUCT 90° RCP (D-LOAD PER PROFILE).
23. CONSTRUCT CONCRETE ENCASEMENT PER CITY OF ONTARIO STD. 2102 CASE 3
25. CONSTRUCT MANHOLE CONE TO PROPOSED GRADE AND EXTEND MANHOLE BY RINGS TO THE EXISTING GROUND.

CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
C	44°05'21"	45.00'	35.41'	18.68'
D	44°58'57"	45.00'	35.33'	18.63'
E	44°58'57"	45.00'	35.33'	18.63'

GRAPHIC SCALE
40 0 20 40 80 120
(IN FEET)
1 inch = 40 ft.

EXHIBIT 4
HAVEN SD
PG. 4 OF 13

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REGISTERED PROFESSIONAL ENGINEER JEFFREY T OKAMOTO No. 46049 Expiration 12-31-20 CIVIL STATE OF CALIFORNIA

RECORD DRAWINGS

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REVISIONS			
MARK	DATE	BY	APPROVED/RCE No.
1	11/4/19	HZ	RCE CA 46049

DESIGNED BY:
DATE:
DRAWN BY:
DATE:
CHECKED BY: HN KD
DATE: 7/30/14

CITY OF ONTARIO

RECOMMENDED BY:
BRYAN LIRLEY, P.E./ PRINCIPAL ENGINEER DATE
ACCEPTED BY:
KHOI DO, P.E./ CITY ENGINEER DATE

BENCH MARK No. S.P.S.N 00789 ELEVATION. 785.572

SAN BERNARDINO COUNTY BENCHMARK LOCATED AT THE INTERSECTION OF TURNER & RIVERSIDE AVENUES, 1/4 COR. SEC. 2/11, T2S, R7W. 2" BRASS DISK STAMPED "T2S, R7W, 1/4, S2, S11" "LS 3258" SET FLUSH IN A.C.

NGVD29 / 1990 ADJ.

TTG TMAD TAYLOR & GAINES
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Phone: 909.477.6915 Fax: 909.477.6916
www.ttgcorp.com

CHARLES W. LOCKMAN 42485 RCE No. 07/07/2014 DATE

STORM DRAIN IMPROVEMENT PLAN & PROFILE

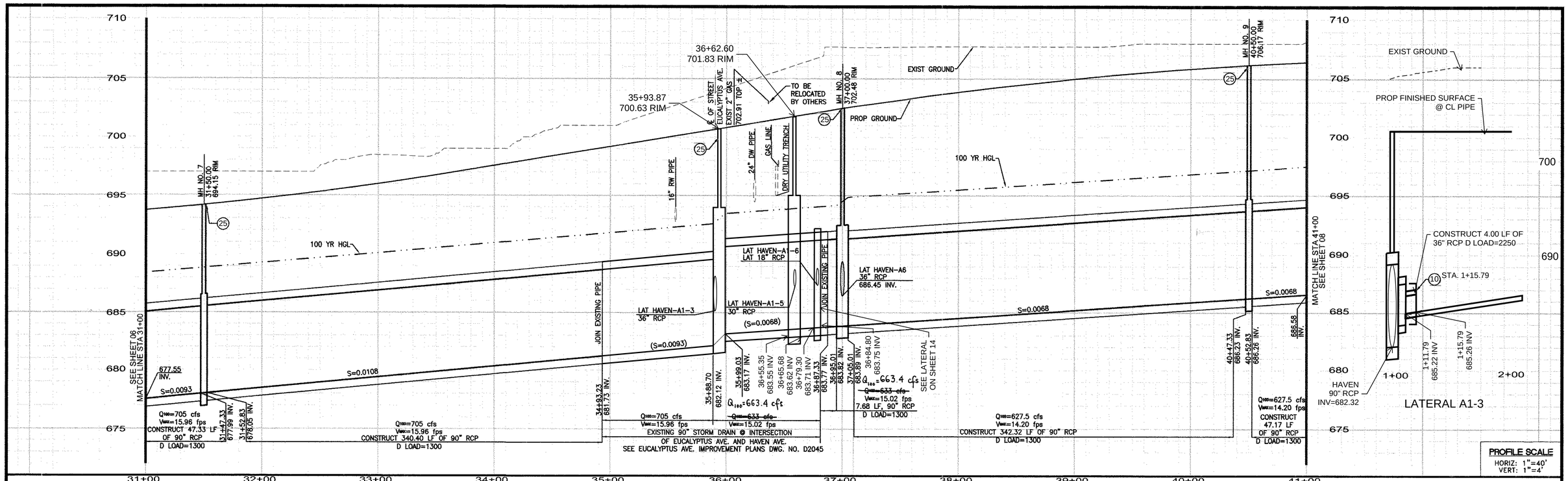
HAVEN AVENUE (HAVEN-A1)

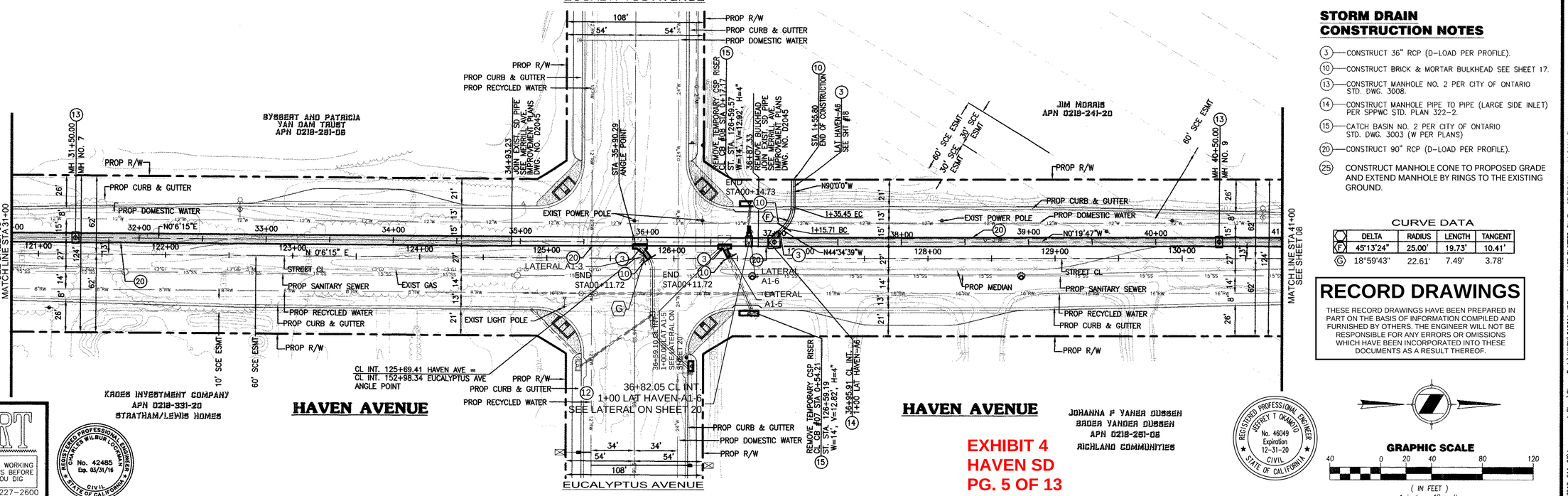
FROM 1,070' ± N/O BELLEGRAVE AVE TO 2,070' ± N/O BELLEGRAVE AVE

M-442

SHEET 6 OF 22
CONTRACT
ACCOUNT
DWG. NO. D13606

N:\RD_CAD\TMAD Projects\2010\6010-011-001\Improvement Plans\Storm Drain\HAVEN\010011sd06pp.dwg - LAST PLOTTED ON Tue 07/08/14 - 10:49AM BY pshu





STORM DRAIN CONSTRUCTION NOTES

(3) CONSTRUCT 36" RCP (D-LOAD PER PROFILE).

(10) CONSTRUCT BRICK & MORTAR BULKHEAD SEE SHEET 17.

(13) CONSTRUCT MANHOLE NO. 2 PER CITY OF ONTARIO STD. DWG. 3008.

(14) CONSTRUCT MANHOLE PIPE TO PIPE (LARGE SIDE INLET) PER SPPWC STD. PLAN 322-2.

(15) CATCH BASIN NO. 2 PER CITY OF ONTARIO STD. DWG. 3003 (W PER PLANS)

(20) CONSTRUCT 90° RCP (D-LOAD PER PROFILE).

(25) CONSTRUCT MANHOLE CONE TO PROPOSED GRADE AND EXTEND MANHOLE BY RINGS TO THE EXISTING GROUND.

CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
(F)	45°13'24"	25.00'	19.73'	10.41'
(G)	18°59'43"	22.61'	7.49'	3.78'

RECORD DRAWINGS

THESE RECORD DRAWINGS HAVE BEEN PREPARED IN PART ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THESE DOCUMENTS AS A RESULT THEREOF.

GRAPHIC SCALE

40 0 20 40 80 120

(IN FEET)
1 inch = 40 ft.

DIGALERT
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TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REGISTERED PROFESSIONAL ENGINEER CHARLES WILBUR LOCKMAN No. 42485 Exp. 03/31/16 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER JEFFREY T OKAMOTO No. 46049 Expiration 12-31-20 CIVIL STATE OF CALIFORNIA

EXHIBIT 4
HAVEN SD
PG. 5 OF 13

REVISIONS			
MARK	DATE	BY	APPROVED/RCE No.
1	11/4/19	HZ	RCE CA 46049

DESIGNED BY:
DATE:
DRAWN BY:
DATE:
CHECKED BY: HN
DATE: 7/30/14 LD

CITY OF ONTARIO

RECOMMENDED BY:

BRYAN LIRLEY, P.E./ PRINCIPAL ENGINEER DATE

ACCEPTED BY:

KHOI DO, P.E./ CITY ENGINEER DATE

BENCH MARK No. S.P.S.N 00789 ELEVATION. 785.572

SAN BERNARDINO COUNTY BENCHMARK LOCATED AT THE INTERSECTION OF TURNER & RIVERSIDE AVENUES, 1/4 COR. SEC. 2/11, T2S, R7W. 2" BRASS DISK STAMPED "T2S, R7W, 1/4, S2, S11" "LS 3258" SET FLUSH IN A.C.

NGVD29 / 1990 ADJ.

TTG TAYLOR & GAINES
901 Via Piemonte, Suite 400
Ontario, California 91764
Phone: 909.477.6915 Fax: 909.477.6916
www.ttgcorp.com

CHARLES W. LOCKMAN 42485 RCE No. 07/07/2014 DATE

STORM DRAIN IMPROVEMENT PLAN & PROFILE

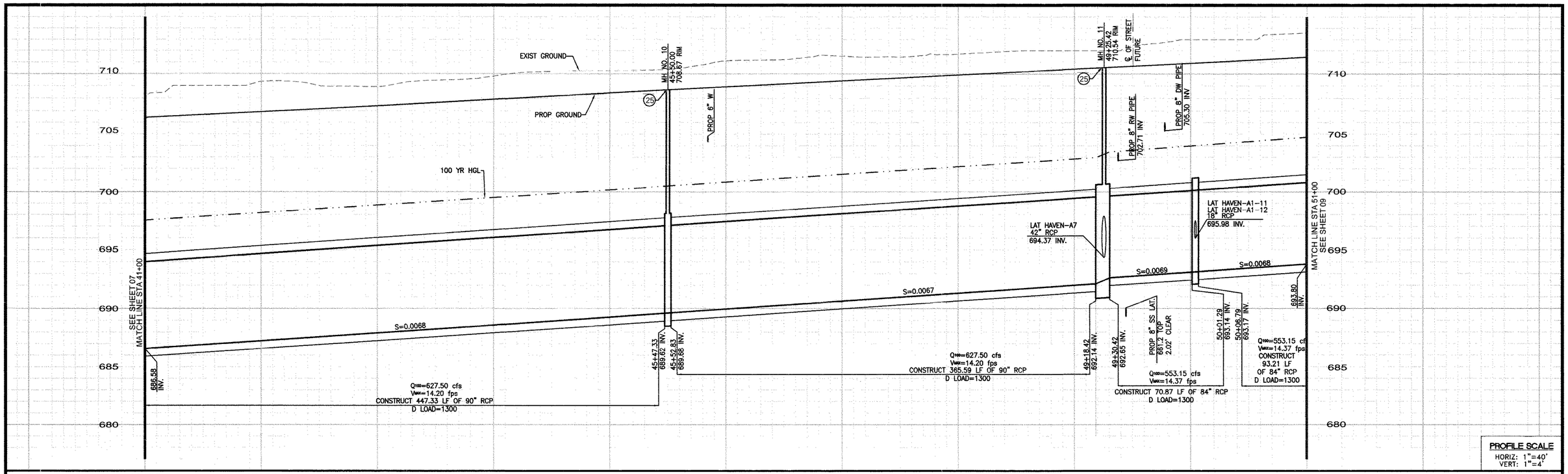
HAVEN AVENUE (HAVEN-A1)

FROM 490' ± S/O EUCALYPTUS AVE TO 510' ± N/O EUCALYPTUS AVE

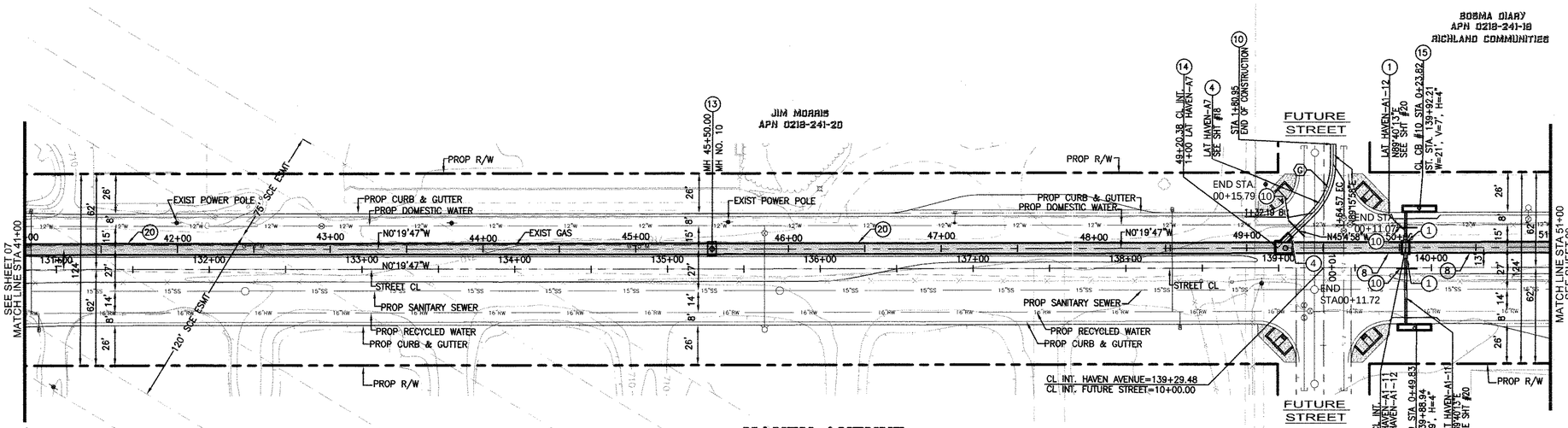
M-442

SHEET 7 OF 22
CONTRACT
ACCOUNT
DWG. NO. D13607

N:\65\CAD\TMD Projects\2010\6010-011-00\Improvement Plans\Storm Drain\HAVEN 01001 sd07pp.dwg — LAST PLOTTED ON Tue 07/08/14 — 11:24AM BY pstu



PROFILE SCALE
HORIZ: 1"=40'
VERT: 1"=4'



HAVEN AVENUE

STORM DRAIN CONSTRUCTION NOTES

1. CONSTRUCT 18" RCP (D-LOAD PER PROFILE).
4. CONSTRUCT 42" RCP (D-LOAD PER PROFILE).
8. CONSTRUCT 84" RCP (D-LOAD PER PROFILE).
10. CONSTRUCT BRICK & MORTAR BULKHEAD SEE SHEET 17.
12. CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN 340-2.
13. CONSTRUCT MANHOLE NO. 2 PER CITY OF ONTARIO STD. DWG. 3008.
14. CONSTRUCT MANHOLE PIPE TO PIPE (LARGE SIDE INLET) PER SPPWC STD. PLAN 322-2.
15. CATCH BASIN NO. 2 PER CITY OF ONTARIO STD. DWG. 3003 (W PER PLANS)
20. CONSTRUCT 90° RCP (D-LOAD PER PROFILE).
25. CONSTRUCT MANHOLE CONE TO PROPOSED GRADE AND EXTEND MANHOLE BY RINGS TO THE EXISTING GROUND.

CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
C	45°03'04"	45.00'	35.38'	18.66'

EXHIBIT 4
HAVEN SD
PG. 6 OF 13

GRAPHIC SCALE
40 0 20 40 80 120
(IN FEET)
1 inch = 40 ft.

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REGISTERED PROFESSIONAL ENGINEER CHARLES W. LOCKMAN No. 42485 Exp. 03/31/16 CIVIL STATE OF CALIFORNIA

RECORD DRAWINGS
THESE RECORD DRAWINGS HAVE BEEN PREPARED IN PART ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THESE DOCUMENTS AS A RESULT THEREOF.

REGISTERED PROFESSIONAL ENGINEER JEFFREY T OKAMOTO No. 46049 Expiration 12-31-20 CIVIL STATE OF CALIFORNIA

REVISIONS			
MARK	DATE	BY	APPROVED/RCE No.
1	11/4/19	HZ	RCE CA 46049

DESIGNED BY: DATE:
DRAWN BY: DATE:
CHECKED BY: HN DATE: 7/30/14

CITY OF ONTARIO
RECOMMENDED BY:
BRYAN LIRLEY, P.E./ PRINCIPAL ENGINEER DATE
ACCEPTED BY:
KHOI DO, P.E./ CITY ENGINEER DATE

BENCH MARK No. S.P.S.N 00789 **ELEVATION.** 785.572
SAN BERNARDINO COUNTY BENCHMARK LOCATED AT THE INTERSECTION OF TURNER & RIVERSIDE AVENUES, 1/4 COR. SEC. 2/11, T2S, R7W. 2" BRASS DISK STAMPED "T2S, R7W, 1/4, S2, S11" "LS 3258" SET FLUSH IN A.C.
NGVD29 / 1990 ADJ.

TTG TAYLOR & GAINES
901 Via Piemonte, Suite 400
Ontario, California 91764
Phone: 909.477.6915 Fax: 909.477.6916
www.ttgcorp.com
CHARLES W. LOCKMAN 42485 RCE No. 07/07/2014 DATE

STORM DRAIN IMPROVEMENT PLAN & PROFILE

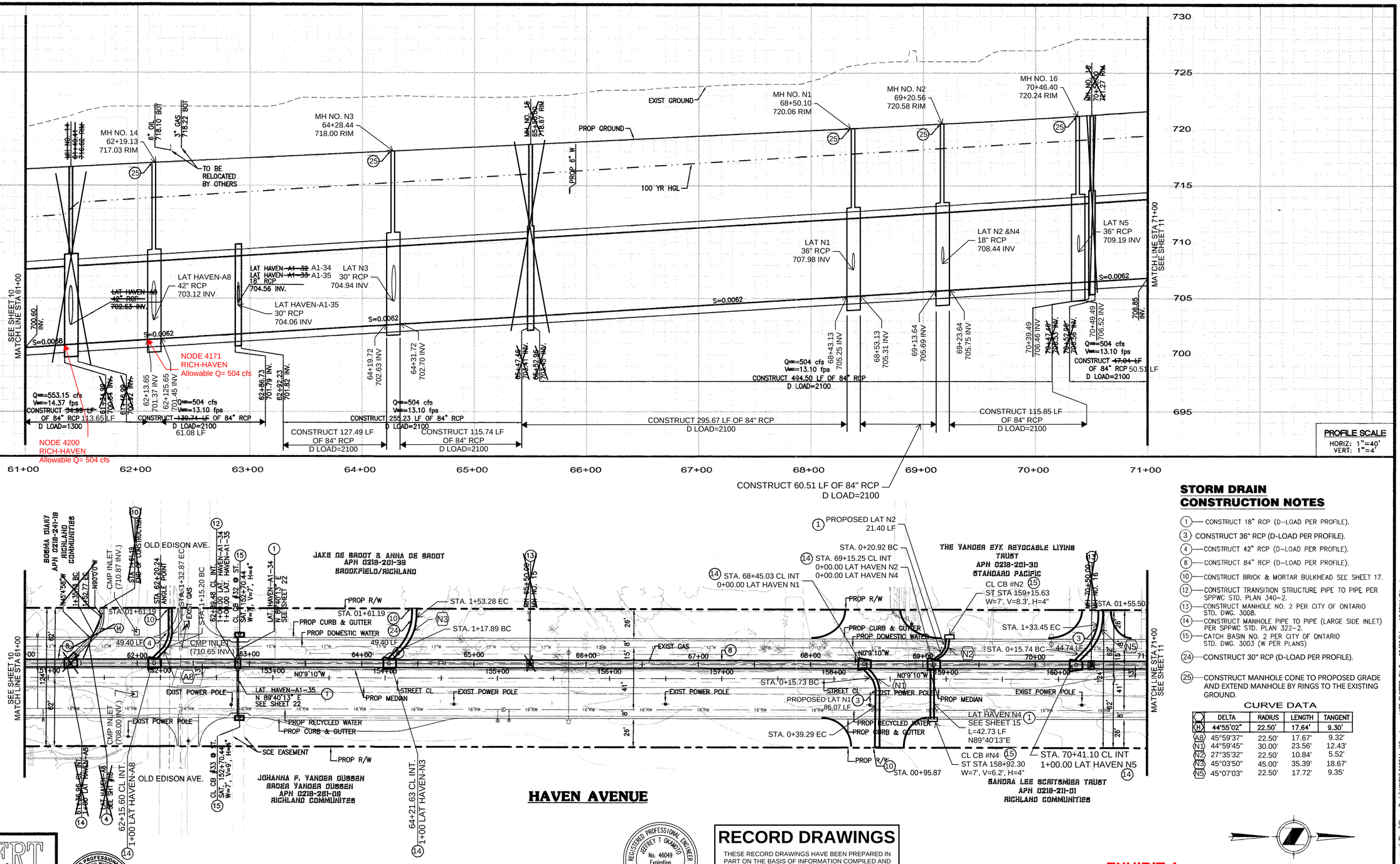
HAVEN AVENUE (HAVEN-A1)

FROM 510' ± N/O EUCALYPTUS AVE TO 1,510' ± N/O EUCALYPTUS AVE

M-442

SHEET 8 OF 22
CONTRACT
ACCOUNT
DWG. NO. D13608

N:\60.CAD\TMAD Projects\2010\6010-011-001\Improvement Plans\Storm Drain\HAVEN\D10013sd08pp.dwg — LAST PLOTTED ON Tue 07/08/14 — 02:43PM BY pshu



HAVEN AVENUE

PROFILE SCALE
HORIZ: 1"=40'
VERT: 1"=4'

STORM DRAIN CONSTRUCTION NOTES

1. CONSTRUCT 18" RCP (D-LOAD PER PROFILE).
3. CONSTRUCT 36" RCP (D-LOAD PER PROFILE).
4. CONSTRUCT 42" RCP (D-LOAD PER PROFILE).
8. CONSTRUCT 84" RCP (D-LOAD PER PROFILE).
10. CONSTRUCT BRICK & MORTAR BULKHEAD SEE SHEET 17.
12. CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN 340-2.
13. CONSTRUCT MANHOLE NO. 2 PER CITY OF ONTARIO STD. DWG. 3008.
14. CONSTRUCT MANHOLE PIPE TO PIPE (LARGE SIDE INLET) PER SPPWC STD. PLAN 322-2.
15. CATCH BASIN NO. 2 PER CITY OF ONTARIO STD. DWG. 3003 (W PER PLANS)
24. CONSTRUCT 30" RCP (D-LOAD PER PROFILE).
25. CONSTRUCT MANHOLE CONE TO PROPOSED GRADE AND EXTEND MANHOLE BY RINGS TO THE EXISTING GROUND.

CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
H	44°55'02"	22.50'	17.64'	9.30'
A8	45°59'37"	22.50'	17.67'	9.32'
N1	44°59'45"	30.00'	23.56'	12.43'
N2	27°35'32"	22.50'	10.84'	5.52'
N3	45°03'50"	45.00'	35.39'	18.67'
N5	45°07'03"	22.50'	17.72'	9.35'

GRAPHIC SCALE
40 0 20 40 80 120
(IN FEET)
1 inch = 40 ft.

EXHIBIT 4
HAVEN SD
PG. 7 OF 13

DIGALERT
DIAL BEFORE YOU DIG
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TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REGISTERED PROFESSIONAL ENGINEER
CHARLES WILBUR LOCKMAN
No. 42485
Exp. 03/31/16
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
JEFFREY T OKAMOTO
No. 46049
Expiration 12-31-20
CIVIL
STATE OF CALIFORNIA

RECORD DRAWINGS
THESE RECORD DRAWINGS HAVE BEEN PREPARED IN PART ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY OTHERS. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THESE DOCUMENTS AS A RESULT THEREOF.

REVISIONS			
MARK	DATE	BY	APPROVED/RCE No.
1	11/4/19	HZ	RCE CA 46049

DESIGNED BY:
DATE:
DRAWN BY:
DATE:
CHECKED BY: HW WO
DATE: 7/30/14

CITY OF ONTARIO
RECOMMENDED BY:
BRYAN LIRLEY, P.E./ PRINCIPAL ENGINEER DATE
ACCEPTED BY:
KHOI DO, P.E./ CITY ENGINEER DATE

BENCH MARK No. S.P.S.N 00789 **ELEVATION.** 785.572
SAN BERNARDINO COUNTY BENCHMARK LOCATED AT THE INTERSECTION OF TURNER & RIVERSIDE AVENUES, 1/4 COR. SEC. 2/11, T2S, R7W. 2" BRASS DISK STAMPED "T2S, R7W, 1/4, S2, S11" "LS 3258" SET FLUSH IN A.C.
NGVD29 / 1990 ADJ.

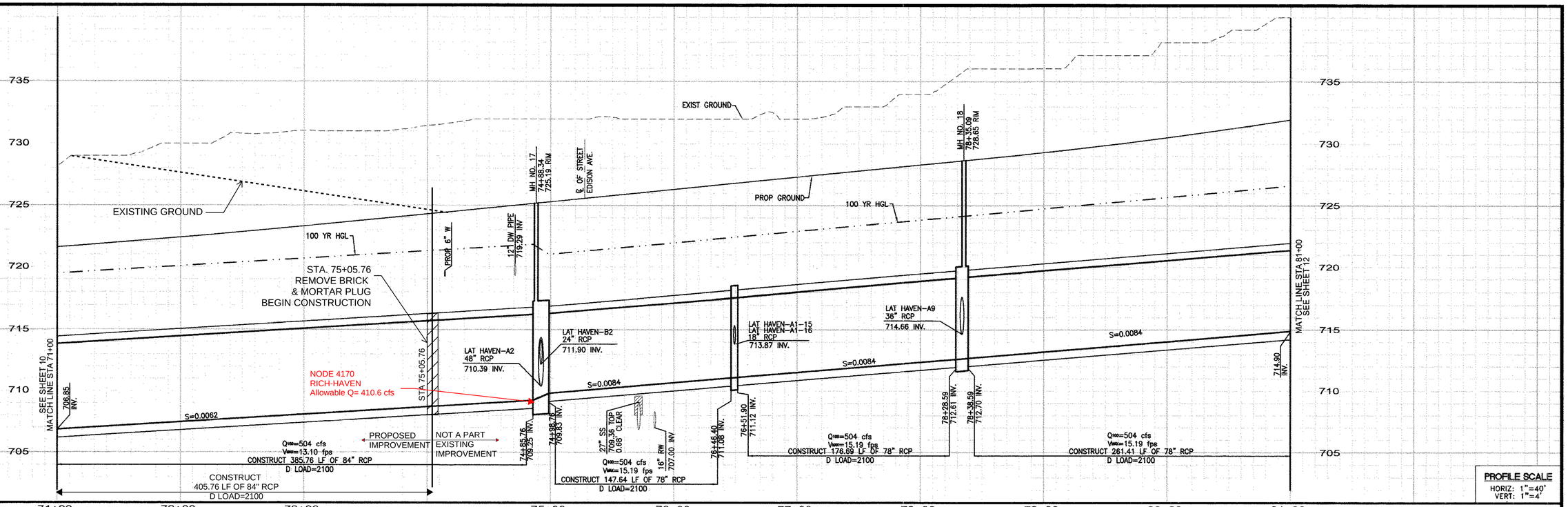
TMAD TAYLOR & GAINES
901 Via Piemonte, Suite 400
Ontario, California 91764
Phone: 909.477.6915 Fax: 909.477.6916
www.ttgcorp.com
CHARLES W. LOCKMAN 42485 RCE No. 07/07/2014 DATE

STORM DRAIN IMPROVEMENT PLAN & PROFILE
HAVEN AVENUE (HAVEN-A1)
FROM 2,510' ± N/O EUCALYPTUS AVE TO 430' ± S/O ~~EDISON AVE~~
ONTARIO RANCH ROAD

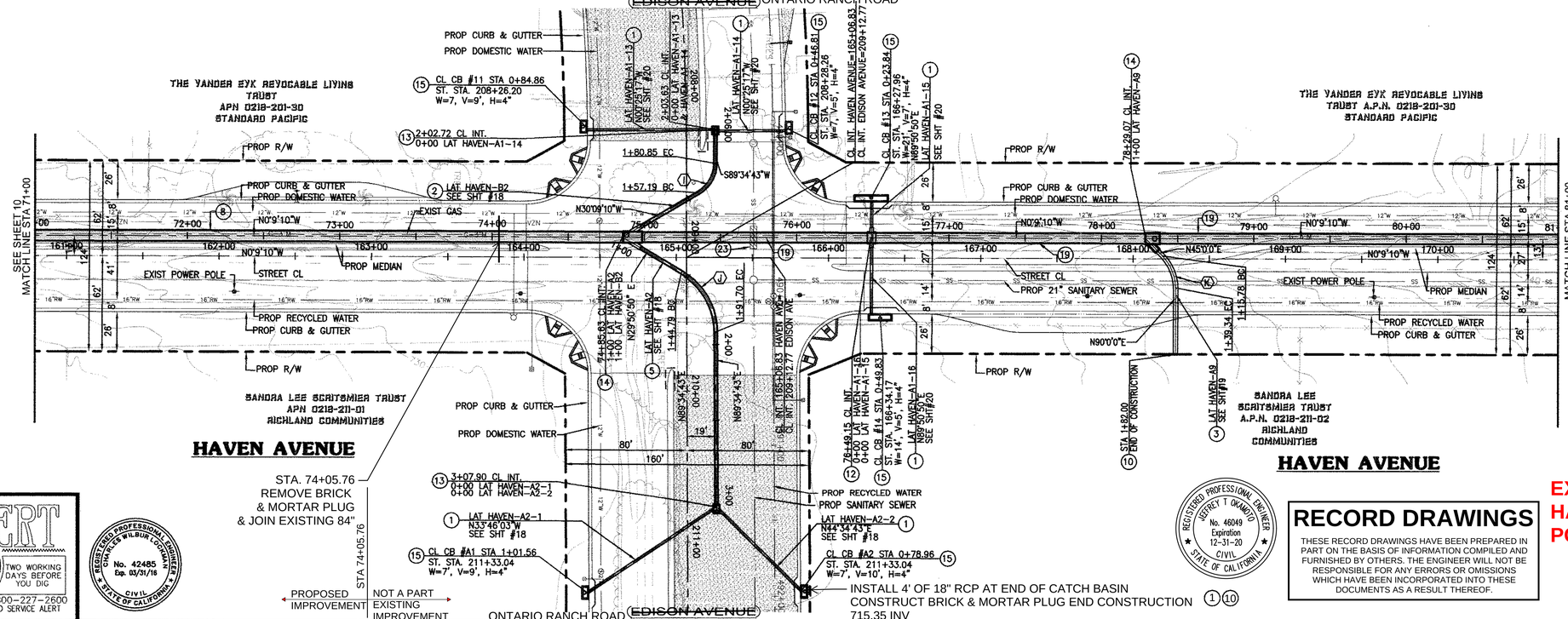
M-442

SHEET 10 OF 22
CONTRACT
ACCOUNT
DWG. NO. D13610

N:\60.CAD\TMAD Projects\2010\6010-011-00\Improvement Plans\Storm Drain\HAVEN\01001sd10pr.dwg - LAST PLOTTED ON Tue 07/08/14 - 10:52AM BY pshu



PROFILE SCALE
HORIZ: 1"=40'
VERT: 1"=4'



STORM DRAIN CONSTRUCTION NOTES

1. CONSTRUCT 18" RCP (D-LOAD PER PROFILE).
2. CONSTRUCT 24" RCP (D-LOAD PER PROFILE).
3. CONSTRUCT 36" RCP (D-LOAD PER PROFILE).
5. CONSTRUCT 48" RCP (D-LOAD PER PROFILE).
8. CONSTRUCT 84" RCP (D-LOAD PER PROFILE).
10. CONSTRUCT BRICK & MORTAR BULKHEAD SEE SHEET 17.
12. CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN 340-2.
14. CONSTRUCT MANHOLE PIPE TO PIPE (LARGE SIDE INLET) PER SPPWC STD. PLAN 322-2.
15. CATCH BASIN NO. 2 PER CITY OF ONTARIO STD. DWG. 3003 (W PER PLANS)
19. CONSTRUCT 78" RCP (D-LOAD PER PROFILE).
23. CONSTRUCT CONCRETE ENCASEMENT PER CITY OF ONTARIO STD. 2102 CASE 3

CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
(I)	60°16'07"	22.50'	23.67'	13.06'
(J)	59°43'53"	45.00'	46.91'	25.84'
(K)	45°00'00"	30.00'	23.56'	12.43'

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REGISTERED PROFESSIONAL ENGINEER CHARLES WILBUR LOCKMAN No. 42485 Exp. 03/31/16 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER JEFFREY T OKAMOTO No. 46049 Expiration 12-31-20 CIVIL STATE OF CALIFORNIA

RECORD DRAWINGS
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EXHIBIT 4
HAVEN SD
PG. 8 OF 13

GRAPHIC SCALE
40 0 20 40 80 120
(IN FEET)
1 inch = 40 ft.

REVISIONS			
MARK	DATE	BY	APPROVED/RCE No.
1	11/4/19	HZ	RCE CA 46049

DESIGNED BY:
DATE:
DRAWN BY:
DATE:
CHECKED BY: HN LO
DATE: 7/16/14

CITY OF ONTARIO
RECOMMENDED BY:
BRYAN LIRLEY, P.E./ PRINCIPAL ENGINEER DATE
ACCEPTED BY:
KHOI DO, P.E./ CITY ENGINEER DATE

BENCH MARK No. S.P.S.N 00789 ELEVATION 785.572
SAN BERNARDINO COUNTY BENCHMARK LOCATED AT THE INTERSECTION OF TURNER & RIVERSIDE AVENUES, 1/4 COR. SEC. 2/11, T2S, R7W. 2" BRASS DISK STAMPED "T2S, R7W, 1/4, S2, S11" "LS 3258" SET FLUSH IN A.C.
NGVD29 / 1990 ADJ.

TMAD TAYLOR & GAINES
901 Via Piemonte, Suite 400
Ontario, California 91764
Phone: 909.477.6915 Fax: 909.477.6916
www.ttgcorp.com

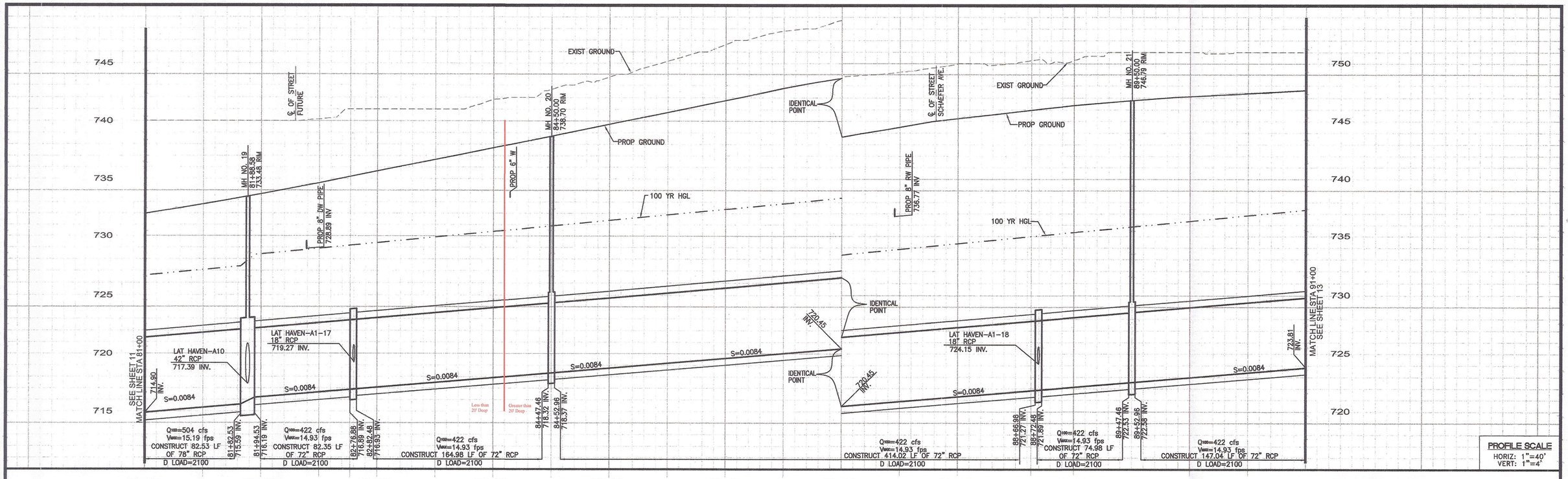
CHARLES W. LOCKMAN 42485 RCE No. 07/07/2014 DATE

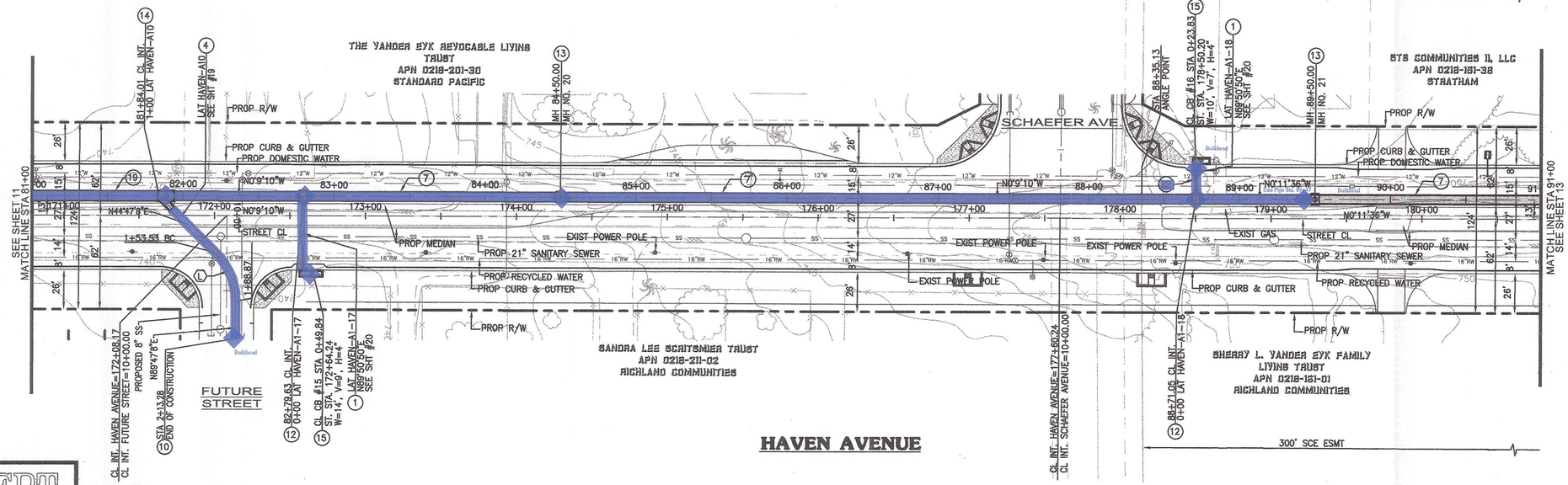
STORM DRAIN IMPROVEMENT PLAN & PROFILE
HAVEN AVENUE (HAVEN-A1)
FROM 430' ± S/O ~~EDISON AVE~~ TO ~~570' ± N/O~~ ~~EDISON AVE~~
ONTARIO RANCH ROAD 120' ± S/O ONTARIO RANCH ROAD

M-442

SHEET 11 OF 22
CONTRACT
ACCOUNT
DWG. NO. D13611

N:\60.CAD\TMAD Projects\2010\60010-011-00\Improvement Plans\Storm Drain\HAVEN\D10011sd11pp.dwg - LAST PLOTTED ON Tue 07/08/14 - 10:52AM BY cshu





STORM DRAIN CONSTRUCTION NOTES

1. CONSTRUCT 18" RCP (D-LOAD PER PROFILE).
4. CONSTRUCT 42" RCP (D-LOAD PER PROFILE).
7. CONSTRUCT 72" RCP (D-LOAD PER PROFILE).
10. CONSTRUCT BRICK & MORTAR BULKHEAD SEE SHEET 17.
12. CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN 340-2.
13. CONSTRUCT MANHOLE NO. 2 PER CITY OF ONTARIO STD. DWG. 3008.
14. CONSTRUCT MANHOLE PIPE TO PIPE (LARGE SIDE INLET) PER SPPWC STD. PLAN 322-2.
15. CATCH BASIN NO. 2 PER CITY OF ONTARIO STD. DWG. 3003 (W PER PLANS)
19. CONSTRUCT 78" RCP (D-LOAD PER PROFILE).
22. CONSTRUCT PIPE ANCHORS PER SPPWC STD. PLAN 221-2.

CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
(L)	45°00'00"	45.00'	35.34'	18.64'

PROFILE SCALE
HORIZ: 1"=40'
VERT: 1"=4'

GRAPHIC SCALE
40 0 20 40 80 120
(IN FEET)
1 inch = 40 ft.

EXHIBIT 4
HAVEN SD
PG. 9 OF 13

DIG ALERT
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A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REGISTERED PROFESSIONAL ENGINEER — CHARLES WILBUR LOCKMAN — No. 42485 Exp. 03/31/16 — CIVIL — STATE OF CALIFORNIA

REVISIONS			
MARK	DATE	BY	APPROVED/RCE No.

DESIGNED BY:
DATE:
DRAWN BY:
DATE:
CHECKED BY: HW MD
DATE: 7/30/14

CITY OF ONTARIO
RECOMMENDED BY: Raymond Lee 8/7/14
RAYMOND LEE, P.E./ ASSISTANT CITY ENGINEER DATE
ACCEPTED BY: Louis Abi-Younes 8.12.14
LOUIS ABI-YOUNES, P.E./ CITY ENGINEER DATE

BENCH MARK No. S.P.S.N 00789 ELEVATION. 785.572
SAN BERNARDINO COUNTY BENCHMARK LOCATED AT THE INTERSECTION OF TURNER & RIVERSIDE AVENUES, 1/4 COR. SEC. 2/11, T2S, R7W. 2" BRASS DISK STAMPED "T2S, R7W, 1/4, S2, S11" "LS 3258" SET FLUSH IN A.C.
NGVD29 / 1990 ADJ.

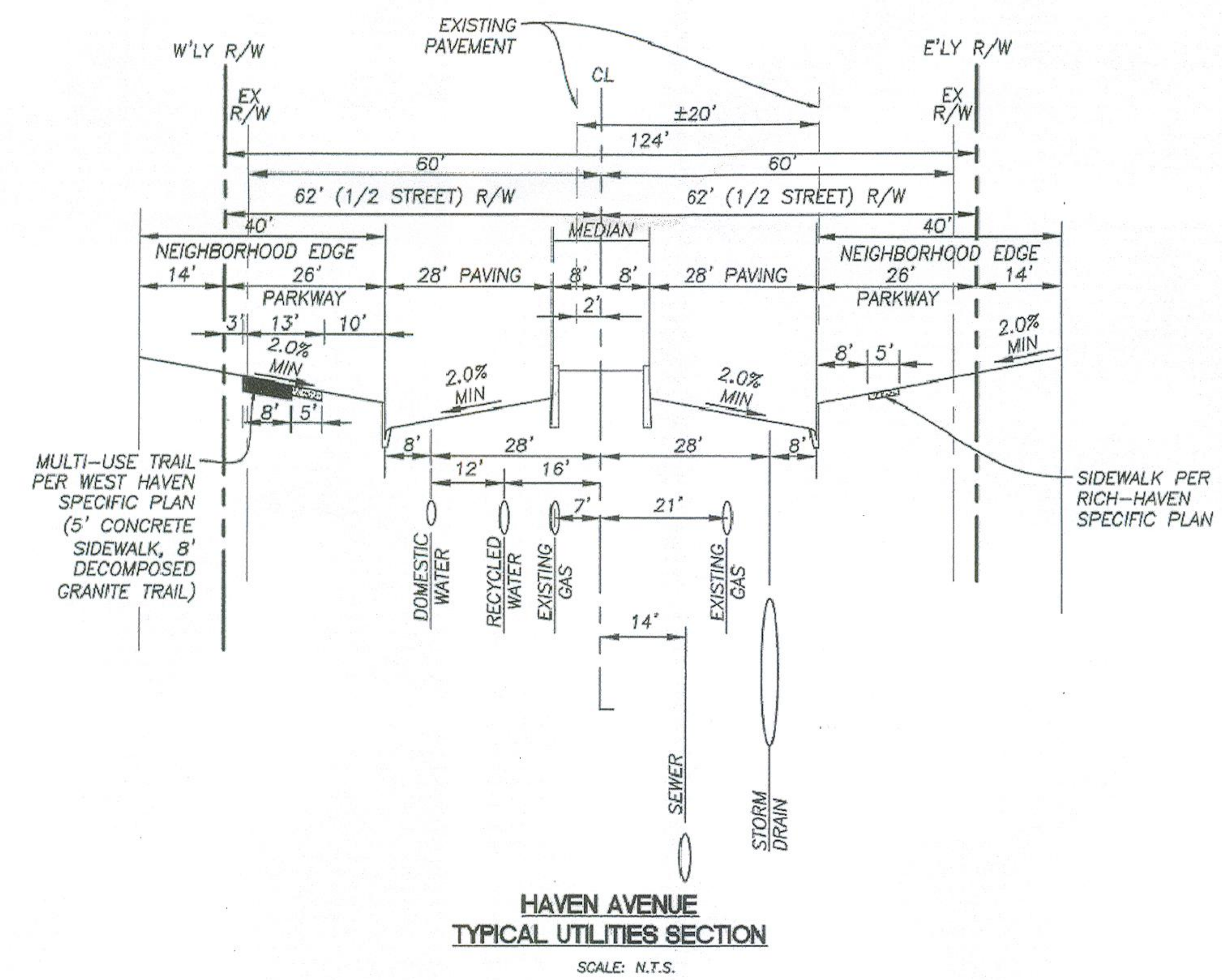
TTG TAYLOR & GAINES
901 Via Piemonte, Suite 400
Ontario, California 91764
Phone: 909.477.6915 Fax: 909.477.6916
www.ttgcorp.com
CHARLES W. LOCKMAN — 42485 RCE No. — 07/07/2014 DATE

STORM DRAIN IMPROVEMENT PLAN & PROFILE
HAVEN AVENUE (HAVEN-A1)
FROM 570' ± N/O EDISON AVE TO 1,570' ± N/O EDISON AVE

M-442

SHEET 12 OF 22
CONTRACT
ACCOUNT
DWG. NO. D13612

N:\DLCAD\TMD Projects\2010\6010-011-00\Improvement Plans\Storm Drain\HAVEN\D10011sd12pp.dwg - LAST PLOTTED ON Tue 07/08/14 - 10:53AM BY pahu

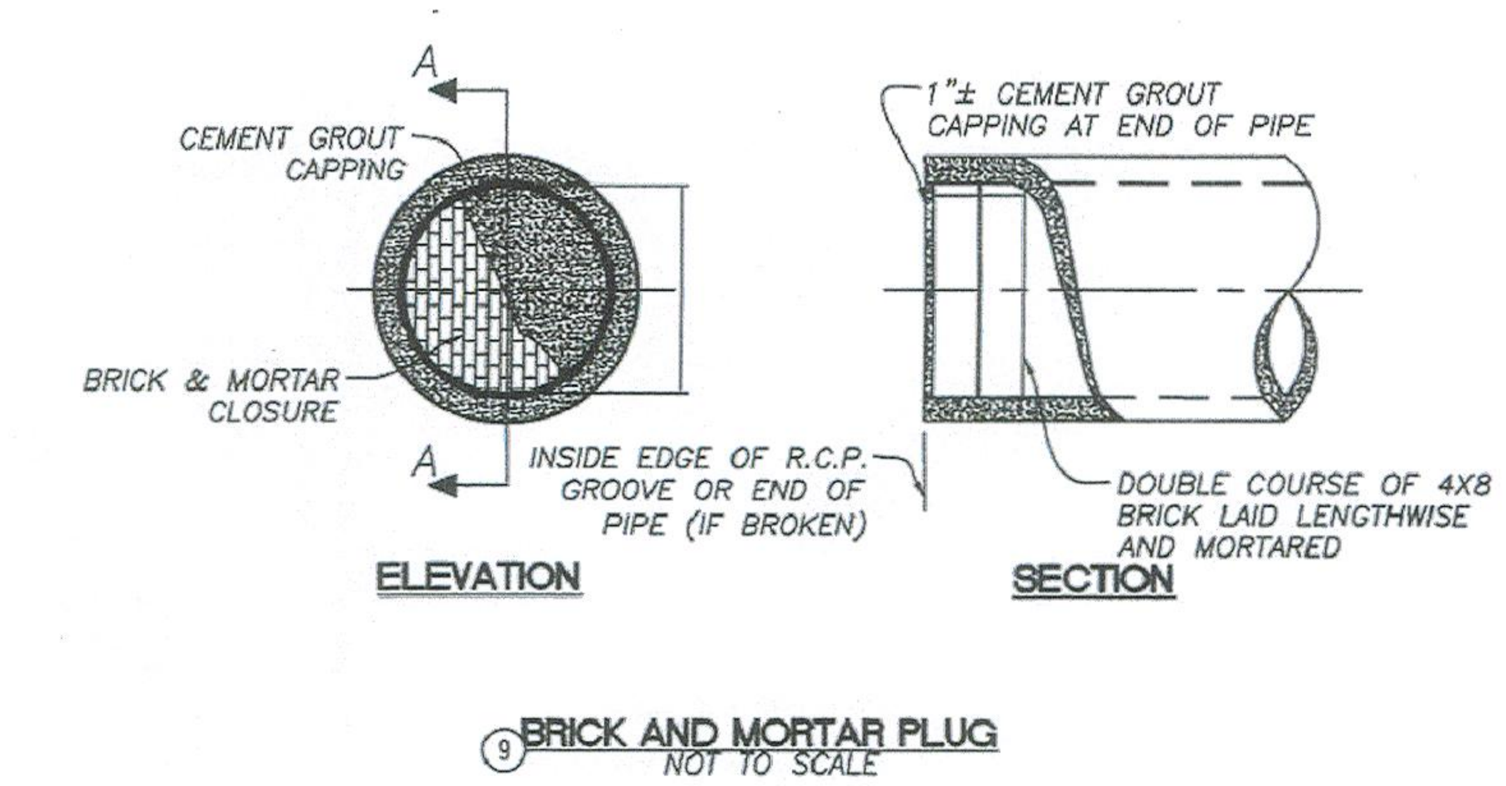


HAVEN AVENUE
TYPICAL UTILITIES SECTION

SCALE: N.T.S.

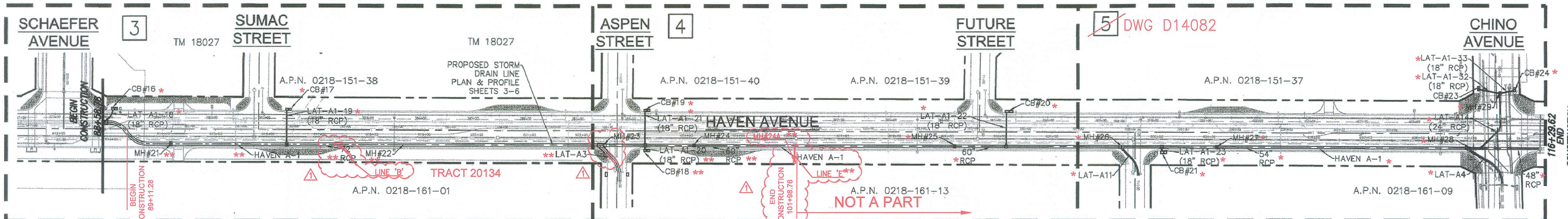
CONSTRUCTION NOTES

		QUANTITY
(1)	INSTALL 72" RCP (D-LOAD PER PROFILE)	907 ~~1001~~ LF **
(2)	INSTALL 60" RCP (D-LOAD PER PROFILE)	352 ~~959~~ LF **
(3)	INSTALL 54" RCP (D-LOAD PER PROFILE)	641 LF *
(4)	INSTALL 48" RCP (D-LOAD PER PROFILE)	124 LF *
(5)	INSTALL 42" RCP (D-LOAD PER PROFILE)	35 ~~89~~ LF **
(6)	INSTALL 36" RCP (D-LOAD PER PROFILE)	57 LF *
(7)	INSTALL 24" RCP (D-LOAD PER PROFILE)	24 ~~112~~ LF **
(8)	INSTALL 18" RCP (D-LOAD PER PROFILE)	266 LF *
(9)	CONSTRUCT BRICK & MORTAR BULKHEAD PER SHEET 2	4 ~~3~~ EA **
(10)	CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN 340-2.	1 ~~5~~ EA **
(11)	CONSTRUCT MANHOLE NO. 1 PER CITY OF ONTARIO STD. DWG. 3008	4 ~~6~~ EA **
(12)	CONSTRUCT MANHOLE PIPE TO PIPE (LARGE SIDE INLET) PER SPPWC STD. PLAN 322-2.	2 ~~3~~ EA **
(15)	CATCH BASIN NO. 2 PER CITY OF ONTARIO STD. DWG. 3003 (W PER PLANS)	1 ~~8~~ EA **



(9) BRICK AND MORTAR PLUG
NOT TO SCALE

REVISION DESCRIPTIONS
⚠ DEVELOPER REQUEST - REVISED QUANTITIES



INDEX MAP
SCALE: 1" = 100'

*NOT APPLICABLE TO THIS REVISION
**ADDED/REVISED DATA
THE REVISIONS MADE ON THIS PLAN WERE ADDED/REVISED UNDER MY DIRECTION

PUNEET COMAR, P.E. R.C.E. 73065 5/28/20 DATE

EXHIBIT 4
HAVEN SD
PG. 10 OF 13

DIGALERT — DIAL BEFORE YOU DIG — TWO WORKING DAYS BEFORE YOU DIG — TOLL FREE 1-800-422-4133 — A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REGISTERED PROFESSIONAL ENGINEER JEFFREY T OKAMOTO No. 46049 Expiration 12-31-18 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER PUNEET COMAR NO. 73065 CIVIL STATE OF CALIFORNIA

REVISIONS

MARK	DATE	BY	APPROVED/RCE NO.
⚠1	5/28/20	PC	

DESIGNED BY HUITT-ZOLLARS DATE 08-24-2018
DRAWN BY HUITT-ZOLLARS DATE 08-24-2018
CHECKED BY [signature] DATE

CITY OF ONTARIO

RECOMMENDED BY: Khoi Do P.E./Assistant City Engineer — 10-19-18 Date
ACCEPTED BY: Louis Abi-Younes, P.E./City Engineer — 10-24-18 Date

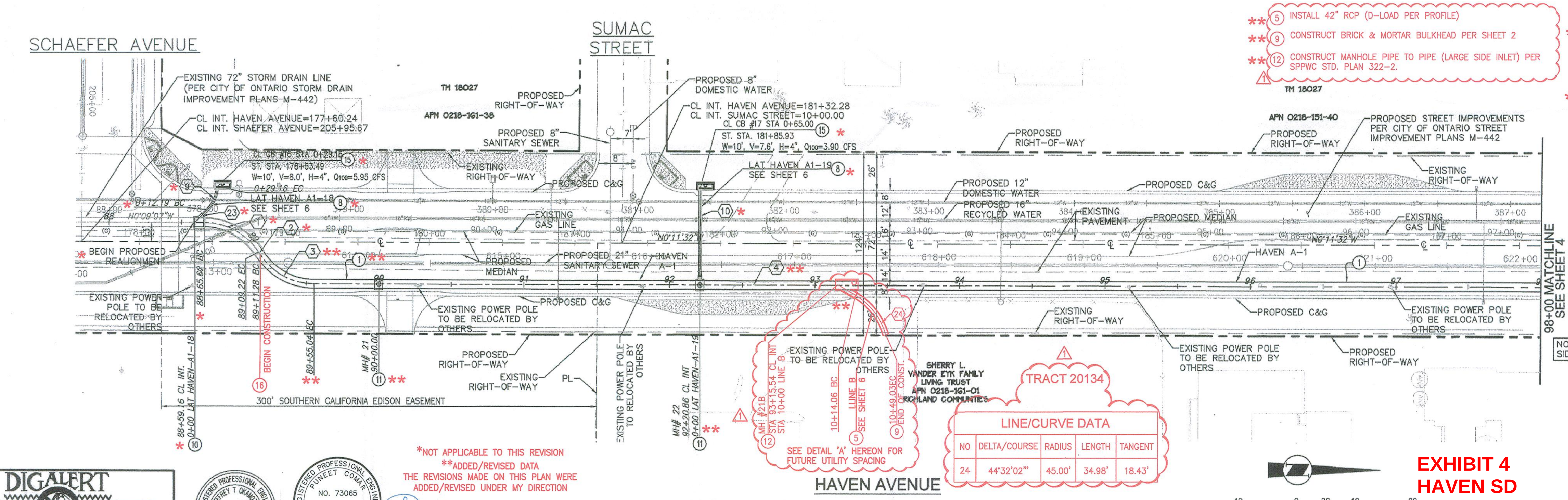
BENCH MARK No. S.P.S.N. 00789 ELEVATION. 785.572
LOCATION: CITY OF ONTARIO
SAN BERNARDINO COUNTY BENCHMARK LOCATED AT THE INTERSECTION OF TURNER & RIVERSIDE AVENUES, 1/4 COR. SEC. 2/11, T2S, R7W. 2" BRASS DISK STAMPED "T2S, R7W, 1/4, S2, S11" "LS 3258" SET FLUSH IN A.C.
NGVD29 / 1990 ADJ.

HUITT-ZOLLARS
Huitt-Zollars, Inc. Irvine
2603 MAIN STREET, SUITE 400 • IRVINE, CALIFORNIA 92614 • (949) 988-5815
APPROVED BY JEFFREY T OKAMOTO R.C.E. 46049 EXPIRES 12-31-18 DATE

STORM DRAIN IMPROVEMENT PLAN
HAVEN AVENUE
CONSTRUCTION NOTES AND INDEX MAP

TR 20134 **
~~TM 18922-4~~

SHEET 2 OF ~~6~~ 5 **
CONTRACT
ACCOUNT
DWG. NO. D14079



LINE/CURVE DATA				
NO	DELTA/COURSE	RADIUS	LENGTH	TANGENT
24	44°32'02"'	45.00'	34.98'	18.43'

HAVEN AVENUE

** (5) INSTALL 42" RCP (D–LOAD PER PROFILE)

** (9) CONSTRUCT BRICK & MORTAR BULKHEAD PER SHEET 2

** (12) CONSTRUCT MANHOLE PIPE TO PIPE (LARGE SIDE INLET) PER SPPWC STD. PLAN 322–2.

CONSTRUCTION NOTES

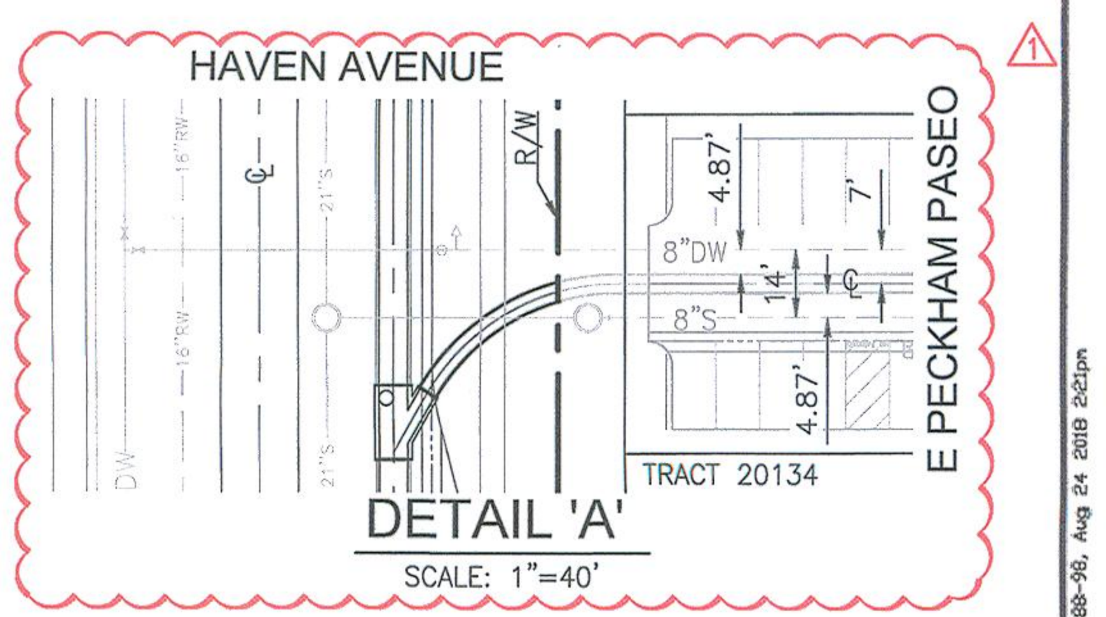
** (1) INSTALL 72" RCP (D–LOAD PER PROFILE)

* (8) INSTALL 18" RCP (D–LOAD PER PROFILE)

* (10) CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN 340–2.

** (11) CONSTRUCT MANHOLE NO. 1 PER CITY OF ONTARIO STD. DWG. 3008

* (15) CATCH BASIN NO. 2 PER CITY OF ONTARIO STD. DWG. 3003 (W PER PLANS)



DETAIL 'A'

SCALE: 1"=40'

NOTE: ALL SOUTHERN CALIFORNIA EDISON POWER POLES ON THE EAST SIDE OF HAVEN AVENUE TO BE RELOCATED BY OTHERS IN FUTURE

LINE/CURVE DATA					
NO	DELTA/COURSE	RADIUS	LENGTH	TANGENT	
1	55°31'14"	45.00'	43.60'	23.68'	
2	N55°30'58"E	–	2.06'	–	
3	55°42'33"	45.00'	43.75'	23.78'	
4	N0°11'35"W	–	2660.85'	–	TOTAL
9	43°12'28"	22.50'	16.97'	8.91'	
10	S89°48'24"W	–	65.00'	–	
23	N45°11'36"W	–	12.19'	–	

EXHIBIT 4
HAVEN SD
PG. 11 OF 13

SCALE 1"= 40'

*NOT APPLICABLE TO THIS REVISION
**ADDED/REVISED DATA
THE REVISIONS MADE ON THIS PLAN WERE ADDED/REVISED UNDER MY DIRECTION

PUNEET COMAR, P.E. R.C.E. 73065 5/28/20 DATE

REVISION DESCRIPTIONS

△1 DEVELOPER REQUEST – ADDED MANHOLE #21B & PROPOSED LINE B FOR TRACT 20134 CONNECTION. ADD CURVE 23 TO LINE & CURVE TABLE FOR LINE B INFORMATION. REVISED PROFILE TO SHOW PROPOSED MANHOLE #21B

DIGALERT — DIAL BEFORE YOU DIG — TWO WORKING DAYS BEFORE YOU DIG — TOLL FREE 1-800-422-4133 — A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REGISTERED PROFESSIONAL ENGINEER JEFFREY T OKAMOTO No. 46049 Expiration 12-31-18 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER PUNEET COMAR NO. 73065 CIVIL STATE OF CALIFORNIA

REVISIONS			
MARK	DATE	BY	APPROVED/RCE NO.
△1	5/28/20	PC	

DESIGNED BY HUITT–ZOLLARS DATE 08–24–2018
DRAWN BY HUITT–ZOLLARS DATE 08–24–2018
CHECKED BY DATE

CITY OF ONTARIO

RECOMMENDED BY: Kho Do P.E./Assistant City Engineer — Date 10-19-18
ACCEPTED BY: Louis Abi-Younes, P.E./City Engineer — Date 10-24-18

BENCH MARK No. S.P.S.N. 00789 ELEVATION. 785.572
LOCATION: CITY OF ONTARIO
SAN BERNARDINO COUNTY BENCHMARK LOCATED AT THE INTERSECTION OF TURNER & RIVERSIDE AVENUES, 1/4 COR. SEC. 2/11, T2S, R7W. 2" BRASS DISK STAMPED "T2S, R7W, 1/4, S2, S11" "LS 3258" SET FLUSH IN A.C.
NGVD29 / 1990 ADJ.

HUITT-ZOLLARS
Huitt-Zollars, Inc. Irvine
2603 MAIN STREET, SUITE 400 * IRVINE, CALIFORNIA 92614 * (949) 988-5815
APPROVED BY JEFFREY T OKAMOTO R.C.E. 46049 EXPIRES 12–31–18 DATE 9/20/18

STORM DRAIN IMPROVEMENT PLAN

HAVEN AVENUE

PLAN & PROFILE FROM SCHAEFER AVENUE TO 1000' N OF SCHAEFER AVENUE

** TR 20134
~~TM18922-4~~

SHEET 3 OF **65
CONTRACT
ACCOUNT
DWG. NO. D14080

CONSTRUCTION NOTES

- ** (1) INSTALL 72" RCP (D-LOAD PER PROFILE)
- ** (2) INSTALL 60" RCP (D-LOAD PER PROFILE)
- * (8) INSTALL 18" RCP (D-LOAD PER PROFILE)
- ** (9) CONSTRUCT BRICK & MORTAR BULKHEAD PER SHEET 2
- ** (10) CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN 340-2.
- ** (11) CONSTRUCT MANHOLE NO. 1 PER CITY OF ONTARIO STD. DWG. 3008
- ** (12) CONSTRUCT MANHOLE PIPE TO PIPE (LARGE SIDE INLET) PER SPPWC STD. PLAN 322-2.
- ** (15) CATCH BASIN NO. 2 PER CITY OF ONTARIO STD. DWG. 3003 (W PER PLANS)
- ** (7) INSTALL 24" RCP (D-LOAD PER PROFILE)

NOTE: ALL SOUTHERN CALIFORNIA EDISON POWER POLES ON THE EAST SIDE OF HAVEN AVENUE TO BE RELOCATED BY OTHERS IN FUTURE

LINE/CURVE DATA

NO.	DELTA/COURSE	RADIUS	LENGTH	TANGENT	
4	N0°11'35"W	–	2660.85'	–	TOTAL
11	N44°48'23"E	–	15.71'	–	
12	S89°48'25"W	–	64.99'	–	
13	N89°48'24"E	–	8.72'	–	
14	S89°48'24"W	–	59.20'	–	
24	15°29'52" ~~44°59'58"~~	45.00'	12.17' ~~35.34'~~	6.12' ~~18.64'~~	
25	~~N89°48'24"E~~	~~–~~	~~11.11'~~	–	
26	N89°48'44"	–	23.95'	–	

EXHIBIT 4
HAVEN SD
PG. 12 OF 13

REVISIONS			
MARK	DATE	BY	APPROVED/RCE NO.
1	5/28/20	PC	

DESIGNED BY HUITT-ZOLLARS DATE 08-24-2018
DRAWN BY HUITT-ZOLLARS DATE 08-24-2018
CHECKED BY [illegible] DATE

CITY OF ONTARIO

RECOMMENDED BY: Khoi Do, P.E./Assistant City Engineer 10-9-18 Date
ACCEPTED BY: Louis Abi-younes, P.E./City Engineer 10.24.18 Date

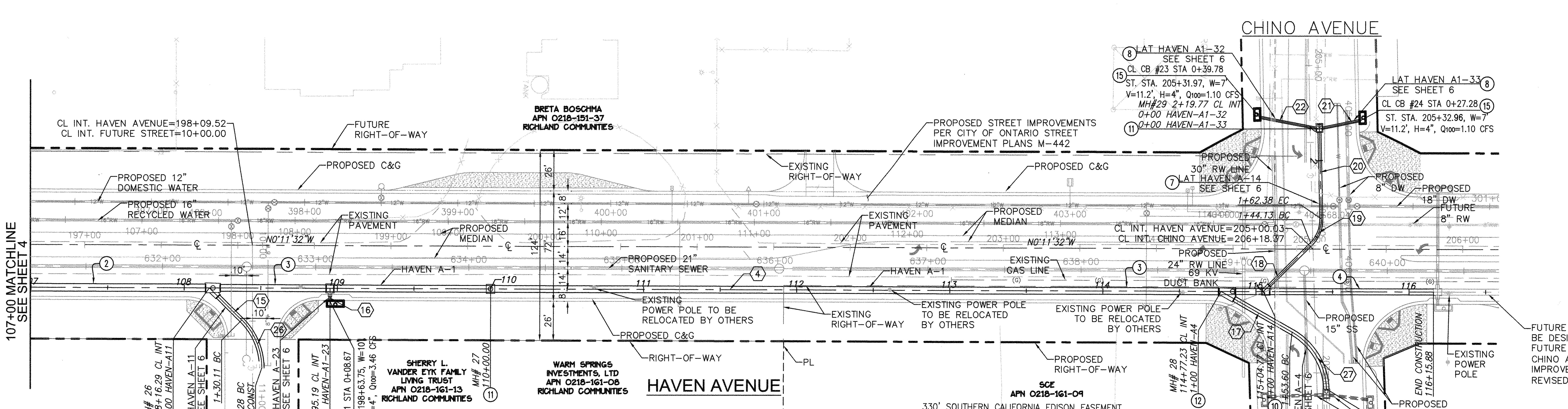
BENCH MARK No. S.P.S.N. 00789 ELEVATION 785.572
LOCATION: CITY OF ONTARIO
SAN BERNARDINO COUNTY BENCHMARK LOCATED AT THE INTERSECTION OF TURNER & RIVERSIDE AVENUES, 1/4 COR. SEC. 2/11, T2S, R7W. 2" BRASS DISK STAMPED "T2S, R7W, S2, S11" "LS 3258" SET FLUSH IN A.C.
NGVD29 / 1990 ADJ.

HUITT-ZOLLARS
Huitt-Zollars, Inc. Irvine
2603 MAIN STREET, SUITE 400 • IRVINE, CALIFORNIA 92614 • (949) 988-5815
APPROVED BY JEFFREY T. OKAMOTO R.C.E. 46049 EXPIRES 12-31-18 DATE 9/20/18

STORM DRAIN IMPROVEMENT PLAN
HAVEN AVENUE
PLAN & PROFILE FROM 1000' N OF SCHAEFER AVENUE TO 840' S OF CHINO AVENUE

** TR 20134
~~TM18922-4~~

SHEET 4 OF ~~6~~ **5
CONTRACT
ACCOUNT
DWG. NO. D14081



CONSTRUCTION NOTES

2. INSTALL 60" RCP (D-LOAD PER PROFILE)
3. INSTALL 54" RCP (D-LOAD PER PROFILE)
4. INSTALL 48" RCP (D-LOAD PER PROFILE)
5. INSTALL 42" RCP (D-LOAD PER PROFILE)
6. INSTALL 36" RCP (D-LOAD PER PROFILE)
7. INSTALL 24" RCP (D-LOAD PER PROFILE)
8. INSTALL 18" RCP (D-LOAD PER PROFILE)
9. CONSTRUCT BRICK & MORTAR BULKHEAD PER SHEET 2
10. CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN 340-2.
11. CONSTRUCT MANHOLE NO. 1 PER CITY OF ONTARIO STD. DWG. 3008
12. CONSTRUCT MANHOLE PIPE TO PIPE (LARGE SIDE INLET) PER SPPWC STD. PLAN 322-2.
15. CATCH BASIN NO. 2 PER CITY OF ONTARIO STD. DWG. 3003 (W PER PLANS)

LINE/CURVE DATA

NO.	DELTA/COURSE	RADIUS	LENGTH	TANGENT
4	N0°11'35"W	–	2660.85'	–
15	N44°48'24"E	–	22.16'	–
16	N89°48'24"E	–	3.14'	–
17	N29°48'26"E	–	43.89'	–
18	N45°11'36"W	–	38.60'	–

TOTAL

LINE/CURVE DATA

NO.	DELTA/COURSE	RADIUS	LENGTH	TANGENT
19	46°26'55"	22.50'	18.24'	9.65'
20	S88°21'29"W	–	55.54'	–
21	N11°55'57"W	–	25.50'	–
22	S10°47'21"W	–	37.99'	–
26	44°46'42"	45.00'	35.17'	18.54'

LINE/CURVE DATA

NO.	DELTA/COURSE	RADIUS	LENGTH	TANGENT
27	46°33'52"	45.00'	36.57'	19.36'

NOTE: ALL SOUTHERN CALIFORNIA EDISON POWER POLES ON THE EAST SIDE OF HAVEN AVENUE TO BE RELOCATED BY OTHERS IN FUTURE

SCALE 1"= 40'

EXHIBIT 4
HAVEN SD
PG. 13 OF 13

DIGALERT — DIAL BEFORE YOU DIG — TWO WORKING DAYS BEFORE YOU DIG — TOLL FREE 1-800-422-4133 — A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REGISTERED PROFESSIONAL ENGINEER — JEFFREY T. OKAMOTO — No. 46049 — Expiration 12-31-18 — CIVIL — STATE OF CALIFORNIA

REVISIONS

MARK	DATE	BY	APPROVED/RCE NO.

DESIGNED BY HUITT-ZOLLARS DATE 09-13-2018
DRAWN BY HUITT-ZOLLARS DATE 09-13-2018
CHECKED BY WK, BL DATE

CITY OF ONTARIO

RECOMMENDED BY: Khoi Do, P.E./Assistant City Engineer 10-19-18 Date
ACCEPTED BY: Louis Abi-Younes, P.E./City Engineer 10.24.18 Date

BENCH MARK No. S.P.S.N. 00789 ELEVATION. 785.572
LOCATION: CITY OF ONTARIO
SAN BERNARDINO COUNTY BENCHMARK LOCATED AT THE INTERSECTION OF TURNER & RIVERSIDE AVENUES, 1/4 COR. SEC. 2/11, T2S, R7W. 2" BRASS DISK STAMPED "T2S, R7W, ¼, S2, S11" "LS 3258" SET FLUSH IN A.C. NGVD29 / 1990 ADJ.

HUITT-ZOLLARS
Huitt-Zollars, Inc. Irvine
2603 MAIN STREET, SUITE 400 • IRVINE, CALIFORNIA 92614 • (949) 988-5815
APPROVED BY JEFFREY T. OKAMOTO R.C.E. 46049 EXPIRES 12-31-18 DATE 9/20/18

STORM DRAIN IMPROVEMENT PLAN

HAVEN AVENUE

PLAN & PROFILE FROM 840' S OF CHINO AVENUE TO CHINO AVENUE

TM18922-4

SHEET 5 OF 6
CONTRACT
ACCOUNT
DWG. NO. D14082

SCALE:
HOR. 1":40'
VERT 1": 4'

HORIZ. 1"=40'
VERT. 1"=4'

BELLGRAVE AVENUE

℄ INT MILL CREEK SD & COUNTY LINE CHANNEL

EX. 16'-X 10' RCB COUNTY LINE CHANNEL PROJECT NO. 2-0-0300

EXIST GROUND

PROP FS

100 YR HGL

RICH-HAVEN 100-YR HGL W/ DETENTION

℄ MH#1 STA 15+00.00
RIM EL 686.68

PROP GAS LINE

PROP 12" DW
679.2± INV

PROP 6" PW
677.8± INV

PROP DRY UTILITY TRENCH

675.93 TOP

2 SACK CEMENT SLURRY FROM SD SPRINGLINE TO BOTTOM OF SS STEEL CASING

LAT MILLC-A1-1
18" RCP
INV=671.29

LAT MILLC-A1-2
18" RCP
INV=671.60

S=0.0030

S=0.0031

INV = 669.40

INV = 669.40

S=0.0031

PROP 36" STEEL CASING
663.9± TOP

S=0.0068

PROP 24" SS
663.4± TOP

STA 9+92.84
BEGIN PIPE
INV=667.23
CONTRACTOR TO FIELD VERIFY

STA 10+17.86
INV=667.29

STA 10+30.61
INV=667.35

STA 13+98.28 EC
INV=666.45
90°

STA 14+29.56 BC
INV=666.25

PROP SEWER

CONSTRUCT 707.16 LF 10' x 8' RCB
Q_{100}=1119.1 CFS, V_{100}=14.0 FPS

CONSTRUCT 651
Q_{100}= 1119.1 C

685
675
665
655

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+

HORIZ. 1"=40'
VERT. 1"=4'

℄ MH#2 STA 20+00.00
RIM EL 691.47

EXIST GROUND

℄ FUTURE STREET

PROP FS

PROP 6" FH
683.6± BOP

PROP 8" DW
684.7± INV

100 YR HGL

LAT MILLC-A9
36" RCP
INV=671.20

LAT MILLC-A1-3
18" RCP
INV=674.28

STA 17+51.20 BC
INV=669.56

STA 18+19.25 EC
INV=669.78

PROP SEWER

18+00 19+00 20+00

DWG #

MERRILL AVENUE

℄ MERRILL AVENUE

EXIST GROUND

℄ MH#3A STA 24+09.50
RIM EL 695.17

℄ MH#3 STA 24+91.50
RIM EL 695.91

EX 2" GAS
695.5± BOP

PROP GAS LINE

PROP DRY UTILITY TRENCH

PROP FS

RICH-HAVEN 100-YR HGL W/ DETENTION

100 YR HGL

TRANSITION STRUCTURE

TRANSITION STRUCTURE

PROP 12" RW
688.4± INV

686.93 TOP

PROP 24" DW
690.2± INV

LAT MILLC-A2
48" RCP
INV=678.94

LAT MILLC-A1-4
18" RCP
INV=682.45

LAT MILLC-A1-5
18" RCP
INV=683.07

LAT MILLC-A3
36" RCP
INV=680.22

INV=678.92

INV=678.92

S=0.0094

INV=670.97

INV=670.97

S=0.0031

LAT MILLC-WQ-1
60" RCP
INV=671.35

LAT MILLC-WQ-1
60" RCP
INV=671.82

PROP SEWER

STA 23+51.00
END RCB
INV=671.44

STA 24+01.00
BEGIN RCB
INV=671.61

STA 24+13.50
60" RCP DIVERSION
INV=671.65

STA 24+21.00
END RCB
INV=671.75

STA 24+71.67
BEGIN PIPE
INV=676.62

STA 24+79.67
END PIPE
INV=676.69

STA 24+93.83
BEGIN PIPE
INV=676.98

CONSTRUCT 206.17 LF 108" RCP D-LOAD=1300
Q_{100}= 1036.6 CFS, V_{100}= 16.3 FPS

CONSTRUCT 8.00 L.F. 108" RCP D-LOAD=1300
Q_{100}= 1096.3 CFS, V_{100}= 17.2 FPS

CONSTRUCT 50.00 LF 10'x13' RCB
Q_{100}= 1096.3 CFS, V_{100}= 17.2 FPS

+00 23+00 24+00 25+00 26+00 27-

1"=40'
1"=4'

EXIST GROUND

℄ MH#4 STA 29+91.11
RIM EL 701.83

PROP FS

PROP 6" FH
693.0± BOP

100 YR HGL

LAT MILLC A-9
36" RCP
INV=687.64

INV = 685.87

S=0.0102

INV=680.81

IDENTICAL POINTS

S=0.0094

INV=680.81

PROP SEWER

STA 29+88.78
BEGIN PIPE
INV=681.64

STA 29+93.44
END PIPE
INV=681.70

CONSTRUCT 406.56 L.F. 108" RCP D-LOAD=1300
Q_{100}=1023.1 CFS, V_{100}=16.1 FPS

PROP SEWER

CONSTRUCT 288.78 L.F. 108" RCP D-LOAD=1300
Q_{100}=1036.6 CFS, V_{100}=16.3 FPS

+00 28+00 29-

+00 30+00 31+00 32+00 33+00 34+00

EXHIBIT 5

MILL CREEK STORM DRAIN PLAN
SHEET 1 OF 4- BELLEGRAVE AVENUE TO NORTH OF MERRILL AVENUE

X ENGINEERING & CONSULTING, INC.
6 Hutton Centre Drive, Suite 650
Santa Ana, California 92707
949.522.7100 | xengineeringinc.com

SCALE:
HOR. 1":40'
VERT1": 4'

1"=40'
1"=4'

EXIST GROUND
℄ MH#6
STA 34+91.11
RIM 709.32
PROP FS
RICH-HAVEN 100-YR HGL
W/ DETENTION
100 YR HGL
PROP 6" FH
702.1± BOP
PROP 8" RW
INV
LAT MILLC-A1_22
18" RCP
INV=691.83
IDENTICAL POINT
INV=685.29
S=0.0108
INV=685.29
S=0.0102
PROP 8" SS
6± TOP
STA 34+88.77
END PIPE
INV=686.78
STA 34+93.44
BEGIN PIPE
INV=686.88
PROP SEWER
CONSTRUCT 88.77 LF
RCP ~ D-LOAD=1300
=1023.1 CFS, V=16.1 FPS*
CONSTRUCT 495.34 LF 108" RCP D-LOAD=1300
Q=978.0 CFS, V=21.5 FPS*
35+00
36+00
37+00
38+00
39

EXIST GROUND
℄ MH#6
STA 34+91.11
RIM 709.32
PROP FS
RICH-HAVEN 100-YR HGL
W/ DETENTION
100 YR HGL
IDENTICAL POINT
INV=685.29
S=0.0108
STA 39+88.78
END PIPE
INV=692.23
STA 39+53.44
BEGIN PIPE
INV=692.33
PROP SEWER
CONSTRUCT 406.56 LF 108" RCP D-LOAD=1300
Q=978.0 CFS, V=21.5 FPS*
+00
40+00
41+00
42+00
43+00
44-

EXIST GROUND
℄ INT STA 44+22.82 MILL CREEK
STA 0+00 FUTURE STREET
℄ INT STA 44+62.64 MILL CREEK
STA 0+00 FUTURE STREET
℄ MH#7
STA 44+38.23
RIM EL 714.14
PROP FS
PROP 8" FH
710.6± BOP
PROP 8" OW
709.3± BOP
PROP 8" RW
707.5± INV
706.31 TOP
LAT MILLC-A1-7
18" RCP
INV=701.75
LAT MILLC-A1-6
18" RCP
INV=702.10
100 YR HGL
LAT MILLC-A10
36" RCP
INV=700.02
INV=699.04
INV=696.49
INV=696.49
S=0.0056
S=0.0104
S=0.0103
STA 44+28.91
END PIPE
INV=696.79
STA 44+40.57
BEGIN PIPE
INV=697.02
PROP SEWER
CONSTRUCT 28.91 LF 108" RCP D-LOAD=1300
Q=978.0 CFS, V=21.5 CFS*
CONSTRUCT 478.70 LF 108" RCP D-LOAD=1300
Q=965.1 CFS, V=16.9 CFS
+00
45+00
46+00
47+00
48

EXIST GROUND
℄ MH#8
STA 49+21.61
RIM EL 715.97
EXIST 8" OIL
TO BE RELOCATED
BY OTHERS
PROP FS
OLD
EDISON
AVENUE
℄ INT STA 141+85.85 MILL CREEK
STA 0+00 EXIST EDISON AVE
RICH-HAVEN 100-YR HGL
W/ DETENTION
RELOCATED 8" OIL
BY OTHERS
711.9± BOP
100 YR HGL
LAT MILLC-A11
36" RCP
INV=703.99
LAT MILLC-A1-8
18" RCP
INV=705.77
LAT MILLC-A1-9
18" RCP
INV=705.92
IDENTICAL POINT
INV= 702.47
S=0.0056
S=0.0056
INV=599.04
STA 49+19.27
END PIPE
INV=699.71
STA 49+23.93
BEGIN PIPE
INV=699.81
PROP SEWER
CONSTRUCT 476.07 LF 108" RCP D-LOAD=1300
Q=965.1 CFS, V=17.8 CFS
+00
49+00
50+00
51+00
52+00
53+00
54-

1"=40'
1"=4'

℄ MH#9
STA 54+21.61
RIM EL 719.47
EXIST GROUND
PROP FS
100 YR HGL
INV=702.47
S=0.0056
STA 54+19.29
END PIPE
INV=702.58
STA 54+23.95
BEGIN PIPE
INV=702.68
PROP SEWER
CONSTRUCT 19.29 L.F.
108" RCP D-LOAD=1300
Q=965.1 CFS, V=17.8 FPS
CONSTRUCT 387.59 LF 108" RCP D-LOAD=1300
Q=965.1 CFS, V=16.1 FPS
+00
55+00
56+00
57+00

℄ MH#10
STA 58+37.37
RIM EL 721.45
PROP 8" FH
715.8± BOP
PROP 8" RW
716.6± INV
713.95 TOP
100 YR HGL
LAT MILLC-A12
18" RCP
INV=707.84
LAT MILLC-A1-10
18" RCP
INV=709.13
INV=705.46
INV=705.46
S=0.0043
S=0.0048
STA 58+41.54
END PIPE
INV=704.53
STA 58+19.72
BEGIN PIPE
INV=704.68
CONSTRUCT 299.57 L.F. 108" RCP D-LOAD=1300
Q=965.1 CFS, V=16.1 FPS
58+00
59+00
60-

℄ MH#11
STA 61+21.62
RIM EL 722.97
100 YR HGL
IDENTICAL POINT
STA 61+19.29
END PIPE
INV=705.97
STA 61+23.95
BEGIN PIPE
INV=706.07
+00
61+00

MILL CREEK STORM DRAIN PLAN
SHEET 2 OF 4- NORTH OF MERRILL AVENUE TO NORTH OF OLD EDISON AVENUE

EXHIBIT 5

X ENGINEERING & CONSULTING, INC.
6 Hutton Centre Drive, Suite 650
Santa Ana, California 92707
949.522.7100 | xengineeringinc.com

SCALE:
HOR. 1":40'
VERT1": 4'

1"=40'
1"=4'

ONTARIO
RANCH ROAD

EXIST GROUND
PROP FS
PROP GAS LINE
PROP DRY UTILITY TRENCH
RICH-HAVEN 100-YR HGL
W/ DETENTION
100 YR HGL
PROP 6" EH
723.0± BOP
PROP 8" RW
719.1± INV
717.51 TOP
PROP 12" RW
719.7± INV
717.40 TOP
PROP 8" DW
718.8± BOP
716.95 TOP
℄ MH#12
STA 64+57.66
RIM EL 726.60
℄ MH#13
STA 64+64.40
RIM EL 725.97
℄ EDISON AVENUE
℄ MH#14
STA 68+94.50
RIM EL 727.45
LAT MILLC-A4
54" RCP
INV=710.15
LAT MILLC-45
54" RCP
INV=710.06
LAT MILLC-A1-13
18" RCP
INV=712.85
LAT MILLC-A1-12
18" RCP
INV=712.91
STA 64+56.74
BEGIN PIPE
INV=708.06
STA 64+75.57
END PIPE
INV=708.20
STA 67+89.57 BC
INV=710.90
STA 69+37.05 EC
INV=713.36
71+89.15 STA
716.91 INV
71+99.15 STA
717.06 INV
INV=718.50
Lat Connection (Randall)
71+94.15 STA
718.24 INV
54"RCP
Q_100=99.4 cfs
S=0.0090
S=0.0053
S=0.0175
S=0.0141
S=0.0052
INV=706.98
INV=706.98
S=0.0052
STA 64+43.57
END PIPE
INV=707.13
STA 64+86.73
BEGIN PIPE
INV=708.42
STA 67+19.28
END PIPE
INV=709.64
STA 67+28.44
BEGIN PIPE
INV=709.83
STA 69+92.18
END PIPE
INV=712.70
STA 69+96.84
BEGIN PIPE
INV=712.80
PROP SEWER
CONSTRUCT 143.57 LF 108" RCP D-LOAD=1300
Q_{100}= 965.1 CFS, V_{100}= 16.1 FPS
CONSTRUCT 15.83 LF 96" RCP D-LOAD=1500
Q_{100}= 823.8 CFS, V_{100}= 12.9 FPS
CONSTRUCT 232.55 LF 96" RCP D-LOAD=1500
Q_{100}= 711.5 CFS, V_{100}= 23.1 FPS*
CONSTRUCT 163.74 LF 84" RCP D-LOAD=1400
Q_{100}= 711.5 CFS, V_{100}= 23.1 FPS*
CONSTRUCT 403.16 LF 84" RCP D-LOAD=1400
Q_{100}= 711.5 CFS, V_{100}= 23.1 FPS*
T 176.05 L.F. 108" RCP D-LOAD=1300
Q_{100}=965.1 CFS, V_{100}=16.1 FPS
62+00
63+00
64+00
65+00
66+00
67+00
68+00
69+00
70+00
71+00
72+00
73+

MIRALOMA
SUBSTATION
ACCESS ROAD

1"=40'
1"=4'

EXIST GROUND
PROP FS
℄ FUTURE STREET
PROP 6" EH
734.7± BOP
PROP 8" DW
735.8± INV
PROP 8" DW
733.5± INV
RICH-HAVEN 100-YR HGL
W/ DETENTION
100 YR HGL
℄ MH#15
STA 73+31.60
RIM EL 736.91
℄ MH#16
STA 78+70
RIM EL 750.20
LAT MILLC-A1-3
18" RCP
INV=723.35
LAT MILLC-A1-14
18" RCP
INV=722.96
LAT MILLC-A6
72" RCP
INV=721.41
ADJUSTED PIPE SEGMENT PER MC DELTA 4
INV=718.50
S=0.0141
S=0.0041
INV=722.14
IDENTI
POINT
STA 73+29.27
END PIPE
INV=718.90
STA 73+33.93
BEGIN PIPE
INV=719.00
STA 73+50.37
END PIPE
INV=720.73
STA 77+71.83
BEGIN PIPE
INV=721.11
PROP SEWER
PROP 8" SS
719.2± TOP
CONSTRUCT 29.27 LF 84" RCP D-LOAD = 1400
Q_{100}=711.5 CFS, V_{100}=23.1 FPS*
CONSTRUCT 418.44 LF 84" RCP D-LOAD = 1400
Q_{100}=711.5 CFS, V_{100}=23.1 FPS*
74+00
75+00
76+00
77+00
78+00

EXIST GROUND
PROP FS
℄ MH#17
STA 81+85.01
RIM EL 745.67
PROP 6" EH
739.7± BOP
100 YR HGL
80+95.00
STA
727.91 INV
81+05.00
STA
728.12 INV
PIPE SOFFIT AND INVERT
PER MC DELTA 4
Lat Connection (Vander
Eyk)
81+00.00 STA
729.51 INV
48"RCP
Q_100=55.8 cfs
INV=731.12
INV=731.12
S=0.0115
S=0.0310
STA 78+48.98 BC
INV=722.74
STA 81+87.34
BEGIN PIPE
INV=728.83
STA 81+82.37
END PIPE
INV=728.73
STA 81+67.90 EC
INV=729.42
PROP SEWER
CONSTRUCT 411.64 LF 84" RCP D-LOAD = 1400
Q_{100}=463.6 CFS, V_{100}=17.1 FPS
CONSTRUCT 112.66 LF 84" RCP D-LOAD = 1400
Q_{100}=463.6 CFS, V_{100}=17.1 FPS
79+00
80+00
81+00
82+00
83+

℄ MH#18
STA 85+74.74
RIM EL 74
℄ FUTURE
PROP FS
PROP 6" EH
745.5± BO
PROP 8" RW
742.4± INV
741.14 TOP
100 YR HGL
LAT MILLC-A1-15
18" RCP
INV=736.92
LAT MILLC-A13
36" RCP
INV=736.34
LAT MILLC-A1-16
18" RCP
INV=737.83
INV=73
S=0.0115
UPSIZED PIPE FROM 72" TO 84" PER MC DELTA 4
PROP SEWER
CONSTRUCT 258.07 LF 84" RCP D-LOAD=1400
Q_{100}=463.6 CFS, V_{100}=17.1 FPS
STA 85+69.07
END PIPE
INV=734.11
STA 85+74.74
BEGIN PIPE
INV=734.46
PROP 8" SS
726.5± TOP
84+00
85+00
86+00

EXHIBIT 5

X ENGINEERING & CONSULTING, INC.
6 Hutton Centre Drive, Suite 650
Santa Ana, California 92707
949.522.7100 | xengineeringinc.com

MILL CREEK STORM DRAIN PLAN
SHEET 3 OF 4- NORTH OF OLD EDISON AVENUE TO MID OF MIRALOMA SUBSTATION

SCALE:
HOR. 1":40'
VERT1": 4'

1"=40'
1"=4'

EXIST GROUND
PROP FS
℄ MH#19
STA 90+72.41
RIM EL 753.74
RICH-HAVEN 100-YR HGL
W/ DETENTION
PROP 6" FH
749.74 BOP
100 YR HGL
S=0.0102
IDENTICAL POINT
INV=735.47
S=0.0081
STA 88+30.11 BC
INV=736.52
STA 89+09.68 EC
INV=737.83
PROP SEWER
STA 90+70.58
END PIPE
INV=738.46
STA 90+74.24
BEGIN PIPE
INV=738.56
92+27.59 STA
740.12 INV
92+37.59 STA
740.23 INV
INV=740.83
Lat Connection
(Colonial)
92+32.59 STA
740.18 INV
72" RCP
Q_100=62.2 cfs
CONSTRUCT 495.84 L.F. 72" RCP D-LOAD=1800
Q_{100}=383.9 CFS, V_{100}=16.3 FPS
UPSIZED PIPE FROM 72" TO 84" PER MC DELTA 4
CONSTRUCT 225.76 L.F. 72" RCP D-LOAD=1800
V_{100}=383.9 CFS, V_{100}=16.3 FPS
88+00
89+00
90+00
91+00
92+00
℄ MH#20
STA 95+35.99
RIM EL 751.07
℄ FUTURE STREET
EXIST GROUND
PROP GROUND
℄ MH#21
STA 103+39.99
RIM EL 761.27
PROP 6" LH
755.22 BOP
PROP 8" RW
751.62 INV
750.43 TP
PIPE SOFFIT AND INVERT
PER MC DELTA 4
LAT MILLC-A1-17
18" RCP
INV=747.13
100 YR HGL
S=0.0058
INV=740.83
S=0.0102
STA 95+37.67
END PIPE
INV 743.27
STA 95+42.33
BEGIN PIPE
INV 743.37
PROP SEWER
CONSTRUCT 237.67 L.F. 72" RCP D-LOAD=1800
Q_{100}=378.8 CFS, V_{100}=16.3 FPS
CONSTRUCT 495.34 L.F. 72" RCP D-LOAD=1800
Q_{100}=378.8 CFS, V_{100}=16.3 FPS
STA 103+37.67
END PIPE
INV 746.22
STA 104+42.33
BEGIN PIPE
94+00
95+00
96+00
97+00
98+00
99+00
100+00
UPSIZED PIPE FROM 72" TO 84" PER MC DELTA 4

CHINO AVENUE

℄ MH#22
STA 104+43.72
RIM EL 764.71
℄ CHINO AVENUE
EXIST GROUND
PROP GROUND
℄ MH#23
STA 109+26.97
RIM EL 768.97
PROP 6" FH
765.72 BOP
PROP 8" RW
758.64 INV
PROP 16" D
758.34 INV
PROP 12" DW
758.91 INV
PROP 6" FH
760.12 BOP
PROP GAS LINE
PROP DRY UTILITY TRENCH
100 YR HGL
PROP 24" RW
757.12 INV
RICH-HAVEN 100-YR HGL
W/ DETENTION
INV=759.34
S=0.0083
S=0.0173
LAT MILLC-A1-18
18" RCP
INV=752.06
LAT MILLC-A1-19
18" RCP
INV=751.57
LAT MILLC-A14
24" RCP
INV=746.84
LAT MILLC-A15
18" RCP
INV=750.62
S=0.0177
LAT MILLC-A7
24" RCP
INV=747.85
PROP SEWER
INV=747.09
INV=747.09
S=0.0030
S=0.0030
STA 104+27.39
END PIPE
INV=747.47
STA 104+45.05
BEGIN PIPE
INV=747.05
STA 104+75.08 BC
INV=748.36
STA 104+82.89 EC
INV=748.50
STA 105+19.63
END PIPE
INV=749.15
STA 105+38.79
BEGIN PIPE
INV=749.51
TRANSITION STRUCTURE
STA 109+24.63
END PIPE
INV=756.18
STA 109+29.30
BEGIN PIPE
INV=756.28
STA 103+58.58 BC
INV=740.04
STA 102+31.66 EC
INV=746.88
INV 746.32
CONSTRUCT 127.39 L.F. 72" RCP
D-LOAD=1800
Q_{100}=378.8 CFS, V_{100}=13.4 FPS
CONSTRUCT 73.58 L.F. 72" RCP D-LOAD=1800
Q_{100}=87.6 CFS, V_{100}=3.1 FPS
CONSTRUCT 385.84 L.F. 48" RCP D-LOAD=1700
Q_{100}=84.7 CFS, V_{100}=11.0 FPS
CONSTRUCT 370.70 L.F. 48" RCP D-LOAD = 1800
Q_{100}=84.7 CFS, V_{100}=11.0 FPS
CONSTRUCT 257.67 L.F. 72" RCP D-LOAD=1800
Q_{100}=378.8 CFS, V_{100}=13.4 FPS
101+00
102+00
103+00
104+00
105+00
106+00
107+00
108+00
109+00
110+00
111+00
112+00
113+00
CHINO AVENUE DWG #
Modeled End

EXHIBIT 5

X ENGINEERING & CONSULTING, INC.
6 Hutton Centre Drive, Suite 650
Santa Ana, California 92707
949.522.7100 | xengineeringinc.com

MILL CREEK STORM DRAIN PLAN
SHEET 4 OF 4- MID OF MIRALOMA SUBSTATION TO CHINO AVENUE

APPENDIX B
HYDROLGY CALCULATIONS

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018 Version 9.0
Rational Hydrology Study Date: 09/08/22

Rich-Haven Specific Plan
Hydrology Study
100-yr Storm
Haven Storm Drain

Program License Serial Number 6440

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.200 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 4070.000 to Point/Station 4070.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 32.46
Pervious ratio(Ap) = 0.3620 Max loss rate(Fm)= 0.353(In/Hr)
Rainfall intensity = 2.348(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 19.60 min. Rain intensity = 2.35(In/Hr)
Total area this stream = 67.70(Ac.)
Total Study Area (Main Stream No. 1) = 67.70(Ac.)
Total runoff = 121.60(CFS)

++

Process from Point/Station 4070.000 to Point/Station 4075.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 744.000(Ft.)
Downstream point/station elevation = 740.000(Ft.)
Pipe length = 660.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 121.600(CFS)
Given pipe size = 54.00(In.)
Calculated individual pipe flow = 121.600(CFS)
Normal flow depth in pipe = 36.33(In.)

```
Flow top width inside pipe =   50.67(In.)
Critical Depth =   38.94(In.)
Pipe flow velocity =     10.68(Ft/s)
Travel time through pipe =    1.03 min.
Time of concentration (TC) =    20.63 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4070.000 to Point/Station     4075.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     67.700(Ac.)
Runoff from this stream =    121.600(CFS)
Time of concentration =   20.63 min.
Rainfall intensity =     2.277(In/Hr)
Area averaged loss rate (Fm) =    0.3530(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3620
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   640.000(Ft.)
Top (of initial area) elevation =   765.000(Ft.)
Bottom (of initial area) elevation =   761.000(Ft.)
Difference in elevation =     4.000(Ft.)
Slope =    0.00625  s(%)=       0.63
TC = k(0.483)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.670 min.
Rainfall intensity =      2.499(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.601
Subarea runoff =      7.264(CFS)
Total initial stream area =        4.840(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      403.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   753.000(Ft.)
Downstream point/station elevation =   747.000(Ft.)
```

```
Pipe length  =   760.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.264(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =     7.264(CFS)
Normal flow depth in pipe =    8.51(In.)
Flow top width inside pipe =   30.59(In.)
Critical Depth =   10.15(In.)
Pipe flow velocity =      5.69(Ft/s)
Travel time through pipe =    2.23 min.
Time of concentration (TC) =    19.90 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      403.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    19.90 min.
Rainfall intensity =      2.327(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.579
Subarea runoff =     14.841(CFS) for   11.580(Ac.)
Total runoff =     22.106(CFS)
Effective area this stream =       16.42(Ac.)
Total Study Area (Main Stream No. 2) =       84.12(Ac.)
Area averaged Fm value =    0.831(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station     4075.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   747.000(Ft.)
Downstream point/station elevation =   740.000(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.106(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    22.106(CFS)
Normal flow depth in pipe =    5.78(In.)
Flow top width inside pipe =   26.44(In.)
Critical Depth =   18.14(In.)
Pipe flow velocity =     30.09(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    19.91 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station     4075.000
**** SUBAREA FLOW ADDITION ****
```

```
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    19.91 min.
Rainfall intensity =      2.326(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.619
Subarea runoff =      5.444(CFS) for    2.720(Ac.)
Total runoff =     27.549(CFS)
Effective area this stream =       19.14(Ac.)
Total Study Area (Main Stream No. 2) =       86.84(Ac.)
Area averaged Fm value =    0.727(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station     4075.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     19.140(Ac.)
Runoff from this stream =     27.549(CFS)
Time of concentration =   19.91 min.
Rainfall intensity =     2.326(In/Hr)
Area averaged loss rate (Fm) =    0.7269(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7434
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    121.60    67.700     20.63    0.353      2.277
2     27.55    19.140     19.91    0.727      2.326
Qmax(1) =
           1.000 *    1.000 *   121.600) +
           0.969 *    1.000 *    27.549) + =     148.302
Qmax(2) =
           1.026 *    0.965 *   121.600) +
           1.000 *    1.000 *    27.549) + =     147.895

Total of 2 main streams to confluence:
Flow rates before confluence point:
     122.600      28.549
Maximum flow rates at confluence using above data:
      148.302      147.895
Area of streams before confluence:
       67.700       19.140
Effective area values after confluence:
       86.840       84.472
```

```
Results of confluence:
Total flow rate =    148.302(CFS)
Time of concentration =    20.630 min.
Effective stream area after confluence  =     86.840(Ac.)
Study area average Pervious fraction(Ap) =  0.446
Study area average soil loss rate(Fm) =    0.435(In/Hr)
Study area total =      86.84(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4075.000 to Point/Station     4120.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   740.000(Ft.)
Downstream point/station elevation =   729.300(Ft.)
Pipe length  =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   148.302(CFS)
Given pipe size =     60.00(In.)
Calculated individual pipe flow  =   148.302(CFS)
Normal flow depth in pipe =   31.69(In.)
Flow top width inside pipe =   59.91(In.)
Critical Depth =   41.86(In.)
Pipe flow velocity =     14.11(Ft/s)
Travel time through pipe =    1.17 min.
Time of concentration (TC) =    21.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4120.000 to Point/Station     4120.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     86.840(Ac.)
Runoff from this stream =    148.302(CFS)
Time of concentration =   21.80 min.
Rainfall intensity =     2.203(In/Hr)
Area averaged loss rate (Fm) =    0.4354(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4461


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4075.000 to Point/Station     4120.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   990.000(Ft.)
```

```
Top (of initial area) elevation =   740.000(Ft.)
Bottom (of initial area) elevation =   729.300(Ft.)
Difference in elevation =    10.700(Ft.)
Slope =    0.01081  s(%)=       1.08
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.868 min.
Rainfall intensity =      3.173(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.872
Subarea runoff =      8.745(CFS)
Total initial stream area =        3.160(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4120.000 to Point/Station     4120.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.160(Ac.)
Runoff from this stream =      8.745(CFS)
Time of concentration =   11.87 min.
Rainfall intensity =     3.173(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    148.30    86.840     21.80    0.435      2.203
2      8.75     3.160     11.87    0.098      3.173
Qmax(1) =
           1.000 *    1.000 *   148.302) +
           0.685 *    1.000 *     8.745) + =     154.290
Qmax(2) =
           1.549 *    0.544 *   148.302) +
           1.000 *    1.000 *     8.745) + =     133.786

Total of 2 streams to confluence:
Flow rates before confluence point:
     148.302       8.745
Maximum flow rates at confluence using above data:
      154.290      133.786
Area of streams before confluence:
       86.840        3.160
Effective area values after confluence:
       90.000       50.436
Results of confluence:
Total flow rate =    154.290(CFS)
Time of concentration =    21.800 min.
Effective stream area after confluence =     90.000(Ac.)
Study area average Pervious fraction(Ap) =  0.434
Study area average soil loss rate(Fm) =    0.424(In/Hr)
```

```
Study area total (this main stream) =      90.00(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4075.000 to Point/Station     4120.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     90.000(Ac.)
Runoff from this stream =    154.290(CFS)
Time of concentration =   21.80 min.
Rainfall intensity =     2.203(In/Hr)
Area averaged loss rate (Fm) =    0.4236(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4339
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4080.000 to Point/Station     4080.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.04
Pervious ratio(Ap) = 0.3570     Max loss rate(Fm)=     0.349(In/Hr)
Rainfall intensity =      2.612(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  16.41 min.  Rain intensity =       2.61(In/Hr)
Total area this stream =        68.90(Ac.)
Total Study Area (Main Stream No. 2) =      158.90(Ac.)
Total runoff =    121.80(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4080.000 to Point/Station      410.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   747.700(Ft.)
Downstream point/station elevation =   745.890(Ft.)
Pipe length  =   360.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   121.800(CFS)
Given pipe size =     60.00(In.)
Calculated individual pipe flow  =   121.800(CFS)
Normal flow depth in pipe =   35.58(In.)
Flow top width inside pipe =   58.95(In.)
Critical Depth =   37.83(In.)
Pipe flow velocity =     10.05(Ft/s)
Travel time through pipe =    0.60 min.
Time of concentration (TC) =    17.01 min.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Process from Point/Station     4080.000 to Point/Station      410.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     68.900(Ac.)
Runoff from this stream =    121.800(CFS)
Time of concentration =   17.01 min.
Rainfall intensity =     2.557(In/Hr)
Area averaged loss rate (Fm) =    0.3490(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3570


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Process from Point/Station      406.000 to Point/Station      407.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   400.000(Ft.)
Top (of initial area) elevation =   765.000(Ft.)
Bottom (of initial area) elevation =   762.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.00750  s(%)=       0.75
TC = k(0.483)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.118 min.
Rainfall intensity =      2.859(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.638
Subarea runoff =      4.344(CFS)
Total initial stream area =        2.380(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station      407.000 to Point/Station      410.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   749.000(Ft.)
Downstream point/station elevation =   745.890(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.344(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     4.344(CFS)
Normal flow depth in pipe =    5.35(In.)
Flow top width inside pipe =   19.98(In.)
Critical Depth =    8.77(In.)
Pipe flow velocity =      8.33(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    14.32 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      407.000 to Point/Station      410.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    14.32 min.
Rainfall intensity =      2.835(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.676
Subarea runoff =      1.156(CFS) for    0.490(Ac.)
Total runoff =      5.499(CFS)
Effective area this stream =        2.87(Ac.)
Total Study Area (Main Stream No. 2) =      161.77(Ac.)
Area averaged Fm value =    0.706(In/Hr)


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Process from Point/Station      406.000 to Point/Station      410.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.870(Ac.)
Runoff from this stream =      5.499(CFS)
Time of concentration =   14.32 min.
Rainfall intensity =     2.835(In/Hr)
Area averaged loss rate (Fm) =    0.7059(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7220
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    121.80    68.900     17.01    0.349      2.557
2      5.50     2.870     14.32    0.706      2.835
Qmax(1) =
           1.000 *    1.000 *   121.800) +
           0.869 *    1.000 *     5.499) + =     126.581
Qmax(2) =
           1.126 *    0.842 *   121.800) +
           1.000 *    1.000 *     5.499) + =     120.958

Total of 2 streams to confluence:
Flow rates before confluence point:
     121.800       5.499
Maximum flow rates at confluence using above data:
      126.581      120.958
Area of streams before confluence:
       68.900        2.870
```

```
Effective area values after confluence:
       71.770       60.874
Results of confluence:
Total flow rate =    126.581(CFS)
Time of concentration =    17.007 min.
Effective stream area after confluence =     71.770(Ac.)
Study area average Pervious fraction(Ap) =  0.372
Study area average soil loss rate(Fm) =    0.363(In/Hr)
Study area total (this main stream) =      71.77(Ac.)


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Process from Point/Station      410.000 to Point/Station      415.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   745.890(Ft.)
Downstream point/station elevation =   741.230(Ft.)
Pipe length  =   930.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   126.581(CFS)
Given pipe size =     60.00(In.)
Calculated individual pipe flow  =   126.581(CFS)
Normal flow depth in pipe =   36.52(In.)
Flow top width inside pipe =   58.57(In.)
Critical Depth =   38.63(In.)
Pipe flow velocity =     10.12(Ft/s)
Travel time through pipe =    1.53 min.
Time of concentration (TC) =    18.54 min.


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Process from Point/Station      410.000 to Point/Station      415.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     71.770(Ac.)
Runoff from this stream =    126.581(CFS)
Time of concentration =   18.54 min.
Rainfall intensity =     2.428(In/Hr)
Area averaged loss rate (Fm) =    0.3633(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3716


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Process from Point/Station      411.000 to Point/Station      412.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   630.000(Ft.)
```

```
Top (of initial area) elevation =   759.000(Ft.)
Bottom (of initial area) elevation =   756.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.00476  s(%)=       0.48
TC = k(0.483)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.541 min.
Rainfall intensity =      2.428(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.592
Subarea runoff =      6.207(CFS)
Total initial stream area =        4.320(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station      412.000 to Point/Station      415.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   749.000(Ft.)
Downstream point/station elevation =   741.230(Ft.)
Pipe length  =   840.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.207(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     6.207(CFS)
Normal flow depth in pipe =    8.78(In.)
Flow top width inside pipe =   23.12(In.)
Critical Depth =   10.57(In.)
Pipe flow velocity =      5.97(Ft/s)
Travel time through pipe =    2.34 min.
Time of concentration (TC) =    20.88 min.


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Process from Point/Station      412.000 to Point/Station      415.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    20.88 min.
Rainfall intensity =      2.260(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.569
Subarea runoff =     13.730(CFS) for   11.180(Ac.)
Total runoff =     19.937(CFS)
Effective area this stream =       15.50(Ac.)
Total Study Area (Main Stream No. 2) =      177.27(Ac.)
Area averaged Fm value =    0.831(In/Hr)


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Process from Point/Station      412.000 to Point/Station      415.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    20.88 min.
Rainfall intensity =      2.260(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.591
Subarea runoff =      2.491(CFS) for    1.280(Ac.)
Total runoff =     22.429(CFS)
Effective area this stream =       16.78(Ac.)
Total Study Area (Main Stream No. 2) =      178.55(Ac.)
Area averaged Fm value =    0.775(In/Hr)


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Process from Point/Station      411.000 to Point/Station      415.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     16.780(Ac.)
Runoff from this stream =     22.429(CFS)
Time of concentration =   20.88 min.
Rainfall intensity =     2.260(In/Hr)
Area averaged loss rate (Fm) =    0.7752(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7928
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    126.58    71.770     18.54    0.363      2.428
2     22.43    16.780     20.88    0.775      2.260
Qmax(1) =
           1.000 *    1.000 *   126.581) +
           1.113 *    0.888 *    22.429) + =     148.736
Qmax(2) =
           0.919 *    1.000 *   126.581) +
           1.000 *    1.000 *    22.429) + =     138.741

Total of 2 streams to confluence:
Flow rates before confluence point:
     126.581      22.429
Maximum flow rates at confluence using above data:
      148.736      138.741
Area of streams before confluence:
       71.770       16.780
Effective area values after confluence:
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```
       86.666       88.550
Results of confluence:
Total flow rate =    148.736(CFS)
Time of concentration =    18.539 min.
Effective stream area after confluence =     86.666(Ac.)
Study area average Pervious fraction(Ap) =  0.451
Study area average soil loss rate(Fm) =    0.441(In/Hr)
Study area total (this main stream) =      88.55(Ac.)


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Process from Point/Station      415.000 to Point/Station      416.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   741.230(Ft.)
Downstream point/station elevation =   739.420(Ft.)
Pipe length  =   240.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   148.736(CFS)
Given pipe size =     72.00(In.)
Calculated individual pipe flow  =   148.736(CFS)
Normal flow depth in pipe =   31.88(In.)
Flow top width inside pipe =   71.53(In.)
Critical Depth =   39.77(In.)
Pipe flow velocity =     12.32(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    18.86 min.


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Process from Point/Station      415.000 to Point/Station      416.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     86.666(Ac.)
Runoff from this stream =    148.736(CFS)
Time of concentration =   18.86 min.
Rainfall intensity =     2.403(In/Hr)
Area averaged loss rate (Fm) =    0.4413(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4514


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Process from Point/Station      416.000 to Point/Station      416.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 31.61
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Rainfall intensity =      2.642(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  16.10 min.  Rain intensity =       2.64(In/Hr)
Total area this stream =        14.60(Ac.)
Total Study Area (Main Stream No. 2) =      193.15(Ac.)
Total runoff =     32.50(CFS)
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Process from Point/Station      416.000 to Point/Station      416.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.600(Ac.)
Runoff from this stream =     32.500(CFS)
Time of concentration =   16.10 min.
Rainfall intensity =     2.642(In/Hr)
Area averaged loss rate (Fm) =    0.1960(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    148.74    86.666     18.86    0.441      2.403
2     32.50    14.600     16.10    0.196      2.642
Qmax(1) =
           1.000 *    1.000 *   148.736) +
           0.902 *    1.000 *    32.500) + =     178.052
Qmax(2) =
           1.122 *    0.853 *   148.736) +
           1.000 *    1.000 *    32.500) + =     174.951

Total of 2 streams to confluence:
Flow rates before confluence point:
     148.736      32.500
Maximum flow rates at confluence using above data:
      178.052      174.951
Area of streams before confluence:
       86.666       14.600
Effective area values after confluence:
      101.266       88.567
Results of confluence:
Total flow rate =    178.052(CFS)
Time of concentration =    18.864 min.
Effective stream area after confluence =    101.266(Ac.)
Study area average Pervious fraction(Ap) =  0.415
Study area average soil loss rate(Fm) =    0.406(In/Hr)
Study area total (this main stream) =     101.27(Ac.)


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Process from Point/Station      416.000 to Point/Station      420.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   739.420(Ft.)
Downstream point/station elevation =   730.300(Ft.)
Pipe length  =  1550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   178.052(CFS)
Given pipe size =     72.00(In.)
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Calculated individual pipe flow  =   178.052(CFS)
Normal flow depth in pipe =   38.02(In.)
Flow top width inside pipe =   71.89(In.)
Critical Depth =   43.65(In.)
Pipe flow velocity =     11.75(Ft/s)
Travel time through pipe =    2.20 min.
Time of concentration (TC) =    21.06 min.


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Process from Point/Station      416.000 to Point/Station      420.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    101.266(Ac.)
Runoff from this stream =    178.052(CFS)
Time of concentration =   21.06 min.
Rainfall intensity =     2.249(In/Hr)
Area averaged loss rate (Fm) =    0.4060(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4152


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Process from Point/Station      417.000 to Point/Station      416.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Initial subarea data:
Initial area flow distance =   275.000(Ft.)
Top (of initial area) elevation =   758.200(Ft.)
Bottom (of initial area) elevation =   755.400(Ft.)
Difference in elevation =     2.800(Ft.)
Slope =    0.01018  s(%)=       1.02
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.669 min.
Rainfall intensity =      4.123(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.857
Subarea runoff =      1.273(CFS)
Total initial stream area =        0.360(Ac.)
Pervious area fraction = 0.200
Initial area Fm value =    0.196(In/Hr)


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Process from Point/Station      416.000 to Point/Station      420.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   739.420(Ft.)
Downstream point/station elevation =   730.300(Ft.)
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```
Pipe length  =  1550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.273(CFS)
Given pipe size =     72.00(In.)
Calculated individual pipe flow  =     1.273(CFS)
Normal flow depth in pipe =    3.27(In.)
Flow top width inside pipe =   29.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =      2.77(Ft/s)
Travel time through pipe =    9.31 min.
Time of concentration (TC) =    16.98 min.


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Process from Point/Station      416.000 to Point/Station      420.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Time of concentration =    16.98 min.
Rainfall intensity =      2.559(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =     16.723(CFS) for    8.100(Ac.)
Total runoff =     17.996(CFS)
Effective area this stream =        8.46(Ac.)
Total Study Area (Main Stream No. 2) =      201.61(Ac.)
Area averaged Fm value =    0.196(In/Hr)


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Process from Point/Station      420.000 to Point/Station      420.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      8.460(Ac.)
Runoff from this stream =     17.996(CFS)
Time of concentration =   16.98 min.
Rainfall intensity =     2.559(In/Hr)
Area averaged loss rate (Fm) =    0.1956(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    178.05   101.266     21.06    0.406      2.249
2     18.00     8.460     16.98    0.196      2.559
Qmax(1) =
           1.000 *    1.000 *   178.052) +
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           0.869 *    1.000 *    17.996) + =     193.686
Qmax(2) =
           1.168 *    0.806 *   178.052) +
           1.000 *    1.000 *    17.996) + =     185.715

Total of 2 streams to confluence:
Flow rates before confluence point:
     178.052      17.996
Maximum flow rates at confluence using above data:
      193.686      185.715
Area of streams before confluence:
      101.266        8.460
Effective area values after confluence:
      109.726       90.108
Results of confluence:
Total flow rate =    193.686(CFS)
Time of concentration =    21.062 min.
Effective stream area after confluence =    109.726(Ac.)
Study area average Pervious fraction(Ap) =  0.399
Study area average soil loss rate(Fm) =    0.390(In/Hr)
Study area total (this main stream) =     109.73(Ac.)


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Process from Point/Station      420.000 to Point/Station     4120.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   730.300(Ft.)
Downstream point/station elevation =   729.300(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   193.686(CFS)
Given pipe size =     72.00(In.)
Calculated individual pipe flow  =   193.686(CFS)
Normal flow depth in pipe =   22.10(In.)
Flow top width inside pipe =   66.42(In.)
Critical Depth =   45.62(In.)
Pipe flow velocity =     26.32(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    21.08 min.


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Process from Point/Station     4080.000 to Point/Station     4120.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    109.726(Ac.)
Runoff from this stream =    193.686(CFS)
Time of concentration =   21.08 min.
Rainfall intensity =     2.248(In/Hr)
Area averaged loss rate (Fm) =    0.3897(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3986
Summary of stream data:
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Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    154.29    90.000     21.80    0.424      2.203
2    193.69   109.726     21.08    0.390      2.248
Qmax(1) =
           1.000 *    1.000 *   154.290) +
           0.976 *    1.000 *   193.686) + =     343.270
Qmax(2) =
           1.025 *    0.967 *   154.290) +
           1.000 *    1.000 *   193.686) + =     346.631

Total of 2 main streams to confluence:
Flow rates before confluence point:
     155.290     194.686
Maximum flow rates at confluence using above data:
      343.270      346.631
Area of streams before confluence:
       90.000      109.726
Effective area values after confluence:
      199.726      196.733


Results of confluence:
Total flow rate =    346.631(CFS)
Time of concentration =    21.075 min.
Effective stream area after confluence  =    196.733(Ac.)
Study area average Pervious fraction(Ap) =  0.414
Study area average soil loss rate(Fm) =    0.405(In/Hr)
Study area total =     199.73(Ac.)


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Process from Point/Station     4120.000 to Point/Station      430.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   729.300(Ft.)
Downstream point/station elevation =   725.100(Ft.)
Pipe length  =   490.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   346.631(CFS)
Given pipe size =     72.00(In.)
Calculated individual pipe flow  =   346.631(CFS)
Normal flow depth in pipe =   52.59(In.)
Flow top width inside pipe =   63.90(In.)
Critical Depth =   60.58(In.)
Pipe flow velocity =     15.66(Ft/s)
Travel time through pipe =    0.52 min.
Time of concentration (TC) =    21.60 min.


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Process from Point/Station     4120.000 to Point/Station      430.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
```

```
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    196.733(Ac.)
Runoff from this stream =    346.631(CFS)
Time of concentration =   21.60 min.
Rainfall intensity =     2.215(In/Hr)
Area averaged loss rate (Fm) =    0.4050(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4145
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      426.000 to Point/Station      426.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 31.61
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Rainfall intensity =      3.076(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.50 min.  Rain intensity =       3.08(In/Hr)
Total area this stream =         2.80(Ac.)
Total Study Area (Main Stream No. 2) =      204.41(Ac.)
Total runoff =      7.30(CFS)


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Process from Point/Station      426.000 to Point/Station      427.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   739.390(Ft.)
Downstream point/station elevation =   730.300(Ft.)
Pipe length  =  1590.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.300(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =     7.300(CFS)
Normal flow depth in pipe =    9.26(In.)
Flow top width inside pipe =   31.47(In.)
Critical Depth =   10.18(In.)
Pipe flow velocity =      5.08(Ft/s)
Travel time through pipe =    5.22 min.
Time of concentration (TC) =    17.72 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      426.000 to Point/Station      427.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
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```
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Time of concentration =    17.72 min.
Rainfall intensity =      2.495(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =     41.557(CFS) for   20.810(Ac.)
Total runoff =     48.857(CFS)
Effective area this stream =       23.61(Ac.)
Total Study Area (Main Stream No. 2) =      225.22(Ac.)
Area averaged Fm value =    0.196(In/Hr)


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Process from Point/Station      427.000 to Point/Station      430.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   730.300(Ft.)
Downstream point/station elevation =   729.300(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    48.857(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    48.857(CFS)
Normal flow depth in pipe =   14.18(In.)
Flow top width inside pipe =   35.18(In.)
Critical Depth =   27.31(In.)
Pipe flow velocity =     18.89(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    17.73 min.


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Process from Point/Station      426.000 to Point/Station      430.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     23.610(Ac.)
Runoff from this stream =     48.857(CFS)
Time of concentration =   17.73 min.
Rainfall intensity =     2.493(In/Hr)
Area averaged loss rate (Fm) =    0.1956(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    346.63   196.733     21.60    0.405      2.215
2     48.86    23.610     17.73    0.196      2.493
Qmax(1) =
          1.000 *    1.000 *   346.631) +
          0.879 *    1.000 *    48.857) + =     389.576
Qmax(2) =
          1.154 *    0.821 *   346.631) +
```

```
           1.000 *    1.000 *    48.857) + =     377.206

Total of 2 main streams to confluence:
Flow rates before confluence point:
     347.631      49.857
Maximum flow rates at confluence using above data:
      389.576      377.206
Area of streams before confluence:
      196.733       23.610
Effective area values after confluence:
      220.343      185.156


Results of confluence:
Total flow rate =    389.576(CFS)
Time of concentration =    21.597 min.
Effective stream area after confluence  =    220.343(Ac.)
Study area average Pervious fraction(Ap) =  0.392
Study area average soil loss rate(Fm) =    0.383(In/Hr)
Study area total =     220.34(Ac.)


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Process from Point/Station      430.000 to Point/Station      440.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   725.100(Ft.)
Downstream point/station elevation =   721.360(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   389.576(CFS)
Given pipe size =     72.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     4.911(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      4.229(Ft.)
 Minor friction loss =      4.422(Ft.)  K-factor =   1.50
Pipe flow velocity =     13.78(Ft/s)
Travel time through pipe =    0.60 min.
Time of concentration (TC) =    22.20 min.


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Process from Point/Station      430.000 to Point/Station      440.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    220.343(Ac.)
Runoff from this stream =    389.576(CFS)
Time of concentration =   22.20 min.
Rainfall intensity =     2.179(In/Hr)
Area averaged loss rate (Fm) =    0.3825(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3915


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Process from Point/Station      430.000 to Point/Station      440.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   500.000(Ft.)
Top (of initial area) elevation =   725.100(Ft.)
Bottom (of initial area) elevation =   721.360(Ft.)
Difference in elevation =     3.740(Ft.)
Slope =    0.00748  s(%)=       0.75
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.720 min.
Rainfall intensity =      3.577(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     31.309(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      430.000 to Point/Station      440.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     9.72 min.
Rainfall intensity =      3.577(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.875
Subarea runoff =     11.302(CFS) for    3.610(Ac.)
Total runoff =     42.611(CFS)
Effective area this stream =       13.61(Ac.)
Total Study Area (Main Stream No. 1) =      238.83(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station      440.000 to Point/Station      440.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     13.610(Ac.)
Runoff from this stream =     42.611(CFS)
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```
Time of concentration =    9.72 min.
Rainfall intensity =     3.577(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    389.58   220.343     22.20    0.383      2.179
2     42.61    13.610      9.72    0.098      3.577
Qmax(1) =
           1.000 *    1.000 *   389.576) +
           0.598 *    1.000 *    42.611) + =     415.068
Qmax(2) =
           1.778 *    0.438 *   389.576) +
           1.000 *    1.000 *    42.611) + =     345.880

Total of 2 streams to confluence:
Flow rates before confluence point:
     389.576      42.611
Maximum flow rates at confluence using above data:
      415.068      345.880
Area of streams before confluence:
      220.343       13.610
Effective area values after confluence:
      233.953      110.082
Results of confluence:
Total flow rate =    415.068(CFS)
Time of concentration =    22.201 min.
Effective stream area after confluence =    233.953(Ac.)
Study area average Pervious fraction(Ap) =  0.375
Study area average soil loss rate(Fm) =    0.366(In/Hr)
Study area total (this main stream) =     233.95(Ac.)


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Process from Point/Station      440.000 to Point/Station      445.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   721.360(Ft.)
Downstream point/station elevation =   716.140(Ft.)
Pipe length  =   630.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   415.068(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   415.068(CFS)
Normal flow depth in pipe =   52.50(In.)
Flow top width inside pipe =   81.33(In.)
Critical Depth =   64.38(In.)
Pipe flow velocity =     16.42(Ft/s)
Travel time through pipe =    0.64 min.
Time of concentration (TC) =    22.84 min.
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Process from Point/Station      445.000 to Point/Station      445.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    233.953(Ac.)
Runoff from this stream =    415.068(CFS)
Time of concentration =   22.84 min.
Rainfall intensity =     2.142(In/Hr)
Area averaged loss rate (Fm) =    0.3660(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3746


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      440.000 to Point/Station      445.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   630.000(Ft.)
Top (of initial area) elevation =   721.360(Ft.)
Bottom (of initial area) elevation =   716.140(Ft.)
Difference in elevation =     5.220(Ft.)
Slope =    0.00829  s(%)=       0.83
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.446 min.
Rainfall intensity =      3.425(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.874
Subarea runoff =      7.008(CFS)
Total initial stream area =        2.340(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      445.000 to Point/Station      445.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.340(Ac.)
Runoff from this stream =      7.008(CFS)
Time of concentration =   10.45 min.
Rainfall intensity =     3.425(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)
```

```
1    415.07   233.953     22.84    0.366      2.142
2      7.01     2.340     10.45    0.098      3.425
Qmax(1) =
           1.000 *    1.000 *   415.068) +
           0.614 *    1.000 *     7.008) + =     419.373
Qmax(2) =
           1.722 *    0.457 *   415.068) +
           1.000 *    1.000 *     7.008) + =     333.975

Total of 2 streams to confluence:
Flow rates before confluence point:
     415.068       7.008
Maximum flow rates at confluence using above data:
      419.373      333.975
Area of streams before confluence:
      233.953        2.340
Effective area values after confluence:
      236.293      109.334
Results of confluence:
Total flow rate =    419.373(CFS)
Time of concentration =    22.841 min.
Effective stream area after confluence =    236.293(Ac.)
Study area average Pervious fraction(Ap) =  0.372
Study area average soil loss rate(Fm) =    0.363(In/Hr)
Study area total (this main stream) =     236.29(Ac.)


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Process from Point/Station      440.000 to Point/Station      445.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    236.293(Ac.)
Runoff from this stream =    419.373(CFS)
Time of concentration =   22.84 min.
Rainfall intensity =     2.142(In/Hr)
Area averaged loss rate (Fm) =    0.3633(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3718
Program is now starting with Main Stream No. 2


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Process from Point/Station      445.000 to Point/Station      445.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 55.61
Pervious ratio(Ap) = 0.2300     Max loss rate(Fm)=     0.170(In/Hr)
Rainfall intensity =      3.597(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.63 min.  Rain intensity =       3.60(In/Hr)
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Total area this stream =        36.30(Ac.)
Total Study Area (Main Stream No. 2) =      277.47(Ac.)
Total runoff =     95.46(CFS)


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Process from Point/Station      445.000 to Point/Station      445.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     36.300(Ac.)
Runoff from this stream =     95.460(CFS)
Time of concentration =    9.63 min.
Rainfall intensity =     3.597(In/Hr)
Area averaged loss rate (Fm) =    0.1700(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2300
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    419.37   236.293     22.84    0.363      2.142
2     95.46    36.300      9.63    0.170      3.597
Qmax(1) =
           1.000 *    1.000 *   419.373) +
           0.576 *    1.000 *    95.460) + =     474.313
Qmax(2) =
           1.818 *    0.422 *   419.373) +
           1.000 *    1.000 *    95.460) + =     416.851

Total of 2 main streams to confluence:
Flow rates before confluence point:
     420.373      96.460
Maximum flow rates at confluence using above data:
      474.313      416.851
Area of streams before confluence:
      236.293       36.300
Effective area values after confluence:
      272.593      135.924


Results of confluence:
Total flow rate =    474.313(CFS)
Time of concentration =    22.841 min.
Effective stream area after confluence  =    272.593(Ac.)
Study area average Pervious fraction(Ap) =  0.353
Study area average soil loss rate(Fm) =    0.338(In/Hr)
Study area total =     272.59(Ac.)


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Process from Point/Station      445.000 to Point/Station      450.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
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Upstream point/station elevation =   715.590(Ft.)
Downstream point/station elevation =   713.200(Ft.)
Pipe length  =   360.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   474.313(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   474.313(CFS)
Normal flow depth in pipe =   63.00(In.)
Flow top width inside pipe =   72.75(In.)
Critical Depth =   68.51(In.)
Pipe flow velocity =     15.33(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    23.23 min.


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Process from Point/Station      445.000 to Point/Station      450.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    272.593(Ac.)
Runoff from this stream =    474.313(CFS)
Time of concentration =   23.23 min.
Rainfall intensity =     2.120(In/Hr)
Area averaged loss rate (Fm) =    0.3376(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3529
Program is now starting with Main Stream No. 2


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Process from Point/Station      450.000 to Point/Station      450.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 58.53
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.070(In/Hr)
Rainfall intensity =      5.304(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   5.04 min.  Rain intensity =       5.30(In/Hr)
Total area this stream =         4.10(Ac.)
Total Study Area (Main Stream No. 2) =      281.57(Ac.)
Total runoff =     21.00(CFS)


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Process from Point/Station      450.000 to Point/Station      450.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.100(Ac.)
Runoff from this stream =     21.000(CFS)
Time of concentration =    5.04 min.
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Rainfall intensity =     5.304(In/Hr)
Area averaged loss rate (Fm) =    0.0700(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    474.31   272.593     23.23    0.338      2.120
2     21.00     4.100      5.04    0.070      5.304
Qmax(1) =
           1.000 *    1.000 *   474.313) +
           0.392 *    1.000 *    21.000) + =     482.539
Qmax(2) =
           2.786 *    0.217 *   474.313) +
           1.000 *    1.000 *    21.000) + =     307.649

Total of 2 main streams to confluence:
Flow rates before confluence point:
     475.313      22.000
Maximum flow rates at confluence using above data:
      482.539      307.649
Area of streams before confluence:
      272.593        4.100
Effective area values after confluence:
      276.693       63.236


Results of confluence:
Total flow rate =    482.539(CFS)
Time of concentration =    23.232 min.
Effective stream area after confluence  =    276.693(Ac.)
Study area average Pervious fraction(Ap) =  0.349
Study area average soil loss rate(Fm) =    0.334(In/Hr)
Study area total =     276.69(Ac.)


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Process from Point/Station      450.000 to Point/Station     4170.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   712.610(Ft.)
Downstream point/station elevation =   710.300(Ft.)
Pipe length  =   340.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   482.539(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   482.539(CFS)
Normal flow depth in pipe =   63.28(In.)
Flow top width inside pipe =   72.42(In.)
Critical Depth =   69.04(In.)
Pipe flow velocity =     15.52(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    23.60 min.
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Process from Point/Station     4170.000 to Point/Station     4170.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    276.693(Ac.)
Runoff from this stream =    482.539(CFS)
Time of concentration =   23.60 min.
Rainfall intensity =     2.101(In/Hr)
Area averaged loss rate (Fm) =    0.3336(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3492
Program is now starting with Main Stream No. 2


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Process from Point/Station     4170.000 to Point/Station     4170.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 55.61
Pervious ratio(Ap) = 0.2300     Max loss rate(Fm)=     0.170(In/Hr)
Rainfall intensity =      3.165(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  11.92 min.  Rain intensity =       3.16(In/Hr)
Total area this stream =         8.60(Ac.)
Total Study Area (Main Stream No. 2) =      290.17(Ac.)
Total runoff =     22.10(CFS)


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Process from Point/Station     4170.000 to Point/Station     4170.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      8.600(Ac.)
Runoff from this stream =     22.100(CFS)
Time of concentration =   11.92 min.
Rainfall intensity =     3.165(In/Hr)
Area averaged loss rate (Fm) =    0.1700(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2300
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    482.54   276.693     23.60    0.334      2.101
2     22.10     8.600     11.92    0.170      3.165
Qmax(1) =
           1.000 *    1.000 *   482.539) +
           0.645 *    1.000 *    22.100) + =     496.788
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Qmax(2) =
           1.602 *    0.505 *   482.539) +
           1.000 *    1.000 *    22.100) + =     412.602

Total of 2 main streams to confluence:
Flow rates before confluence point:
     483.539      23.100
Maximum flow rates at confluence using above data:
      496.788      412.602
Area of streams before confluence:
      276.693        8.600
Effective area values after confluence:
      285.293      148.368


Results of confluence:
Total flow rate =    496.788(CFS)
Time of concentration =    23.597 min.
Effective stream area after confluence  =    285.293(Ac.)
Study area average Pervious fraction(Ap) =  0.346
Study area average soil loss rate(Fm) =    0.329(In/Hr)
Study area total =     285.29(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4170.000 to Point/Station     4170.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    285.293(Ac.)
Runoff from this stream =    496.788(CFS)
Time of concentration =   23.60 min.
Rainfall intensity =     2.101(In/Hr)
Area averaged loss rate (Fm) =    0.3287(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3456


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      450.000 to Point/Station     4170.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   340.000(Ft.)
Top (of initial area) elevation =   712.610(Ft.)
Bottom (of initial area) elevation =   710.300(Ft.)
Difference in elevation =     2.310(Ft.)
Slope =    0.00679  s(%)=       0.68
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =    8.493 min.
Rainfall intensity =      3.878(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.877
Subarea runoff =     22.219(CFS)
Total initial stream area =        6.530(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4170.000 to Point/Station     4170.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      6.530(Ac.)
Runoff from this stream =     22.219(CFS)
Time of concentration =    8.49 min.
Rainfall intensity =     3.878(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    496.79   285.293     23.60    0.329      2.101
2     22.22     6.530      8.49    0.098      3.878
Qmax(1) =
           1.000 *    1.000 *   496.788) +
           0.530 *    1.000 *    22.219) + =     508.559
Qmax(2) =
           2.003 *    0.360 *   496.788) +
           1.000 *    1.000 *    22.219) + =     380.380

Total of 2 streams to confluence:
Flow rates before confluence point:
     496.788      22.219
Maximum flow rates at confluence using above data:
      508.559      380.380
Area of streams before confluence:
      285.293        6.530
Effective area values after confluence:
      291.823      109.205
Results of confluence:
Total flow rate =    508.559(CFS)
Time of concentration =    23.597 min.
Effective stream area after confluence =    291.823(Ac.)
Study area average Pervious fraction(Ap) =  0.340
Study area average soil loss rate(Fm) =    0.324(In/Hr)
Study area total (this main stream) =     291.82(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4170.000 to Point/Station      455.000
```

```
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____________________________________________________________________
Upstream point/station elevation =   709.250(Ft.)
Downstream point/station elevation =   706.460(Ft.)
Pipe length  =   440.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   508.559(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   508.559(CFS)
Normal flow depth in pipe =   68.88(In.)
Flow top width inside pipe =   64.54(In.)
Critical Depth =   70.61(In.)
Pipe flow velocity =     15.07(Ft/s)
Travel time through pipe =    0.49 min.
Time of concentration (TC) =    24.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      455.000 to Point/Station      455.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    291.823(Ac.)
Runoff from this stream =    508.559(CFS)
Time of concentration =   24.08 min.
Rainfall intensity =     2.075(In/Hr)
Area averaged loss rate (Fm) =    0.3235(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3401
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      455.000 to Point/Station      455.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
_____________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 58.53
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.070(In/Hr)
Rainfall intensity =      4.142(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.61 min.  Rain intensity =       4.14(In/Hr)
Total area this stream =        10.00(Ac.)
Total Study Area (Main Stream No. 2) =      306.70(Ac.)
Total runoff =     38.71(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      455.000 to Point/Station      455.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     10.000(Ac.)
Runoff from this stream =     38.710(CFS)
```

```
Time of concentration =    7.61 min.
Rainfall intensity =     4.142(In/Hr)
Area averaged loss rate (Fm) =    0.0700(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    508.56   291.823     24.08    0.324      2.075
2     38.71    10.000      7.61    0.070      4.142
Qmax(1) =
           1.000 *    1.000 *   508.559) +
           0.492 *    1.000 *    38.710) + =     527.618
Qmax(2) =
           2.180 *    0.316 *   508.559) +
           1.000 *    1.000 *    38.710) + =     389.054

Total of 2 main streams to confluence:
Flow rates before confluence point:
     509.559      39.710
Maximum flow rates at confluence using above data:
      527.618      389.054
Area of streams before confluence:
      291.823       10.000
Effective area values after confluence:
      301.823      102.209


Results of confluence:
Total flow rate =    527.618(CFS)
Time of concentration =    24.084 min.
Effective stream area after confluence  =    301.823(Ac.)
Study area average Pervious fraction(Ap) =  0.332
Study area average soil loss rate(Fm) =    0.315(In/Hr)
Study area total =     301.82(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      455.000 to Point/Station      460.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   706.460(Ft.)
Downstream point/station elevation =   705.230(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   527.618(CFS)
Given pipe size =     84.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     4.512(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      1.364(Ft.)
 Minor friction loss =      4.378(Ft.)  K-factor =   1.50
Pipe flow velocity =     13.71(Ft/s)
Travel time through pipe =    0.24 min.
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Time of concentration (TC) =    24.33 min.


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Process from Point/Station      455.000 to Point/Station      460.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    301.823(Ac.)
Runoff from this stream =    527.618(CFS)
Time of concentration =   24.33 min.
Rainfall intensity =     2.063(In/Hr)
Area averaged loss rate (Fm) =    0.3151(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3322
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    527.62   301.823     24.33    0.315      2.063
Qmax(1) =
           1.000 *    1.000 *   527.618) + =     527.618

Total of 1 main streams to confluence:
Flow rates before confluence point:
     528.618
Maximum flow rates at confluence using above data:
      527.618
Area of streams before confluence:
      301.823
Effective area values after confluence:
      301.823


Results of confluence:
Total flow rate =    527.618(CFS)
Time of concentration =    24.327 min.
Effective stream area after confluence  =    301.823(Ac.)
Study area average Pervious fraction(Ap) =  0.332
Study area average soil loss rate(Fm) =    0.315(In/Hr)
Study area total =     301.82(Ac.)


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Process from Point/Station      460.000 to Point/Station      460.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 31.86
Pervious ratio(Ap) = 0.1870     Max loss rate(Fm)=     0.183(In/Hr)
Rainfall intensity =      3.339(In/Hr) for a   100.0 year storm
User specified values are as follows:
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```
TC =  10.90 min.  Rain intensity =       3.34(In/Hr)
Total area this stream =        19.75(Ac.)
Total Study Area (Main Stream No. 1) =      326.45(Ac.)
Total runoff =     50.20(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      460.000 to Point/Station      460.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     19.750(Ac.)
Runoff from this stream =     50.200(CFS)
Time of concentration =   10.90 min.
Rainfall intensity =     3.339(In/Hr)
Area averaged loss rate (Fm) =    0.1830(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1870
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    527.62   301.823     24.33    0.315      2.063
2     50.20    19.750     10.90    0.183      3.339
Qmax(1) =
           1.000 *    1.000 *   527.618) +
           0.596 *    1.000 *    50.200) + =     557.516
Qmax(2) =
           1.730 *    0.448 *   527.618) +
           1.000 *    1.000 *    50.200) + =     459.275

Total of 2 main streams to confluence:
Flow rates before confluence point:
     528.618      51.200
Maximum flow rates at confluence using above data:
      557.516      459.275
Area of streams before confluence:
      301.823       19.750
Effective area values after confluence:
      321.573      154.984


Results of confluence:
Total flow rate =    557.516(CFS)
Time of concentration =    24.327 min.
Effective stream area after confluence  =    321.573(Ac.)
Study area average Pervious fraction(Ap) =  0.323
Study area average soil loss rate(Fm) =    0.307(In/Hr)
Study area total =     321.57(Ac.)


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Process from Point/Station      460.000 to Point/Station      465.000
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**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____________________________________________________________________
Upstream point/station elevation =   705.230(Ft.)
Downstream point/station elevation =   702.700(Ft.)
Pipe length  =   420.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   557.516(CFS)
Given pipe size =     84.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     5.556(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      3.198(Ft.)
 Minor friction loss =      4.888(Ft.)  K-factor =   1.50
Pipe flow velocity =     14.49(Ft/s)
Travel time through pipe =    0.48 min.
Time of concentration (TC) =    24.81 min.


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Process from Point/Station      460.000 to Point/Station      465.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    321.573(Ac.)
Runoff from this stream =    557.516(CFS)
Time of concentration =   24.81 min.
Rainfall intensity =     2.038(In/Hr)
Area averaged loss rate (Fm) =    0.3070(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3232
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      465.000 to Point/Station      465.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
_____________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.07
Pervious ratio(Ap) = 0.1910     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      4.044(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.92 min.  Rain intensity =       4.04(In/Hr)
Total area this stream =         6.67(Ac.)
Total Study Area (Main Stream No. 2) =      333.12(Ac.)
Total runoff =     23.53(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      465.000 to Point/Station      465.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.670(Ac.)
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```
Runoff from this stream =     23.530(CFS)
Time of concentration =    7.92 min.
Rainfall intensity =     4.044(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1910
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    557.52   321.573     24.81    0.307      2.038
2     23.53     6.670      7.92    0.140      4.044
Qmax(1) =
           1.000 *    1.000 *   557.516) +
           0.486 *    1.000 *    23.530) + =     568.957
Qmax(2) =
           2.159 *    0.319 *   557.516) +
           1.000 *    1.000 *    23.530) + =     407.678

Total of 2 main streams to confluence:
Flow rates before confluence point:
     558.516      24.530
Maximum flow rates at confluence using above data:
      568.957      407.678
Area of streams before confluence:
      321.573        6.670
Effective area values after confluence:
      328.243      109.322


Results of confluence:
Total flow rate =    568.957(CFS)
Time of concentration =    24.811 min.
Effective stream area after confluence  =    328.243(Ac.)
Study area average Pervious fraction(Ap) =  0.321
Study area average soil loss rate(Fm) =    0.304(In/Hr)
Study area total =     328.24(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      465.000 to Point/Station     4171.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   702.700(Ft.)
Downstream point/station elevation =   701.370(Ft.)
Pipe length  =   210.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   568.957(CFS)
Given pipe size =     84.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     5.426(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      1.665(Ft.)
 Minor friction loss =      5.091(Ft.)  K-factor =   1.50
Pipe flow velocity =     14.78(Ft/s)
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Travel time through pipe =    0.24 min.
Time of concentration (TC) =    25.05 min.


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Process from Point/Station      465.000 to Point/Station     4171.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    328.243(Ac.)
Runoff from this stream =    568.957(CFS)
Time of concentration =   25.05 min.
Rainfall intensity =     2.027(In/Hr)
Area averaged loss rate (Fm) =    0.3036(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3206
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4171.000 to Point/Station     4171.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 31.98
Pervious ratio(Ap) = 0.1810     Max loss rate(Fm)=     0.177(In/Hr)
Rainfall intensity =      2.966(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  13.28 min.  Rain intensity =       2.97(In/Hr)
Total area this stream =        14.13(Ac.)
Total Study Area (Main Stream No. 2) =      347.25(Ac.)
Total runoff =     35.60(CFS)


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Process from Point/Station     4171.000 to Point/Station     4171.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     14.130(Ac.)
Runoff from this stream =     35.600(CFS)
Time of concentration =   13.28 min.
Rainfall intensity =     2.966(In/Hr)
Area averaged loss rate (Fm) =    0.1770(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1810
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    568.96   328.243     25.05    0.304      2.027
2     35.60    14.130     13.28    0.177      2.966
```

```
Qmax(1) =
           1.000 *    1.000 *   568.957) +
           0.663 *    1.000 *    35.600) + =     592.570
Qmax(2) =
           1.545 *    0.530 *   568.957) +
           1.000 *    1.000 *    35.600) + =     501.647

Total of 2 main streams to confluence:
Flow rates before confluence point:
     569.957      36.600
Maximum flow rates at confluence using above data:
      592.570      501.647
Area of streams before confluence:
      328.243       14.130
Effective area values after confluence:
      342.373      188.164


Results of confluence:
Total flow rate =    592.570(CFS)
Time of concentration =    25.047 min.
Effective stream area after confluence  =    342.373(Ac.)
Study area average Pervious fraction(Ap) =  0.315
Study area average soil loss rate(Fm) =    0.298(In/Hr)
Study area total =     342.37(Ac.)


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Process from Point/Station      465.000 to Point/Station     4171.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    342.373(Ac.)
Runoff from this stream =    592.570(CFS)
Time of concentration =   25.05 min.
Rainfall intensity =     2.027(In/Hr)
Area averaged loss rate (Fm) =    0.2984(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3148


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Process from Point/Station      465.000 to Point/Station     4171.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   210.000(Ft.)
Top (of initial area) elevation =   702.700(Ft.)
Bottom (of initial area) elevation =   701.370(Ft.)
```

```
Difference in elevation =     1.330(Ft.)
Slope =    0.00633  s(%)=       0.63
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.103 min.
Rainfall intensity =      4.317(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880
Subarea runoff =     21.798(CFS)
Total initial stream area =        5.740(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station     4171.000 to Point/Station     4171.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.740(Ac.)
Runoff from this stream =     21.798(CFS)
Time of concentration =    7.10 min.
Rainfall intensity =     4.317(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    592.57   342.373     25.05    0.298      2.027
2     21.80     5.740      7.10    0.098      4.317
Qmax(1) =
           1.000 *    1.000 *   592.570) +
           0.457 *    1.000 *    21.798) + =     602.535
Qmax(2) =
           2.325 *    0.284 *   592.570) +
           1.000 *    1.000 *    21.798) + =     412.520

Total of 2 streams to confluence:
Flow rates before confluence point:
     592.570      21.798
Maximum flow rates at confluence using above data:
      602.535      412.520
Area of streams before confluence:
      342.373        5.740
Effective area values after confluence:
      348.113      102.830
Results of confluence:
Total flow rate =    602.535(CFS)
Time of concentration =    25.047 min.
Effective stream area after confluence =    348.113(Ac.)
Study area average Pervious fraction(Ap) =  0.311
Study area average soil loss rate(Fm) =    0.295(In/Hr)
Study area total (this main stream) =     348.11(Ac.)
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4171.000 to Point/Station     4200.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   701.370(Ft.)
Downstream point/station elevation =   700.360(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   602.535(CFS)
Given pipe size =     84.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     6.033(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      1.334(Ft.)
 Minor friction loss =      5.710(Ft.)  K-factor =   1.50
Pipe flow velocity =     15.66(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =    25.21 min.
End of computations, Total Study Area =          352.99 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.313
Area averaged SCS curve number =  36.6
```

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018 Version 9.0
Rational Hydrology Study Date: 09/08/22

Rich-Haven Specific Plan
Hydrology Study for Allowable Q
100-yr Stormill Creek Storm Drain
Haven Storm Drain

Program License Serial Number 6440

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.200 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 4070.000 to Point/Station 4070.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 32.46
Pervious ratio(Ap) = 0.3620 Max loss rate(Fm)= 0.353(In/Hr)
Rainfall intensity = 2.348(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 19.60 min. Rain intensity = 2.35(In/Hr)
Total area this stream = 67.70(Ac.)
Total Study Area (Main Stream No. 1) = 67.70(Ac.)
Total runoff = 72.96(CFS)

++

Process from Point/Station 4070.000 to Point/Station 4075.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 744.000(Ft.)
Downstream point/station elevation = 740.000(Ft.)
Pipe length = 660.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 72.960(CFS)
Given pipe size = 54.00(In.)
Calculated individual pipe flow = 72.960(CFS)
Normal flow depth in pipe = 26.25(In.)

```
Flow top width inside pipe =   53.98(In.)
Critical Depth =   29.91(In.)
Pipe flow velocity =      9.51(Ft/s)
Travel time through pipe =    1.16 min.
Time of concentration (TC) =    20.76 min.


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Process from Point/Station     4070.000 to Point/Station     4075.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     67.700(Ac.)
Runoff from this stream =     72.960(CFS)
Time of concentration =   20.76 min.
Rainfall intensity =     2.269(In/Hr)
Area averaged loss rate (Fm) =    0.3530(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3620
Program is now starting with Main Stream No. 2


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Process from Point/Station      401.000 to Point/Station      402.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   640.000(Ft.)
Top (of initial area) elevation =   765.000(Ft.)
Bottom (of initial area) elevation =   761.000(Ft.)
Difference in elevation =     4.000(Ft.)
Slope =    0.00625  s(%)=       0.63
TC = k(0.483)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.670 min.
Rainfall intensity =      2.499(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.601
Subarea runoff =      7.264(CFS)
Total initial stream area =        4.840(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station      402.000 to Point/Station      403.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   753.000(Ft.)
Downstream point/station elevation =   747.000(Ft.)
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Pipe length  =   760.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.264(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =     7.264(CFS)
Normal flow depth in pipe =    8.51(In.)
Flow top width inside pipe =   30.59(In.)
Critical Depth =   10.15(In.)
Pipe flow velocity =      5.69(Ft/s)
Travel time through pipe =    2.23 min.
Time of concentration (TC) =    19.90 min.


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Process from Point/Station      402.000 to Point/Station      403.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    19.90 min.
Rainfall intensity =      2.327(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.579
Subarea runoff =     14.841(CFS) for   11.580(Ac.)
Total runoff =     22.106(CFS)
Effective area this stream =       16.42(Ac.)
Total Study Area (Main Stream No. 2) =       84.12(Ac.)
Area averaged Fm value =    0.831(In/Hr)


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Process from Point/Station      403.000 to Point/Station     4075.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   747.000(Ft.)
Downstream point/station elevation =   740.000(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.106(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    22.106(CFS)
Normal flow depth in pipe =    5.78(In.)
Flow top width inside pipe =   26.44(In.)
Critical Depth =   18.14(In.)
Pipe flow velocity =     30.09(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    19.91 min.


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Process from Point/Station      403.000 to Point/Station     4075.000
**** SUBAREA FLOW ADDITION ****
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COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    19.91 min.
Rainfall intensity =      2.326(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.619
Subarea runoff =      5.444(CFS) for    2.720(Ac.)
Total runoff =     27.549(CFS)
Effective area this stream =       19.14(Ac.)
Total Study Area (Main Stream No. 2) =       86.84(Ac.)
Area averaged Fm value =    0.727(In/Hr)


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Process from Point/Station      401.000 to Point/Station     4075.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     19.140(Ac.)
Runoff from this stream =     27.549(CFS)
Time of concentration =   19.91 min.
Rainfall intensity =     2.326(In/Hr)
Area averaged loss rate (Fm) =    0.7269(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7434
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     72.96    67.700     20.76    0.353      2.269
2     27.55    19.140     19.91    0.727      2.326
Qmax(1) =
           1.000 *    1.000 *    72.960) +
           0.964 *    1.000 *    27.549) + =      99.519
Qmax(2) =
           1.030 *    0.959 *    72.960) +
           1.000 *    1.000 *    27.549) + =      99.629

Total of 2 main streams to confluence:
Flow rates before confluence point:
      73.960      28.549
Maximum flow rates at confluence using above data:
       99.519       99.629
Area of streams before confluence:
       67.700       19.140
Effective area values after confluence:
       86.840       84.074
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```
Results of confluence:
Total flow rate =     99.629(CFS)
Time of concentration =    19.909 min.
Effective stream area after confluence  =     84.074(Ac.)
Study area average Pervious fraction(Ap) =  0.446
Study area average soil loss rate(Fm) =    0.435(In/Hr)
Study area total =      86.84(Ac.)


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Process from Point/Station     4075.000 to Point/Station     4120.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________________
Upstream point/station elevation =   740.000(Ft.)
Downstream point/station elevation =   729.300(Ft.)
Pipe length  =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    99.629(CFS)
Given pipe size =     60.00(In.)
Calculated individual pipe flow  =    99.629(CFS)
Normal flow depth in pipe =   25.20(In.)
Flow top width inside pipe =   59.23(In.)
Critical Depth =   34.08(In.)
Pipe flow velocity =     12.74(Ft/s)
Travel time through pipe =    1.30 min.
Time of concentration (TC) =    21.20 min.


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Process from Point/Station     4120.000 to Point/Station     4120.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     84.074(Ac.)
Runoff from this stream =     99.629(CFS)
Time of concentration =   21.20 min.
Rainfall intensity =     2.240(In/Hr)
Area averaged loss rate (Fm) =    0.4354(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4461


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Process from Point/Station     4075.000 to Point/Station     4120.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   990.000(Ft.)
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Top (of initial area) elevation =   740.000(Ft.)
Bottom (of initial area) elevation =   729.300(Ft.)
Difference in elevation =    10.700(Ft.)
Slope =    0.01081  s(%)=       1.08
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.868 min.
Rainfall intensity =      3.173(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.872
Subarea runoff =      8.745(CFS)
Total initial stream area =        3.160(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station     4120.000 to Point/Station     4120.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.160(Ac.)
Runoff from this stream =      8.745(CFS)
Time of concentration =   11.87 min.
Rainfall intensity =     3.173(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     99.63    84.074     21.20    0.435      2.240
2      8.75     3.160     11.87    0.098      3.173
Qmax(1) =
           1.000 *    1.000 *    99.629) +
           0.697 *    1.000 *     8.745) + =     105.721
Qmax(2) =
           1.517 *    0.560 *    99.629) +
           1.000 *    1.000 *     8.745) + =      93.340

Total of 2 streams to confluence:
Flow rates before confluence point:
      99.629       8.745
Maximum flow rates at confluence using above data:
      105.721       93.340
Area of streams before confluence:
       84.074        3.160
Effective area values after confluence:
       87.234       50.217
Results of confluence:
Total flow rate =    105.721(CFS)
Time of concentration =    21.204 min.
Effective stream area after confluence =     87.234(Ac.)
Study area average Pervious fraction(Ap) =  0.434
Study area average soil loss rate(Fm) =    0.423(In/Hr)
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Study area total (this main stream) =      87.23(Ac.)


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Process from Point/Station     4075.000 to Point/Station     4120.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     87.234(Ac.)
Runoff from this stream =    105.721(CFS)
Time of concentration =   21.20 min.
Rainfall intensity =     2.240(In/Hr)
Area averaged loss rate (Fm) =    0.4232(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4335
Program is now starting with Main Stream No. 2


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Process from Point/Station     4080.000 to Point/Station     4080.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.04
Pervious ratio(Ap) = 0.3570     Max loss rate(Fm)=     0.349(In/Hr)
Rainfall intensity =      2.612(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  16.41 min.  Rain intensity =       2.61(In/Hr)
Total area this stream =        68.90(Ac.)
Total Study Area (Main Stream No. 2) =      158.90(Ac.)
Total runoff =     73.08(CFS)


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Process from Point/Station     4080.000 to Point/Station      410.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   747.700(Ft.)
Downstream point/station elevation =   745.890(Ft.)
Pipe length  =   360.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    73.080(CFS)
Given pipe size =     60.00(In.)
Calculated individual pipe flow  =    73.080(CFS)
Normal flow depth in pipe =   26.23(In.)
Flow top width inside pipe =   59.52(In.)
Critical Depth =   28.99(In.)
Pipe flow velocity =      8.86(Ft/s)
Travel time through pipe =    0.68 min.
Time of concentration (TC) =    17.09 min.


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Process from Point/Station     4080.000 to Point/Station      410.000
**** CONFLUENCE OF MINOR STREAMS ****
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_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     68.900(Ac.)
Runoff from this stream =     73.080(CFS)
Time of concentration =   17.09 min.
Rainfall intensity =     2.550(In/Hr)
Area averaged loss rate (Fm) =    0.3490(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3570


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Process from Point/Station      406.000 to Point/Station      407.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   400.000(Ft.)
Top (of initial area) elevation =   765.000(Ft.)
Bottom (of initial area) elevation =   762.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.00750  s(%)=       0.75
TC = k(0.483)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.118 min.
Rainfall intensity =      2.859(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.638
Subarea runoff =      4.344(CFS)
Total initial stream area =        2.380(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station      407.000 to Point/Station      410.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____________________________________________________________________
Upstream point/station elevation =   749.000(Ft.)
Downstream point/station elevation =   745.890(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.344(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     4.344(CFS)
Normal flow depth in pipe =    5.35(In.)
Flow top width inside pipe =   19.98(In.)
Critical Depth =    8.77(In.)
Pipe flow velocity =      8.33(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    14.32 min.
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Process from Point/Station      407.000 to Point/Station      410.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    14.32 min.
Rainfall intensity =      2.835(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.676
Subarea runoff =      1.156(CFS) for    0.490(Ac.)
Total runoff =      5.499(CFS)
Effective area this stream =        2.87(Ac.)
Total Study Area (Main Stream No. 2) =      161.77(Ac.)
Area averaged Fm value =    0.706(In/Hr)


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Process from Point/Station      406.000 to Point/Station      410.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.870(Ac.)
Runoff from this stream =      5.499(CFS)
Time of concentration =   14.32 min.
Rainfall intensity =     2.835(In/Hr)
Area averaged loss rate (Fm) =    0.7059(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7220
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     73.08    68.900     17.09    0.349      2.550
2      5.50     2.870     14.32    0.706      2.835
Qmax(1) =
           1.000 *    1.000 *    73.080) +
           0.866 *    1.000 *     5.499) + =      77.842
Qmax(2) =
           1.130 *    0.838 *    73.080) +
           1.000 *    1.000 *     5.499) + =      74.675

Total of 2 streams to confluence:
Flow rates before confluence point:
      73.080       5.499
Maximum flow rates at confluence using above data:
       77.842       74.675
Area of streams before confluence:
       68.900        2.870
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Effective area values after confluence:
       71.770       60.602
Results of confluence:
Total flow rate =     77.842(CFS)
Time of concentration =    17.088 min.
Effective stream area after confluence =     71.770(Ac.)
Study area average Pervious fraction(Ap) =  0.372
Study area average soil loss rate(Fm) =    0.363(In/Hr)
Study area total (this main stream) =      71.77(Ac.)


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Process from Point/Station      410.000 to Point/Station      415.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   745.890(Ft.)
Downstream point/station elevation =   741.230(Ft.)
Pipe length  =   930.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    77.842(CFS)
Given pipe size =     60.00(In.)
Calculated individual pipe flow  =    77.842(CFS)
Normal flow depth in pipe =   27.21(In.)
Flow top width inside pipe =   59.74(In.)
Critical Depth =   29.95(In.)
Pipe flow velocity =      8.99(Ft/s)
Travel time through pipe =    1.72 min.
Time of concentration (TC) =    18.81 min.


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Process from Point/Station      410.000 to Point/Station      415.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     71.770(Ac.)
Runoff from this stream =     77.842(CFS)
Time of concentration =   18.81 min.
Rainfall intensity =     2.407(In/Hr)
Area averaged loss rate (Fm) =    0.3633(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3716


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Process from Point/Station      411.000 to Point/Station      412.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   630.000(Ft.)
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Top (of initial area) elevation =   759.000(Ft.)
Bottom (of initial area) elevation =   756.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.00476  s(%)=       0.48
TC = k(0.483)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.541 min.
Rainfall intensity =      2.428(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.592
Subarea runoff =      6.207(CFS)
Total initial stream area =        4.320(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station      412.000 to Point/Station      415.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   749.000(Ft.)
Downstream point/station elevation =   741.230(Ft.)
Pipe length  =   840.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.207(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     6.207(CFS)
Normal flow depth in pipe =    8.78(In.)
Flow top width inside pipe =   23.12(In.)
Critical Depth =   10.57(In.)
Pipe flow velocity =      5.97(Ft/s)
Travel time through pipe =    2.34 min.
Time of concentration (TC) =    20.88 min.


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Process from Point/Station      412.000 to Point/Station      415.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    20.88 min.
Rainfall intensity =      2.260(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.569
Subarea runoff =     13.730(CFS) for   11.180(Ac.)
Total runoff =     19.937(CFS)
Effective area this stream =       15.50(Ac.)
Total Study Area (Main Stream No. 2) =      177.27(Ac.)
Area averaged Fm value =    0.831(In/Hr)


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Process from Point/Station      412.000 to Point/Station      415.000
**** SUBAREA FLOW ADDITION ****
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COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    20.88 min.
Rainfall intensity =      2.260(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.591
Subarea runoff =      2.491(CFS) for    1.280(Ac.)
Total runoff =     22.429(CFS)
Effective area this stream =       16.78(Ac.)
Total Study Area (Main Stream No. 2) =      178.55(Ac.)
Area averaged Fm value =    0.775(In/Hr)


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Process from Point/Station      411.000 to Point/Station      415.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     16.780(Ac.)
Runoff from this stream =     22.429(CFS)
Time of concentration =   20.88 min.
Rainfall intensity =     2.260(In/Hr)
Area averaged loss rate (Fm) =    0.7752(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7928
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     77.84    71.770     18.81    0.363      2.407
2     22.43    16.780     20.88    0.775      2.260
Qmax(1) =
           1.000 *    1.000 *    77.842) +
           1.099 *    0.901 *    22.429) + =     100.035
Qmax(2) =
           0.928 *    1.000 *    77.842) +
           1.000 *    1.000 *    22.429) + =      94.695

Total of 2 streams to confluence:
Flow rates before confluence point:
      77.842      22.429
Maximum flow rates at confluence using above data:
      100.035       94.695
Area of streams before confluence:
       71.770       16.780
Effective area values after confluence:
```

```
       86.884       88.550
Results of confluence:
Total flow rate =    100.035(CFS)
Time of concentration =    18.811 min.
Effective stream area after confluence =     86.884(Ac.)
Study area average Pervious fraction(Ap) =  0.451
Study area average soil loss rate(Fm) =    0.441(In/Hr)
Study area total (this main stream) =      88.55(Ac.)


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Process from Point/Station      415.000 to Point/Station      416.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   741.230(Ft.)
Downstream point/station elevation =   739.420(Ft.)
Pipe length  =   240.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   100.035(CFS)
Given pipe size =     72.00(In.)
Calculated individual pipe flow  =   100.035(CFS)
Normal flow depth in pipe =   25.66(In.)
Flow top width inside pipe =   68.97(In.)
Critical Depth =   32.29(In.)
Pipe flow velocity =     11.07(Ft/s)
Travel time through pipe =    0.36 min.
Time of concentration (TC) =    19.17 min.


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Process from Point/Station      415.000 to Point/Station      416.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     86.884(Ac.)
Runoff from this stream =    100.035(CFS)
Time of concentration =   19.17 min.
Rainfall intensity =     2.379(In/Hr)
Area averaged loss rate (Fm) =    0.4413(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4514


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Process from Point/Station      416.000 to Point/Station      416.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 31.61
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Rainfall intensity =      2.642(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  16.10 min.  Rain intensity =       2.64(In/Hr)
Total area this stream =        14.60(Ac.)
Total Study Area (Main Stream No. 2) =      193.15(Ac.)
Total runoff =     32.50(CFS)
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Process from Point/Station      416.000 to Point/Station      416.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.600(Ac.)
Runoff from this stream =     32.500(CFS)
Time of concentration =   16.10 min.
Rainfall intensity =     2.642(In/Hr)
Area averaged loss rate (Fm) =    0.1960(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    100.03    86.884     19.17    0.441      2.379
2     32.50    14.600     16.10    0.196      2.642
Qmax(1) =
           1.000 *    1.000 *   100.035) +
           0.893 *    1.000 *    32.500) + =     129.042
Qmax(2) =
           1.136 *    0.840 *   100.035) +
           1.000 *    1.000 *    32.500) + =     127.898

Total of 2 streams to confluence:
Flow rates before confluence point:
     100.035      32.500
Maximum flow rates at confluence using above data:
      129.042      127.898
Area of streams before confluence:
       86.884       14.600
Effective area values after confluence:
      101.484       87.560
Results of confluence:
Total flow rate =    129.042(CFS)
Time of concentration =    19.172 min.
Effective stream area after confluence =    101.484(Ac.)
Study area average Pervious fraction(Ap) =  0.415
Study area average soil loss rate(Fm) =    0.406(In/Hr)
Study area total (this main stream) =     101.48(Ac.)


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Process from Point/Station      416.000 to Point/Station      420.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   739.420(Ft.)
Downstream point/station elevation =   730.300(Ft.)
Pipe length  =  1550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   129.042(CFS)
Given pipe size =     72.00(In.)
```

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Calculated individual pipe flow  =   129.042(CFS)
Normal flow depth in pipe =   31.55(In.)
Flow top width inside pipe =   71.45(In.)
Critical Depth =   36.90(In.)
Pipe flow velocity =     10.83(Ft/s)
Travel time through pipe =    2.39 min.
Time of concentration (TC) =    21.56 min.


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Process from Point/Station      416.000 to Point/Station      420.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    101.484(Ac.)
Runoff from this stream =    129.042(CFS)
Time of concentration =   21.56 min.
Rainfall intensity =     2.218(In/Hr)
Area averaged loss rate (Fm) =    0.4060(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4152


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Process from Point/Station      417.000 to Point/Station      416.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Initial subarea data:
Initial area flow distance =   275.000(Ft.)
Top (of initial area) elevation =   758.200(Ft.)
Bottom (of initial area) elevation =   755.400(Ft.)
Difference in elevation =     2.800(Ft.)
Slope =    0.01018  s(%)=       1.02
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.669 min.
Rainfall intensity =      4.123(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.857
Subarea runoff =      1.273(CFS)
Total initial stream area =        0.360(Ac.)
Pervious area fraction = 0.200
Initial area Fm value =    0.196(In/Hr)


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Process from Point/Station      416.000 to Point/Station      420.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   739.420(Ft.)
Downstream point/station elevation =   730.300(Ft.)
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Pipe length  =  1550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.273(CFS)
Given pipe size =     72.00(In.)
Calculated individual pipe flow  =     1.273(CFS)
Normal flow depth in pipe =    3.27(In.)
Flow top width inside pipe =   29.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =      2.77(Ft/s)
Travel time through pipe =    9.31 min.
Time of concentration (TC) =    16.98 min.


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Process from Point/Station      416.000 to Point/Station      420.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Time of concentration =    16.98 min.
Rainfall intensity =      2.559(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =     16.723(CFS) for    8.100(Ac.)
Total runoff =     17.996(CFS)
Effective area this stream =        8.46(Ac.)
Total Study Area (Main Stream No. 2) =      201.61(Ac.)
Area averaged Fm value =    0.196(In/Hr)


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Process from Point/Station      420.000 to Point/Station      420.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      8.460(Ac.)
Runoff from this stream =     17.996(CFS)
Time of concentration =   16.98 min.
Rainfall intensity =     2.559(In/Hr)
Area averaged loss rate (Fm) =    0.1956(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    129.04   101.484     21.56    0.406      2.218
2     18.00     8.460     16.98    0.196      2.559
Qmax(1) =
           1.000 *    1.000 *   129.042) +
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           0.856 *    1.000 *    17.996) + =     144.439
Qmax(2) =
           1.188 *    0.788 *   129.042) +
           1.000 *    1.000 *    17.996) + =     138.799

Total of 2 streams to confluence:
Flow rates before confluence point:
     129.042      17.996
Maximum flow rates at confluence using above data:
      144.439      138.799
Area of streams before confluence:
      101.484        8.460
Effective area values after confluence:
      109.944       88.403
Results of confluence:
Total flow rate =    144.439(CFS)
Time of concentration =    21.558 min.
Effective stream area after confluence =    109.944(Ac.)
Study area average Pervious fraction(Ap) =  0.399
Study area average soil loss rate(Fm) =    0.390(In/Hr)
Study area total (this main stream) =     109.94(Ac.)


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Process from Point/Station      420.000 to Point/Station     4120.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   730.300(Ft.)
Downstream point/station elevation =   729.300(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   144.439(CFS)
Given pipe size =     72.00(In.)
Calculated individual pipe flow  =   144.439(CFS)
Normal flow depth in pipe =   19.01(In.)
Flow top width inside pipe =   63.47(In.)
Critical Depth =   39.09(In.)
Pipe flow velocity =     24.21(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    21.57 min.


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Process from Point/Station     4080.000 to Point/Station     4120.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    109.944(Ac.)
Runoff from this stream =    144.439(CFS)
Time of concentration =   21.57 min.
Rainfall intensity =     2.217(In/Hr)
Area averaged loss rate (Fm) =    0.3898(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3987
Summary of stream data:
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Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    105.72    87.234     21.20    0.423      2.240
2    144.44   109.944     21.57    0.390      2.217
Qmax(1) =
           1.000 *    1.000 *   105.721) +
           1.013 *    0.983 *   144.439) + =     249.484
Qmax(2) =
           0.987 *    1.000 *   105.721) +
           1.000 *    1.000 *   144.439) + =     248.822

Total of 2 main streams to confluence:
Flow rates before confluence point:
     106.721     145.439
Maximum flow rates at confluence using above data:
      249.484      248.822
Area of streams before confluence:
       87.234      109.944
Effective area values after confluence:
      195.303      197.178


Results of confluence:
Total flow rate =    249.484(CFS)
Time of concentration =    21.204 min.
Effective stream area after confluence  =    195.303(Ac.)
Study area average Pervious fraction(Ap) =  0.414
Study area average soil loss rate(Fm) =    0.405(In/Hr)
Study area total =     197.18(Ac.)


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Process from Point/Station     4120.000 to Point/Station      430.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   729.300(Ft.)
Downstream point/station elevation =   725.100(Ft.)
Pipe length  =   490.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   249.484(CFS)
Given pipe size =     72.00(In.)
Calculated individual pipe flow  =   249.484(CFS)
Normal flow depth in pipe =   41.72(In.)
Flow top width inside pipe =   71.09(In.)
Critical Depth =   51.92(In.)
Pipe flow velocity =     14.69(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =    21.76 min.


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Process from Point/Station     4120.000 to Point/Station      430.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
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```
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    195.303(Ac.)
Runoff from this stream =    249.484(CFS)
Time of concentration =   21.76 min.
Rainfall intensity =     2.205(In/Hr)
Area averaged loss rate (Fm) =    0.4046(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4141
Program is now starting with Main Stream No. 2


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Process from Point/Station      426.000 to Point/Station      426.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 31.61
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Rainfall intensity =      3.076(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.50 min.  Rain intensity =       3.08(In/Hr)
Total area this stream =         2.80(Ac.)
Total Study Area (Main Stream No. 2) =      204.41(Ac.)
Total runoff =      7.30(CFS)


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Process from Point/Station      426.000 to Point/Station      427.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   739.390(Ft.)
Downstream point/station elevation =   730.300(Ft.)
Pipe length  =  1590.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.300(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =     7.300(CFS)
Normal flow depth in pipe =    9.26(In.)
Flow top width inside pipe =   31.47(In.)
Critical Depth =   10.18(In.)
Pipe flow velocity =      5.08(Ft/s)
Travel time through pipe =    5.22 min.
Time of concentration (TC) =    17.72 min.


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Process from Point/Station      426.000 to Point/Station      427.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
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Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Time of concentration =    17.72 min.
Rainfall intensity =      2.495(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =     41.557(CFS) for   20.810(Ac.)
Total runoff =     48.857(CFS)
Effective area this stream =       23.61(Ac.)
Total Study Area (Main Stream No. 2) =      225.22(Ac.)
Area averaged Fm value =    0.196(In/Hr)


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Process from Point/Station      427.000 to Point/Station      430.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   730.300(Ft.)
Downstream point/station elevation =   729.300(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    48.857(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    48.857(CFS)
Normal flow depth in pipe =   14.18(In.)
Flow top width inside pipe =   35.18(In.)
Critical Depth =   27.31(In.)
Pipe flow velocity =     18.89(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    17.73 min.


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Process from Point/Station      426.000 to Point/Station      430.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     23.610(Ac.)
Runoff from this stream =     48.857(CFS)
Time of concentration =   17.73 min.
Rainfall intensity =     2.493(In/Hr)
Area averaged loss rate (Fm) =    0.1956(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    249.48   195.303     21.76    0.405      2.205
2     48.86    23.610     17.73    0.196      2.493
Qmax(1) =
          1.000 *    1.000 *   249.484) +
          0.875 *    1.000 *    48.857) + =     292.217
Qmax(2) =
          1.160 *    0.815 *   249.484) +
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           1.000 *    1.000 *    48.857) + =     284.705

Total of 2 main streams to confluence:
Flow rates before confluence point:
     250.484      49.857
Maximum flow rates at confluence using above data:
      292.217      284.705
Area of streams before confluence:
      195.303       23.610
Effective area values after confluence:
      218.913      182.781


Results of confluence:
Total flow rate =    292.217(CFS)
Time of concentration =    21.760 min.
Effective stream area after confluence  =    218.913(Ac.)
Study area average Pervious fraction(Ap) =  0.391
Study area average soil loss rate(Fm) =    0.382(In/Hr)
Study area total =     218.91(Ac.)


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Process from Point/Station      430.000 to Point/Station      440.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   725.100(Ft.)
Downstream point/station elevation =   721.360(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   292.217(CFS)
Given pipe size =     72.00(In.)
Calculated individual pipe flow  =   292.217(CFS)
Normal flow depth in pipe =   48.61(In.)
Flow top width inside pipe =   67.44(In.)
Critical Depth =   56.08(In.)
Pipe flow velocity =     14.38(Ft/s)
Travel time through pipe =    0.58 min.
Time of concentration (TC) =    22.34 min.


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Process from Point/Station      430.000 to Point/Station      440.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    218.913(Ac.)
Runoff from this stream =    292.217(CFS)
Time of concentration =   22.34 min.
Rainfall intensity =     2.171(In/Hr)
Area averaged loss rate (Fm) =    0.3821(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3910


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Process from Point/Station      430.000 to Point/Station      440.000
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**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 500.000(Ft.)
Top (of initial area) elevation = 725.100(Ft.)
Bottom (of initial area) elevation = 721.360(Ft.)
Difference in elevation = 3.740(Ft.)
Slope = 0.00748 s(%)= 0.75
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.720 min.
Rainfall intensity = 3.577(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff = 31.309(CFS)
Total initial stream area = 10.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

++
Process from Point/Station 430.000 to Point/Station 440.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Time of concentration = 9.72 min.
Rainfall intensity = 3.577(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.875
Subarea runoff = 11.302(CFS) for 3.610(Ac.)
Total runoff = 42.611(CFS)
Effective area this stream = 13.61(Ac.)
Total Study Area (Main Stream No. 1) = 238.83(Ac.)
Area averaged Fm value = 0.098(In/Hr)

++
Process from Point/Station 440.000 to Point/Station 440.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 13.610(Ac.)
Runoff from this stream = 42.611(CFS)
Time of concentration = 9.72 min.

```
Rainfall intensity =     3.577(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    292.22   218.913     22.34    0.382      2.171
2     42.61    13.610      9.72    0.098      3.577
Qmax(1) =
           1.000 *    1.000 *   292.217) +
           0.596 *    1.000 *    42.611) + =     317.610
Qmax(2) =
           1.786 *    0.435 *   292.217) +
           1.000 *    1.000 *    42.611) + =     269.681

Total of 2 streams to confluence:
Flow rates before confluence point:
     292.217      42.611
Maximum flow rates at confluence using above data:
      317.610      269.681
Area of streams before confluence:
      218.913       13.610
Effective area values after confluence:
      232.523      108.866
Results of confluence:
Total flow rate =    317.610(CFS)
Time of concentration =    22.339 min.
Effective stream area after confluence =    232.523(Ac.)
Study area average Pervious fraction(Ap) =  0.374
Study area average soil loss rate(Fm) =    0.365(In/Hr)
Study area total (this main stream) =     232.52(Ac.)


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Process from Point/Station      440.000 to Point/Station      445.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   721.360(Ft.)
Downstream point/station elevation =   716.140(Ft.)
Pipe length  =   630.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   317.610(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   317.610(CFS)
Normal flow depth in pipe =   44.25(In.)
Flow top width inside pipe =   83.88(In.)
Critical Depth =   56.31(In.)
Pipe flow velocity =     15.44(Ft/s)
Travel time through pipe =    0.68 min.
Time of concentration (TC) =    23.02 min.


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Process from Point/Station      445.000 to Point/Station      445.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    232.523(Ac.)
Runoff from this stream =    317.610(CFS)
Time of concentration =   23.02 min.
Rainfall intensity =     2.132(In/Hr)
Area averaged loss rate (Fm) =    0.3654(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3740


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Process from Point/Station      440.000 to Point/Station      445.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   630.000(Ft.)
Top (of initial area) elevation =   721.360(Ft.)
Bottom (of initial area) elevation =   716.140(Ft.)
Difference in elevation =     5.220(Ft.)
Slope =    0.00829  s(%)=       0.83
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.446 min.
Rainfall intensity =      3.425(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.874
Subarea runoff =      7.008(CFS)
Total initial stream area =        2.340(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      445.000 to Point/Station      445.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.340(Ac.)
Runoff from this stream =      7.008(CFS)
Time of concentration =   10.45 min.
Rainfall intensity =     3.425(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)
```

```
1    317.61   232.523     23.02    0.365      2.132
2      7.01     2.340     10.45    0.098      3.425
Qmax(1) =
           1.000 *    1.000 *   317.610) +
           0.611 *    1.000 *     7.008) + =     321.895
Qmax(2) =
           1.732 *    0.454 *   317.610) +
           1.000 *    1.000 *     7.008) + =     256.634

Total of 2 streams to confluence:
Flow rates before confluence point:
     317.610       7.008
Maximum flow rates at confluence using above data:
      321.895      256.634
Area of streams before confluence:
      232.523        2.340
Effective area values after confluence:
      234.863      107.857
Results of confluence:
Total flow rate =    321.895(CFS)
Time of concentration =    23.019 min.
Effective stream area after confluence =    234.863(Ac.)
Study area average Pervious fraction(Ap) =  0.371
Study area average soil loss rate(Fm) =    0.363(In/Hr)
Study area total (this main stream) =     234.86(Ac.)


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Process from Point/Station      440.000 to Point/Station      445.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    234.863(Ac.)
Runoff from this stream =    321.895(CFS)
Time of concentration =   23.02 min.
Rainfall intensity =     2.132(In/Hr)
Area averaged loss rate (Fm) =    0.3627(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3712
Program is now starting with Main Stream No. 2


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Process from Point/Station      445.000 to Point/Station      445.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 55.61
Pervious ratio(Ap) = 0.2300     Max loss rate(Fm)=     0.170(In/Hr)
Rainfall intensity =      3.597(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.63 min.  Rain intensity =       3.60(In/Hr)
Total area this stream =        36.30(Ac.)
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Total Study Area (Main Stream No. 2) =      277.47(Ac.)
Total runoff =     95.46(CFS)


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Process from Point/Station      445.000 to Point/Station      445.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     36.300(Ac.)
Runoff from this stream =     95.460(CFS)
Time of concentration =    9.63 min.
Rainfall intensity =     3.597(In/Hr)
Area averaged loss rate (Fm) =    0.1700(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2300
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    321.89   234.863     23.02    0.363      2.132
2     95.46    36.300      9.63    0.170      3.597
Qmax(1) =
           1.000 *    1.000 *   321.895) +
           0.573 *    1.000 *    95.460) + =     376.557
Qmax(2) =
           1.828 *    0.418 *   321.895) +
           1.000 *    1.000 *    95.460) + =     341.581

Total of 2 main streams to confluence:
Flow rates before confluence point:
     322.895      96.460
Maximum flow rates at confluence using above data:
      376.557      341.581
Area of streams before confluence:
      234.863       36.300
Effective area values after confluence:
      271.163      134.555


Results of confluence:
Total flow rate =    376.557(CFS)
Time of concentration =    23.019 min.
Effective stream area after confluence  =    271.163(Ac.)
Study area average Pervious fraction(Ap) =  0.352
Study area average soil loss rate(Fm) =    0.337(In/Hr)
Study area total =     271.16(Ac.)


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Process from Point/Station      445.000 to Point/Station      450.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
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Upstream point/station elevation =   715.590(Ft.)
Downstream point/station elevation =   713.200(Ft.)
Pipe length  =   360.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   376.557(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   376.557(CFS)
Normal flow depth in pipe =   52.97(In.)
Flow top width inside pipe =   81.08(In.)
Critical Depth =   61.36(In.)
Pipe flow velocity =     14.74(Ft/s)
Travel time through pipe =    0.41 min.
Time of concentration (TC) =    23.43 min.


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Process from Point/Station      445.000 to Point/Station      450.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    271.163(Ac.)
Runoff from this stream =    376.557(CFS)
Time of concentration =   23.43 min.
Rainfall intensity =     2.110(In/Hr)
Area averaged loss rate (Fm) =    0.3369(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3523
Program is now starting with Main Stream No. 2


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Process from Point/Station      450.000 to Point/Station      450.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 58.53
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.070(In/Hr)
Rainfall intensity =      5.304(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   5.04 min.  Rain intensity =       5.30(In/Hr)
Total area this stream =         4.10(Ac.)
Total Study Area (Main Stream No. 2) =      281.57(Ac.)
Total runoff =     21.00(CFS)


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Process from Point/Station      450.000 to Point/Station      450.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.100(Ac.)
Runoff from this stream =     21.000(CFS)
Time of concentration =    5.04 min.
Rainfall intensity =     5.304(In/Hr)
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```
Area averaged loss rate (Fm) =    0.0700(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    376.56   271.163     23.43    0.337      2.110
2     21.00     4.100      5.04    0.070      5.304
Qmax(1) =
           1.000 *    1.000 *   376.557) +
           0.390 *    1.000 *    21.000) + =     384.741
Qmax(2) =
           2.802 *    0.215 *   376.557) +
           1.000 *    1.000 *    21.000) + =     247.979

Total of 2 main streams to confluence:
Flow rates before confluence point:
     377.557      22.000
Maximum flow rates at confluence using above data:
      384.741      247.979
Area of streams before confluence:
      271.163        4.100
Effective area values after confluence:
      275.263       62.439


Results of confluence:
Total flow rate =    384.741(CFS)
Time of concentration =    23.426 min.
Effective stream area after confluence  =    275.263(Ac.)
Study area average Pervious fraction(Ap) =  0.349
Study area average soil loss rate(Fm) =    0.333(In/Hr)
Study area total =     275.26(Ac.)


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Process from Point/Station      450.000 to Point/Station     4170.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   712.610(Ft.)
Downstream point/station elevation =   710.300(Ft.)
Pipe length  =   340.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   384.741(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   384.741(CFS)
Normal flow depth in pipe =   53.30(In.)
Flow top width inside pipe =   80.90(In.)
Critical Depth =   62.02(In.)
Pipe flow velocity =     14.94(Ft/s)
Travel time through pipe =    0.38 min.
Time of concentration (TC) =    23.81 min.
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Process from Point/Station     4170.000 to Point/Station     4170.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    275.263(Ac.)
Runoff from this stream =    384.741(CFS)
Time of concentration =   23.81 min.
Rainfall intensity =     2.090(In/Hr)
Area averaged loss rate (Fm) =    0.3330(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3486
Program is now starting with Main Stream No. 2


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Process from Point/Station     4170.000 to Point/Station     4170.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 55.61
Pervious ratio(Ap) = 0.2300     Max loss rate(Fm)=     0.170(In/Hr)
Rainfall intensity =      3.165(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  11.92 min.  Rain intensity =       3.16(In/Hr)
Total area this stream =         8.60(Ac.)
Total Study Area (Main Stream No. 2) =      290.17(Ac.)
Total runoff =     22.10(CFS)


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Process from Point/Station     4170.000 to Point/Station     4170.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      8.600(Ac.)
Runoff from this stream =     22.100(CFS)
Time of concentration =   11.92 min.
Rainfall intensity =     3.165(In/Hr)
Area averaged loss rate (Fm) =    0.1700(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2300
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    384.74   275.263     23.81    0.333      2.090
2     22.10     8.600     11.92    0.170      3.165
Qmax(1) =
           1.000 *    1.000 *   384.741) +
           0.641 *    1.000 *    22.100) + =     398.908
Qmax(2) =
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           1.612 *    0.501 *   384.741) +
           1.000 *    1.000 *    22.100) + =     332.632

Total of 2 main streams to confluence:
Flow rates before confluence point:
     385.741      23.100
Maximum flow rates at confluence using above data:
      398.908      332.632
Area of streams before confluence:
      275.263        8.600
Effective area values after confluence:
      283.863      146.431


Results of confluence:
Total flow rate =    398.908(CFS)
Time of concentration =    23.805 min.
Effective stream area after confluence  =    283.863(Ac.)
Study area average Pervious fraction(Ap) =  0.345
Study area average soil loss rate(Fm) =    0.328(In/Hr)
Study area total =     283.86(Ac.)


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Process from Point/Station     4170.000 to Point/Station     4170.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    283.863(Ac.)
Runoff from this stream =    398.908(CFS)
Time of concentration =   23.81 min.
Rainfall intensity =     2.090(In/Hr)
Area averaged loss rate (Fm) =    0.3280(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3450


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Process from Point/Station      450.000 to Point/Station     4170.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   340.000(Ft.)
Top (of initial area) elevation =   712.610(Ft.)
Bottom (of initial area) elevation =   710.300(Ft.)
Difference in elevation =     2.310(Ft.)
Slope =    0.00679  s(%)=       0.68
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.493 min.
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Rainfall intensity =      3.878(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.877
Subarea runoff =     22.219(CFS)
Total initial stream area =        6.530(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station     4170.000 to Point/Station     4170.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      6.530(Ac.)
Runoff from this stream =     22.219(CFS)
Time of concentration =    8.49 min.
Rainfall intensity =     3.878(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    398.91   283.863     23.81    0.328      2.090
2     22.22     6.530      8.49    0.098      3.878
Qmax(1) =
           1.000 *    1.000 *   398.908) +
           0.527 *    1.000 *    22.219) + =     410.614
Qmax(2) =
           2.015 *    0.357 *   398.908) +
           1.000 *    1.000 *    22.219) + =     309.033

Total of 2 streams to confluence:
Flow rates before confluence point:
     398.908      22.219
Maximum flow rates at confluence using above data:
      410.614      309.033
Area of streams before confluence:
      283.863        6.530
Effective area values after confluence:
      290.393      107.798
Results of confluence:
Total flow rate =    410.614(CFS)
Time of concentration =    23.805 min.
Effective stream area after confluence =    290.393(Ac.)
Study area average Pervious fraction(Ap) =  0.339
Study area average soil loss rate(Fm) =    0.323(In/Hr)
Study area total (this main stream) =     290.39(Ac.)


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Process from Point/Station     4170.000 to Point/Station      455.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
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Upstream point/station elevation =   709.250(Ft.)
Downstream point/station elevation =   706.460(Ft.)
Pipe length  =   440.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   410.614(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   410.614(CFS)
Normal flow depth in pipe =   57.19(In.)
Flow top width inside pipe =   78.32(In.)
Critical Depth =   64.05(In.)
Pipe flow velocity =     14.71(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =    24.30 min.


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Process from Point/Station      455.000 to Point/Station      455.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    290.393(Ac.)
Runoff from this stream =    410.614(CFS)
Time of concentration =   24.30 min.
Rainfall intensity =     2.064(In/Hr)
Area averaged loss rate (Fm) =    0.3229(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3395
Program is now starting with Main Stream No. 2


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Process from Point/Station      455.000 to Point/Station      455.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 58.53
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.070(In/Hr)
Rainfall intensity =      4.142(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.61 min.  Rain intensity =       4.14(In/Hr)
Total area this stream =        10.00(Ac.)
Total Study Area (Main Stream No. 2) =      306.70(Ac.)
Total runoff =     38.71(CFS)


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Process from Point/Station      455.000 to Point/Station      455.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     10.000(Ac.)
Runoff from this stream =     38.710(CFS)
Time of concentration =    7.61 min.
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```
Rainfall intensity =     4.142(In/Hr)
Area averaged loss rate (Fm) =    0.0700(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    410.61   290.393     24.30    0.323      2.064
2     38.71    10.000      7.61    0.070      4.142
Qmax(1) =
           1.000 *    1.000 *   410.614) +
           0.490 *    1.000 *    38.710) + =     429.567
Qmax(2) =
           2.194 *    0.313 *   410.614) +
           1.000 *    1.000 *    38.710) + =     320.781

Total of 2 main streams to confluence:
Flow rates before confluence point:
     411.614      39.710
Maximum flow rates at confluence using above data:
      429.567      320.781
Area of streams before confluence:
      290.393       10.000
Effective area values after confluence:
      300.393      100.927


Results of confluence:
Total flow rate =    429.567(CFS)
Time of concentration =    24.304 min.
Effective stream area after confluence  =    300.393(Ac.)
Study area average Pervious fraction(Ap) =  0.332
Study area average soil loss rate(Fm) =    0.314(In/Hr)
Study area total =     300.39(Ac.)


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Process from Point/Station      455.000 to Point/Station      460.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   706.460(Ft.)
Downstream point/station elevation =   705.230(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   429.567(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   429.567(CFS)
Normal flow depth in pipe =   59.91(In.)
Flow top width inside pipe =   75.98(In.)
Critical Depth =   65.43(In.)
Pipe flow velocity =     14.63(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    24.53 min.
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Process from Point/Station      455.000 to Point/Station      460.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    300.393(Ac.)
Runoff from this stream =    429.567(CFS)
Time of concentration =   24.53 min.
Rainfall intensity =     2.052(In/Hr)
Area averaged loss rate (Fm) =    0.3144(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3315
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    429.57   300.393     24.53    0.314      2.052
Qmax(1) =
           1.000 *    1.000 *   429.567) + =     429.567

Total of 1 main streams to confluence:
Flow rates before confluence point:
     430.567
Maximum flow rates at confluence using above data:
      429.567
Area of streams before confluence:
      300.393
Effective area values after confluence:
      300.393


Results of confluence:
Total flow rate =    429.567(CFS)
Time of concentration =    24.532 min.
Effective stream area after confluence  =    300.393(Ac.)
Study area average Pervious fraction(Ap) =  0.332
Study area average soil loss rate(Fm) =    0.314(In/Hr)
Study area total =     300.39(Ac.)


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Process from Point/Station      460.000 to Point/Station      460.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 31.86
Pervious ratio(Ap) = 0.1870     Max loss rate(Fm)=     0.183(In/Hr)
Rainfall intensity =      3.339(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  10.90 min.  Rain intensity =       3.34(In/Hr)
Total area this stream =        19.75(Ac.)
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Total Study Area (Main Stream No. 1) =      326.45(Ac.)
Total runoff =     50.20(CFS)


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Process from Point/Station      460.000 to Point/Station      460.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     19.750(Ac.)
Runoff from this stream =     50.200(CFS)
Time of concentration =   10.90 min.
Rainfall intensity =     3.339(In/Hr)
Area averaged loss rate (Fm) =    0.1830(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1870
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    429.57   300.393     24.53    0.314      2.052
2     50.20    19.750     10.90    0.183      3.339
Qmax(1) =
           1.000 *    1.000 *   429.567) +
           0.592 *    1.000 *    50.200) + =     459.300
Qmax(2) =
           1.740 *    0.444 *   429.567) +
           1.000 *    1.000 *    50.200) + =     382.386

Total of 2 main streams to confluence:
Flow rates before confluence point:
     430.567      51.200
Maximum flow rates at confluence using above data:
      459.300      382.386
Area of streams before confluence:
      300.393       19.750
Effective area values after confluence:
      320.143      153.221


Results of confluence:
Total flow rate =    459.300(CFS)
Time of concentration =    24.532 min.
Effective stream area after confluence  =    320.143(Ac.)
Study area average Pervious fraction(Ap) =  0.323
Study area average soil loss rate(Fm) =    0.306(In/Hr)
Study area total =     320.14(Ac.)


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Process from Point/Station      460.000 to Point/Station      465.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
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Upstream point/station elevation =   705.230(Ft.)
Downstream point/station elevation =   702.700(Ft.)
Pipe length  =   420.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   459.300(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   459.300(CFS)
Normal flow depth in pipe =   63.84(In.)
Flow top width inside pipe =   71.75(In.)
Critical Depth =   67.53(In.)
Pipe flow velocity =     14.63(Ft/s)
Travel time through pipe =    0.48 min.
Time of concentration (TC) =    25.01 min.


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Process from Point/Station      460.000 to Point/Station      465.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    320.143(Ac.)
Runoff from this stream =    459.300(CFS)
Time of concentration =   25.01 min.
Rainfall intensity =     2.029(In/Hr)
Area averaged loss rate (Fm) =    0.3063(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3226
Program is now starting with Main Stream No. 2


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Process from Point/Station      465.000 to Point/Station      465.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.07
Pervious ratio(Ap) = 0.1910     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      4.044(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.92 min.  Rain intensity =       4.04(In/Hr)
Total area this stream =         6.67(Ac.)
Total Study Area (Main Stream No. 2) =      333.12(Ac.)
Total runoff =     23.53(CFS)


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Process from Point/Station      465.000 to Point/Station      465.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.670(Ac.)
Runoff from this stream =     23.530(CFS)
Time of concentration =    7.92 min.
Rainfall intensity =     4.044(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1910
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    459.30   320.143     25.01    0.306      2.029
2     23.53     6.670      7.92    0.140      4.044
Qmax(1) =
           1.000 *    1.000 *   459.300) +
           0.484 *    1.000 *    23.530) + =     470.682
Qmax(2) =
           2.170 *    0.317 *   459.300) +
           1.000 *    1.000 *    23.530) + =     339.193

Total of 2 main streams to confluence:
Flow rates before confluence point:
     460.300      24.530
Maximum flow rates at confluence using above data:
      470.682      339.193
Area of streams before confluence:
      320.143        6.670
Effective area values after confluence:
      326.813      108.049


Results of confluence:
Total flow rate =    470.682(CFS)
Time of concentration =    25.010 min.
Effective stream area after confluence  =    326.813(Ac.)
Study area average Pervious fraction(Ap) =  0.320
Study area average soil loss rate(Fm) =    0.303(In/Hr)
Study area total =     326.81(Ac.)


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Process from Point/Station      465.000 to Point/Station     4171.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   702.700(Ft.)
Downstream point/station elevation =   701.370(Ft.)
Pipe length  =   210.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   470.682(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   470.682(CFS)
Normal flow depth in pipe =   63.84(In.)
Flow top width inside pipe =   71.75(In.)
Critical Depth =   68.25(In.)
Pipe flow velocity =     15.00(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    25.24 min.
```

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Process from Point/Station      465.000 to Point/Station     4171.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    326.813(Ac.)
Runoff from this stream =    470.682(CFS)
Time of concentration =   25.24 min.
Rainfall intensity =     2.017(In/Hr)
Area averaged loss rate (Fm) =    0.3029(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3199
Program is now starting with Main Stream No. 2


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Process from Point/Station     4171.000 to Point/Station     4171.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 31.98
Pervious ratio(Ap) = 0.1810     Max loss rate(Fm)=     0.177(In/Hr)
Rainfall intensity =      2.966(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  13.28 min.  Rain intensity =       2.97(In/Hr)
Total area this stream =        14.13(Ac.)
Total Study Area (Main Stream No. 2) =      347.25(Ac.)
Total runoff =     35.60(CFS)


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Process from Point/Station     4171.000 to Point/Station     4171.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     14.130(Ac.)
Runoff from this stream =     35.600(CFS)
Time of concentration =   13.28 min.
Rainfall intensity =     2.966(In/Hr)
Area averaged loss rate (Fm) =    0.1770(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1810
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    470.68   326.813     25.24    0.303      2.017
2     35.60    14.130     13.28    0.177      2.966
Qmax(1) =
           1.000 *    1.000 *   470.682) +
           0.660 *    1.000 *    35.600) + =     494.174
Qmax(2) =
```

```
           1.553 *    0.526 *   470.682) +
           1.000 *    1.000 *    35.600) + =     420.209

Total of 2 main streams to confluence:
Flow rates before confluence point:
     471.682      36.600
Maximum flow rates at confluence using above data:
      494.174      420.209
Area of streams before confluence:
      326.813       14.130
Effective area values after confluence:
      340.943      186.057


Results of confluence:
Total flow rate =    494.174(CFS)
Time of concentration =    25.244 min.
Effective stream area after confluence  =    340.943(Ac.)
Study area average Pervious fraction(Ap) =  0.314
Study area average soil loss rate(Fm) =    0.298(In/Hr)
Study area total =     340.94(Ac.)


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Process from Point/Station      465.000 to Point/Station     4171.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    340.943(Ac.)
Runoff from this stream =    494.174(CFS)
Time of concentration =   25.24 min.
Rainfall intensity =     2.017(In/Hr)
Area averaged loss rate (Fm) =    0.2977(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3141


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Process from Point/Station      465.000 to Point/Station     4171.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   210.000(Ft.)
Top (of initial area) elevation =   702.700(Ft.)
Bottom (of initial area) elevation =   701.370(Ft.)
Difference in elevation =     1.330(Ft.)
Slope =    0.00633  s(%)=       0.63
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.103 min.
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Rainfall intensity =      4.317(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880
Subarea runoff =     21.798(CFS)
Total initial stream area =        5.740(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station     4171.000 to Point/Station     4171.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.740(Ac.)
Runoff from this stream =     21.798(CFS)
Time of concentration =    7.10 min.
Rainfall intensity =     4.317(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    494.17   340.943     25.24    0.298      2.017
2     21.80     5.740      7.10    0.098      4.317
Qmax(1) =
           1.000 *    1.000 *   494.174) +
           0.455 *    1.000 *    21.798) + =     504.090
Qmax(2) =
           2.337 *    0.281 *   494.174) +
           1.000 *    1.000 *    21.798) + =     346.815

Total of 2 streams to confluence:
Flow rates before confluence point:
     494.174      21.798
Maximum flow rates at confluence using above data:
      504.090      346.815
Area of streams before confluence:
      340.943        5.740
Effective area values after confluence:
      346.683      101.672
Results of confluence:
Total flow rate =    504.090(CFS)
Time of concentration =    25.244 min.
Effective stream area after confluence =    346.683(Ac.)
Study area average Pervious fraction(Ap) =  0.311
Study area average soil loss rate(Fm) =    0.294(In/Hr)
Study area total (this main stream) =     346.68(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4171.000 to Point/Station     4200.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

Upstream point/station elevation = 701.370(Ft.)
Downstream point/station elevation = 700.360(Ft.)
Pipe length = 150.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 504.090(CFS)
Given pipe size = 84.00(In.)
Calculated individual pipe flow = 504.090(CFS)
Normal flow depth in pipe = 66.09(In.)
Flow top width inside pipe = 68.80(In.)
Critical Depth = 70.35(In.)
Pipe flow velocity = 15.51(Ft/s)
Travel time through pipe = 0.16 min.
Time of concentration (TC) = 25.40 min.
End of computations, Total Study Area = 352.99 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.313
Area averaged SCS curve number = 36.6

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018 Version 9.0
Rational Hydrology Study Date: 08/19/22

Rich-Haven Specific Plan
Hydrology Study
100-yr Storm
Mill Creek Storm Drain

Program License Serial Number 6440

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.200 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

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Process from Point/Station 5115.000 to Point/Station 5115.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 25.00
Pervious ratio(Ap) = 0.3000 Max loss rate(Fm)= 0.300(In/Hr)
Rainfall intensity = 2.768(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 14.90 min. Rain intensity = 2.77(In/Hr)
Total area this stream = 208.60(Ac.)
Total Study Area (Main Stream No. 1) = 208.60(Ac.)
Total runoff = 373.60(CFS)

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Process from Point/Station 5115.000 to Point/Station 5115.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 208.600(Ac.)
Runoff from this stream = 373.600(CFS)
Time of concentration = 14.90 min.
Rainfall intensity = 2.768(In/Hr)
Area averaged loss rate (Fm) = 0.3000(In/Hr)

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Area averaged Pervious ratio (Ap) = 0.3000
Program is now starting with Main Stream No. 2


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Process from Point/Station      500.000 to Point/Station      500.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  =  1.#R
Pervious ratio(Ap) = 0.3520     Max loss rate(Fm)=     0.359(In/Hr)
Rainfall intensity =      2.950(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  13.40 min.  Rain intensity =       2.95(In/Hr)
Total area this stream =        17.40(Ac.)
Total Study Area (Main Stream No. 2) =      226.00(Ac.)
Total runoff =     41.10(CFS)


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Process from Point/Station      500.000 to Point/Station     5115.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   751.100(Ft.)
Downstream point/station elevation =   749.200(Ft.)
Pipe length  =   320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    41.100(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    41.100(CFS)
Normal flow depth in pipe =   24.35(In.)
Flow top width inside pipe =   33.68(In.)
Critical Depth =   25.06(In.)
Pipe flow velocity =      8.08(Ft/s)
Travel time through pipe =    0.66 min.
Time of concentration (TC) =    14.06 min.


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Process from Point/Station      500.000 to Point/Station     5115.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     17.400(Ac.)
Runoff from this stream =     41.100(CFS)
Time of concentration =   14.06 min.
Rainfall intensity =     2.866(In/Hr)
Area averaged loss rate (Fm) =    0.3590(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3520
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)
```

```
1    373.60   208.600     14.90    0.300      2.768
2     41.10    17.400     14.06    0.359      2.866
Qmax(1) =
           1.000 *    1.000 *   373.600) +
           0.961 *    1.000 *    41.100) + =     413.093
Qmax(2) =
           1.040 *    0.944 *   373.600) +
           1.000 *    1.000 *    41.100) + =     407.649

Total of 2 main streams to confluence:
Flow rates before confluence point:
     374.600      42.100
Maximum flow rates at confluence using above data:
      413.093      407.649
Area of streams before confluence:
      208.600       17.400
Effective area values after confluence:
      226.000      214.244


Results of confluence:
Total flow rate =    413.093(CFS)
Time of concentration =    14.900 min.
Effective stream area after confluence  =    226.000(Ac.)
Study area average Pervious fraction(Ap) =  0.304
Study area average soil loss rate(Fm) =    0.305(In/Hr)
Study area total =     226.00(Ac.)


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Process from Point/Station     5115.000 to Point/Station      504.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   747.580(Ft.)
Downstream point/station elevation =   745.330(Ft.)
Pipe length  =   320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   413.093(CFS)
Given pipe size =     72.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     5.765(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      3.044(Ft.)
 Minor friction loss =      4.972(Ft.)  K-factor =   1.50
Pipe flow velocity =     14.61(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    15.27 min.


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Process from Point/Station     5115.000 to Point/Station      504.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
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```
Stream flow area =    226.000(Ac.)
Runoff from this stream =    413.093(CFS)
Time of concentration =   15.27 min.
Rainfall intensity =     2.728(In/Hr)
Area averaged loss rate (Fm) =    0.3045(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3040
Program is now starting with Main Stream No. 2


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Process from Point/Station      502.000 to Point/Station      503.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   470.000(Ft.)
Top (of initial area) elevation =   769.000(Ft.)
Bottom (of initial area) elevation =   765.000(Ft.)
Difference in elevation =     4.000(Ft.)
Slope =    0.00851  s(%)=       0.85
TC = k(0.483)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.682 min.
Rainfall intensity =      2.793(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.632
Subarea runoff =     11.174(CFS)
Total initial stream area =        6.330(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station      503.000 to Point/Station      504.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   756.000(Ft.)
Downstream point/station elevation =   745.330(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.174(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    11.174(CFS)
Normal flow depth in pipe =    4.53(In.)
Flow top width inside pipe =   28.06(In.)
Critical Depth =   11.70(In.)
Pipe flow velocity =     18.63(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    14.74 min.


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Process from Point/Station      503.000 to Point/Station      504.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    14.74 min.
Rainfall intensity =      2.786(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.648
Subarea runoff =      1.078(CFS) for    0.460(Ac.)
Total runoff =     12.252(CFS)
Effective area this stream =        6.79(Ac.)
Total Study Area (Main Stream No. 2) =      232.79(Ac.)
Area averaged Fm value =    0.781(In/Hr)


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Process from Point/Station      503.000 to Point/Station      504.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.790(Ac.)
Runoff from this stream =     12.252(CFS)
Time of concentration =   14.74 min.
Rainfall intensity =     2.786(In/Hr)
Area averaged loss rate (Fm) =    0.7815(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7992
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    413.09   226.000     15.27    0.305      2.728
2     12.25     6.790     14.74    0.781      2.786
Qmax(1) =
           1.000 *    1.000 *   413.093) +
           0.971 *    1.000 *    12.252) + =     424.988
Qmax(2) =
           1.024 *    0.965 *   413.093) +
           1.000 *    1.000 *    12.252) + =     420.629

Total of 2 main streams to confluence:
Flow rates before confluence point:
     414.093      13.252
Maximum flow rates at confluence using above data:
      424.988      420.629
Area of streams before confluence:
      226.000        6.790
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Effective area values after confluence:
      232.790      224.957


Results of confluence:
Total flow rate =    424.988(CFS)
Time of concentration =    15.265 min.
Effective stream area after confluence  =    232.790(Ac.)
Study area average Pervious fraction(Ap) =  0.318
Study area average soil loss rate(Fm) =    0.318(In/Hr)
Study area total =     232.79(Ac.)


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Process from Point/Station      504.000 to Point/Station      510.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   745.330(Ft.)
Downstream point/station elevation =   739.130(Ft.)
Pipe length  =   880.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   424.988(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   424.988(CFS)
Normal flow depth in pipe =   56.44(In.)
Flow top width inside pipe =   78.88(In.)
Critical Depth =   65.10(In.)
Pipe flow velocity =     15.45(Ft/s)
Travel time through pipe =    0.95 min.
Time of concentration (TC) =    16.21 min.


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Process from Point/Station      504.000 to Point/Station      510.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    232.790(Ac.)
Runoff from this stream =    424.988(CFS)
Time of concentration =   16.21 min.
Rainfall intensity =     2.631(In/Hr)
Area averaged loss rate (Fm) =    0.3185(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3184
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      506.000 to Point/Station      507.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
```

```
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   730.000(Ft.)
Top (of initial area) elevation =   762.000(Ft.)
Bottom (of initial area) elevation =   758.000(Ft.)
Difference in elevation =     4.000(Ft.)
Slope =    0.00548  s(%)=       0.55
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.035 min.
Rainfall intensity =      3.146(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.872
Subarea runoff =     27.437(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      507.000 to Point/Station      510.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   750.000(Ft.)
Downstream point/station elevation =   739.130(Ft.)
Pipe length  =  1070.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    27.437(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    27.437(CFS)
Normal flow depth in pipe =   14.16(In.)
Flow top width inside pipe =   43.78(In.)
Critical Depth =   18.60(In.)
Pipe flow velocity =      8.86(Ft/s)
Travel time through pipe =    2.01 min.
Time of concentration (TC) =    14.05 min.


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Process from Point/Station      507.000 to Point/Station      510.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    14.05 min.
Rainfall intensity =      2.867(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.869
Subarea runoff =     30.843(CFS) for   13.380(Ac.)
Total runoff =     58.279(CFS)
Effective area this stream =       23.38(Ac.)
Total Study Area (Main Stream No. 2) =      256.17(Ac.)
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Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station      507.000 to Point/Station      510.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    14.05 min.
Rainfall intensity =      2.867(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.869
Subarea runoff =      4.337(CFS) for    1.740(Ac.)
Total runoff =     62.617(CFS)
Effective area this stream =       25.12(Ac.)
Total Study Area (Main Stream No. 2) =      257.91(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station      507.000 to Point/Station      510.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     25.120(Ac.)
Runoff from this stream =     62.617(CFS)
Time of concentration =   14.05 min.
Rainfall intensity =     2.867(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    424.99   232.790     16.21    0.318      2.631
2     62.62    25.120     14.05    0.098      2.867
Qmax(1) =
           1.000 *    1.000 *   424.988) +
           0.915 *    1.000 *    62.617) + =     482.261
Qmax(2) =
           1.102 *    0.866 *   424.988) +
           1.000 *    1.000 *    62.617) + =     468.473

Total of 2 main streams to confluence:
Flow rates before confluence point:
     425.988      63.617
```

```
Maximum flow rates at confluence using above data:
      482.261      468.473
Area of streams before confluence:
      232.790       25.120
Effective area values after confluence:
      257.910      226.816


Results of confluence:
Total flow rate =    482.261(CFS)
Time of concentration =    16.214 min.
Effective stream area after confluence  =    257.910(Ac.)
Study area average Pervious fraction(Ap) =  0.297
Study area average soil loss rate(Fm) =    0.297(In/Hr)
Study area total =     257.91(Ac.)


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Process from Point/Station      510.000 to Point/Station     5141.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   739.130(Ft.)
Downstream point/station elevation =   734.240(Ft.)
Pipe length  =   690.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   482.261(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   482.261(CFS)
Normal flow depth in pipe =   62.06(In.)
Flow top width inside pipe =   73.80(In.)
Critical Depth =   68.97(In.)
Pipe flow velocity =     15.81(Ft/s)
Travel time through pipe =    0.73 min.
Time of concentration (TC) =    16.94 min.


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Process from Point/Station     5141.000 to Point/Station      520.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   734.240(Ft.)
Downstream point/station elevation =   726.560(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   482.261(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   482.261(CFS)
Normal flow depth in pipe =   47.34(In.)
Flow top width inside pipe =   83.32(In.)
Critical Depth =   68.97(In.)
Pipe flow velocity =     21.58(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    17.33 min.


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Process from Point/Station     5141.000 to Point/Station      520.000
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**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 257.910(Ac.)
Runoff from this stream = 482.261(CFS)
Time of concentration = 17.33 min.
Rainfall intensity = 2.528(In/Hr)
Area averaged loss rate (Fm) = 0.2970(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2972
Program is now starting with Main Stream No. 2

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Process from Point/Station 516.000 to Point/Station 517.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 980.000(Ft.)
Top (of initial area) elevation = 760.000(Ft.)
Bottom (of initial area) elevation = 750.000(Ft.)
Difference in elevation = 10.000(Ft.)
Slope = 0.01020 s(%)= 1.02
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.957 min.
Rainfall intensity = 3.159(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.872
Subarea runoff = 23.058(CFS)
Total initial stream area = 8.370(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

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Process from Point/Station 517.000 to Point/Station 520.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 741.000(Ft.)
Downstream point/station elevation = 726.560(Ft.)
Pipe length = 720.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 23.058(CFS)
Given pipe size = 48.00(In.)
Calculated individual pipe flow = 23.058(CFS)
Normal flow depth in pipe = 10.91(In.)
Flow top width inside pipe = 40.23(In.)
Critical Depth = 16.99(In.)
Pipe flow velocity = 10.74(Ft/s)
Travel time through pipe = 1.12 min.

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Time of concentration (TC) =    13.07 min.


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Process from Point/Station      517.000 to Point/Station      520.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.07 min.
Rainfall intensity =      2.994(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =     30.008(CFS) for   11.990(Ac.)
Total runoff =     53.066(CFS)
Effective area this stream =       20.36(Ac.)
Total Study Area (Main Stream No. 2) =      278.27(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station      517.000 to Point/Station      520.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.07 min.
Rainfall intensity =      2.994(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =      5.421(CFS) for    2.080(Ac.)
Total runoff =     58.487(CFS)
Effective area this stream =       22.44(Ac.)
Total Study Area (Main Stream No. 2) =      280.35(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station      517.000 to Point/Station      520.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     22.440(Ac.)
Runoff from this stream =     58.487(CFS)
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Time of concentration =   13.07 min.
Rainfall intensity =     2.994(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    482.26   257.910     17.33    0.297      2.528
2     58.49    22.440     13.07    0.098      2.994
Qmax(1) =
           1.000 *    1.000 *   482.261) +
           0.839 *    1.000 *    58.487) + =     531.348
Qmax(2) =
           1.209 *    0.755 *   482.261) +
           1.000 *    1.000 *    58.487) + =     498.281

Total of 2 main streams to confluence:
Flow rates before confluence point:
     483.261      59.487
Maximum flow rates at confluence using above data:
      531.348      498.281
Area of streams before confluence:
      257.910       22.440
Effective area values after confluence:
      280.350      217.041


Results of confluence:
Total flow rate =    531.348(CFS)
Time of concentration =    17.328 min.
Effective stream area after confluence  =    280.350(Ac.)
Study area average Pervious fraction(Ap) =  0.281
Study area average soil loss rate(Fm) =    0.281(In/Hr)
Study area total =     280.35(Ac.)


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Process from Point/Station      520.000 to Point/Station     5215.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   726.560(Ft.)
Downstream point/station elevation =   720.420(Ft.)
Pipe length  =   400.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   531.348(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   531.348(CFS)
Normal flow depth in pipe =   50.34(In.)
Flow top width inside pipe =   82.33(In.)
Critical Depth =   71.86(In.)
Pipe flow velocity =     22.05(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =    17.63 min.
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Process from Point/Station      520.000 to Point/Station     5215.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    280.350(Ac.)
Runoff from this stream =    531.348(CFS)
Time of concentration =   17.63 min.
Rainfall intensity =     2.502(In/Hr)
Area averaged loss rate (Fm) =    0.2810(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2814
Program is now starting with Main Stream No. 2


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Process from Point/Station      521.000 to Point/Station      522.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   780.000(Ft.)
Top (of initial area) elevation =   749.000(Ft.)
Bottom (of initial area) elevation =   746.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.00385  s(%)=       0.38
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.265 min.
Rainfall intensity =      2.968(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =     14.155(CFS)
Total initial stream area =        5.480(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      522.000 to Point/Station     5215.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   722.000(Ft.)
Downstream point/station elevation =   720.420(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.155(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    14.155(CFS)
Normal flow depth in pipe =   12.63(In.)
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Flow top width inside pipe =   23.97(In.)
Critical Depth =   16.26(In.)
Pipe flow velocity =      8.44(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =    13.50 min.


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Process from Point/Station      522.000 to Point/Station     5215.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.50 min.
Rainfall intensity =      2.937(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.870
Subarea runoff =      1.532(CFS) for    0.660(Ac.)
Total runoff =     15.687(CFS)
Effective area this stream =        6.14(Ac.)
Total Study Area (Main Stream No. 2) =      286.49(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station      522.000 to Point/Station     5215.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.140(Ac.)
Runoff from this stream =     15.687(CFS)
Time of concentration =   13.50 min.
Rainfall intensity =     2.937(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5210.000 to Point/Station     5210.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
_____________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 25.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Rainfall intensity =      1.904(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  27.80 min.  Rain intensity =       1.90(In/Hr)
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```
Total area this stream =       153.70(Ac.)
Total Study Area (Main Stream No. 3) =      440.19(Ac.)
Total runoff =    245.60(CFS)


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Process from Point/Station     5210.000 to Point/Station     5215.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   728.800(Ft.)
Downstream point/station elevation =   720.420(Ft.)
Pipe length  =   420.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   245.600(CFS)
Given pipe size =     72.00(In.)
Calculated individual pipe flow  =   245.600(CFS)
Normal flow depth in pipe =   32.13(In.)
Flow top width inside pipe =   71.58(In.)
Critical Depth =   51.52(In.)
Pipe flow velocity =     20.12(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =    28.15 min.


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Process from Point/Station     5210.000 to Point/Station     5215.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =    153.700(Ac.)
Runoff from this stream =    245.600(CFS)
Time of concentration =   28.15 min.
Rainfall intensity =     1.890(In/Hr)
Area averaged loss rate (Fm) =    0.1000(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    531.35   280.350     17.63    0.281      2.502
2     15.69     6.140     13.50    0.098      2.937
3    245.60   153.700     28.15    0.100      1.890
Qmax(1) =
           1.000 *    1.000 *   531.348) +
           0.847 *    1.000 *    15.687) +
           1.342 *    0.626 *   245.600) + =     751.102
Qmax(2) =
           1.196 *    0.766 *   531.348) +
           1.000 *    1.000 *    15.687) +
           1.585 *    0.480 *   245.600) + =     688.902
Qmax(3) =
           0.724 *    1.000 *   531.348) +
           0.631 *    1.000 *    15.687) +
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           1.000 *    1.000 *   245.600) + =     640.346

Total of 3 main streams to confluence:
Flow rates before confluence point:
     532.348      16.687     246.600
Maximum flow rates at confluence using above data:
      751.102      688.902      640.346
Area of streams before confluence:
      280.350        6.140      153.700
Effective area values after confluence:
      382.759      294.568      440.190


Results of confluence:
Total flow rate =    751.102(CFS)
Time of concentration =    17.630 min.
Effective stream area after confluence  =    382.759(Ac.)
Study area average Pervious fraction(Ap) =  0.216
Study area average soil loss rate(Fm) =    0.215(In/Hr)
Study area total =     440.19(Ac.)


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Process from Point/Station     5215.000 to Point/Station      525.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   720.420(Ft.)
Downstream point/station elevation =   712.540(Ft.)
Pipe length  =   920.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   751.102(CFS)
Given pipe size =     84.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    13.706(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     12.714(Ft.)
 Minor friction loss =      8.872(Ft.)  K-factor =   1.50
Pipe flow velocity =     19.52(Ft/s)
Travel time through pipe =    0.79 min.
Time of concentration (TC) =    18.42 min.


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Process from Point/Station      525.000 to Point/Station     5248.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   712.540(Ft.)
Downstream point/station elevation =   710.460(Ft.)
Pipe length  =   250.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   751.102(CFS)
Given pipe size =     96.00(In.)
Calculated individual pipe flow  =   751.102(CFS)
Normal flow depth in pipe =   71.44(In.)
Flow top width inside pipe =   83.78(In.)
Critical Depth =   82.58(In.)
Pipe flow velocity =     18.74(Ft/s)
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Travel time through pipe =    0.22 min.
Time of concentration (TC) =    18.64 min.


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Process from Point/Station      525.000 to Point/Station     5248.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    382.759(Ac.)
Runoff from this stream =    751.102(CFS)
Time of concentration =   18.64 min.
Rainfall intensity =     2.420(In/Hr)
Area averaged loss rate (Fm) =    0.2153(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2155
Program is now starting with Main Stream No. 2


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Process from Point/Station      526.000 to Point/Station      527.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   840.000(Ft.)
Top (of initial area) elevation =   747.000(Ft.)
Bottom (of initial area) elevation =   737.000(Ft.)
Difference in elevation =    10.000(Ft.)
Slope =    0.01190  s(%)=       1.19
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.900 min.
Rainfall intensity =      3.339(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.874
Subarea runoff =     29.141(CFS)
Total initial stream area =        9.990(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      527.000 to Point/Station      528.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   723.000(Ft.)
Downstream point/station elevation =   718.560(Ft.)
Pipe length  =   450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.141(CFS)
Given pipe size =     36.00(In.)
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```
Calculated individual pipe flow  =    29.141(CFS)
Normal flow depth in pipe =   16.71(In.)
Flow top width inside pipe =   35.91(In.)
Critical Depth =   20.95(In.)
Pipe flow velocity =      9.07(Ft/s)
Travel time through pipe =    0.83 min.
Time of concentration (TC) =    11.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      527.000 to Point/Station      528.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    11.73 min.
Rainfall intensity =      3.196(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =     30.803(CFS) for   11.510(Ac.)
Total runoff =     59.944(CFS)
Effective area this stream =       21.50(Ac.)
Total Study Area (Main Stream No. 2) =      461.69(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station      528.000 to Point/Station     5248.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   718.560(Ft.)
Downstream point/station elevation =   710.460(Ft.)
Pipe length  =   810.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    59.944(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =    59.944(CFS)
Normal flow depth in pipe =   20.46(In.)
Flow top width inside pipe =   52.39(In.)
Critical Depth =   26.96(In.)
Pipe flow velocity =     10.86(Ft/s)
Travel time through pipe =    1.24 min.
Time of concentration (TC) =    12.97 min.


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Process from Point/Station      528.000 to Point/Station     5248.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.900
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 35.70
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.095(In/Hr)
Time of concentration =    12.97 min.
Rainfall intensity =      3.008(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =     12.154(CFS) for    6.020(Ac.)
Total runoff =     72.097(CFS)
Effective area this stream =       27.52(Ac.)
Total Study Area (Main Stream No. 2) =      467.71(Ac.)
Area averaged Fm value =    0.097(In/Hr)


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Process from Point/Station      528.000 to Point/Station     5248.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    12.97 min.
Rainfall intensity =      3.008(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =      3.562(CFS) for    1.360(Ac.)
Total runoff =     75.660(CFS)
Effective area this stream =       28.88(Ac.)
Total Study Area (Main Stream No. 2) =      469.07(Ac.)
Area averaged Fm value =    0.097(In/Hr)


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Process from Point/Station      528.000 to Point/Station     5248.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    12.97 min.
Rainfall intensity =      3.008(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =      7.596(CFS) for    2.900(Ac.)
Total runoff =     83.256(CFS)
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Effective area this stream =       31.78(Ac.)
Total Study Area (Main Stream No. 2) =      471.97(Ac.)
Area averaged Fm value =    0.097(In/Hr)


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Process from Point/Station      528.000 to Point/Station     5248.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     31.780(Ac.)
Runoff from this stream =     83.256(CFS)
Time of concentration =   12.97 min.
Rainfall intensity =     3.008(In/Hr)
Area averaged loss rate (Fm) =    0.0973(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    751.10   382.759     18.64    0.215      2.420
2     83.26    31.780     12.97    0.097      3.008
Qmax(1) =
           1.000 *    1.000 *   751.102) +
           0.798 *    1.000 *    83.256) + =     817.538
Qmax(2) =
           1.267 *    0.696 *   751.102) +
           1.000 *    1.000 *    83.256) + =     745.365

Total of 2 main streams to confluence:
Flow rates before confluence point:
     752.102      84.256
Maximum flow rates at confluence using above data:
      817.538      745.365
Area of streams before confluence:
      382.759       31.780
Effective area values after confluence:
      414.539      298.144


Results of confluence:
Total flow rate =    817.538(CFS)
Time of concentration =    18.638 min.
Effective stream area after confluence  =    414.539(Ac.)
Study area average Pervious fraction(Ap) =  0.207
Study area average soil loss rate(Fm) =    0.206(In/Hr)
Study area total =     414.54(Ac.)


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Process from Point/Station     5248.000 to Point/Station     5300.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

```
Upstream point/station elevation =   710.460(Ft.)
Downstream point/station elevation =   707.900(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   817.538(CFS)
Given pipe size =     96.00(In.)
Calculated individual pipe flow  =   817.538(CFS)
Normal flow depth in pipe =   36.49(In.)
Flow top width inside pipe =   93.20(In.)
Critical Depth =   85.20(In.)
Pipe flow velocity =     46.62(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    18.65 min.


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Process from Point/Station     5248.000 to Point/Station     5300.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    414.539(Ac.)
Runoff from this stream =    817.538(CFS)
Time of concentration =   18.65 min.
Rainfall intensity =     2.419(In/Hr)
Area averaged loss rate (Fm) =    0.2062(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2067
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      531.000 to Point/Station      532.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   500.000(Ft.)
Top (of initial area) elevation =   748.000(Ft.)
Bottom (of initial area) elevation =   746.000(Ft.)
Difference in elevation =     2.000(Ft.)
Slope =    0.00400  s(%)=       0.40
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.017 min.
Rainfall intensity =      3.318(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.873
Subarea runoff =     10.925(CFS)
Total initial stream area =        3.770(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)
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Process from Point/Station      532.000 to Point/Station      533.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of street segment elevation =   746.000(Ft.)
End of street segment elevation =   742.000(Ft.)
Length of street segment  =   610.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     20.668(CFS)
Depth of flow =   0.507(Ft.), Average velocity =   2.762(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.000(Ft.)
Flow velocity =   2.76(Ft/s)
Travel time =    3.68 min.     TC =   14.70  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      2.791(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.868
Subarea runoff =     19.371(CFS) for    8.730(Ac.)
Total runoff =     30.296(CFS)
Effective area this stream =       12.50(Ac.)
Total Study Area (Main Stream No. 2) =      484.47(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     30.296(CFS)
Half street flow at end of street =     15.148(CFS)
Depth of flow =   0.561(Ft.), Average velocity =   3.215(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  18.000(Ft.)


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Process from Point/Station      533.000 to Point/Station      534.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

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Upstream point/station elevation =   728.000(Ft.)
Downstream point/station elevation =   721.280(Ft.)
Pipe length  =   720.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    30.296(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    30.296(CFS)
Normal flow depth in pipe =   16.10(In.)
Flow top width inside pipe =   40.84(In.)
Critical Depth =   20.41(In.)
Pipe flow velocity =      8.92(Ft/s)
Travel time through pipe =    1.34 min.
Time of concentration (TC) =    16.04 min.


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Process from Point/Station      533.000 to Point/Station      534.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    16.04 min.
Rainfall intensity =      2.648(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =     22.080(CFS) for   10.320(Ac.)
Total runoff =     52.376(CFS)
Effective area this stream =       22.82(Ac.)
Total Study Area (Main Stream No. 2) =      494.79(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station      533.000 to Point/Station      534.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    16.04 min.
Rainfall intensity =      2.648(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =      6.312(CFS) for    2.750(Ac.)
Total runoff =     58.688(CFS)
Effective area this stream =       25.57(Ac.)
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Total Study Area (Main Stream No. 2) =      497.54(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station      533.000 to Point/Station      534.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    16.04 min.
Rainfall intensity =      2.648(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =     22.103(CFS) for    9.630(Ac.)
Total runoff =     80.790(CFS)
Effective area this stream =       35.20(Ac.)
Total Study Area (Main Stream No. 2) =      507.17(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station      534.000 to Point/Station     5295.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   721.280(Ft.)
Downstream point/station elevation =   715.690(Ft.)
Pipe length  =   640.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    80.790(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    80.790(CFS)
Normal flow depth in pipe =   30.00(In.)
Flow top width inside pipe =   37.95(In.)
Critical Depth =   33.70(In.)
Pipe flow velocity =     10.99(Ft/s)
Travel time through pipe =    0.97 min.
Time of concentration (TC) =    17.01 min.


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Process from Point/Station      534.000 to Point/Station     5295.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     35.200(Ac.)
Runoff from this stream =     80.790(CFS)
Time of concentration =   17.01 min.
Rainfall intensity =     2.556(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
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Process from Point/Station      536.000 to Point/Station      537.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   640.000(Ft.)
Top (of initial area) elevation =   740.000(Ft.)
Bottom (of initial area) elevation =   738.000(Ft.)
Difference in elevation =     2.000(Ft.)
Slope =    0.00313  s(%)=       0.31
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.775 min.
Rainfall intensity =      3.036(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.871
Subarea runoff =     23.532(CFS)
Total initial stream area =        8.900(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      537.000 to Point/Station     5295.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____________________________________________________________________________
Upstream point/station elevation =   728.000(Ft.)
Downstream point/station elevation =   715.690(Ft.)
Pipe length  =   670.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.532(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    23.532(CFS)
Normal flow depth in pipe =   11.27(In.)
Flow top width inside pipe =   40.70(In.)
Critical Depth =   17.17(In.)
Pipe flow velocity =     10.47(Ft/s)
Travel time through pipe =    1.07 min.
Time of concentration (TC) =    13.84 min.


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Process from Point/Station      537.000 to Point/Station     5295.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.200
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Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 39.40
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.092(In/Hr)
Time of concentration =    13.84 min.
Rainfall intensity =      2.893(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =     34.477(CFS) for   14.130(Ac.)
Total runoff =     58.009(CFS)
Effective area this stream =       23.03(Ac.)
Total Study Area (Main Stream No. 2) =      530.20(Ac.)
Area averaged Fm value =    0.094(In/Hr)


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Process from Point/Station      537.000 to Point/Station     5295.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.600
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.400
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 46.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.085(In/Hr)
Time of concentration =    13.84 min.
Rainfall intensity =      2.893(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =     15.747(CFS) for    6.230(Ac.)
Total runoff =     73.755(CFS)
Effective area this stream =       29.26(Ac.)
Total Study Area (Main Stream No. 2) =      536.43(Ac.)
Area averaged Fm value =    0.092(In/Hr)


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Process from Point/Station      537.000 to Point/Station     5295.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 50.50
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.080(In/Hr)
Time of concentration =    13.84 min.
Rainfall intensity =      2.893(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =     25.011(CFS) for    9.880(Ac.)
Total runoff =     98.766(CFS)
Effective area this stream =       39.14(Ac.)
Total Study Area (Main Stream No. 2) =      546.31(Ac.)
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Area averaged Fm value =    0.089(In/Hr)


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Process from Point/Station      537.000 to Point/Station     5295.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.84 min.
Rainfall intensity =      2.893(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =      7.245(CFS) for    2.880(Ac.)
Total runoff =    106.011(CFS)
Effective area this stream =       42.02(Ac.)
Total Study Area (Main Stream No. 2) =      549.19(Ac.)
Area averaged Fm value =    0.090(In/Hr)


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Process from Point/Station      537.000 to Point/Station     5295.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     42.020(Ac.)
Runoff from this stream =    106.011(CFS)
Time of concentration =   13.84 min.
Rainfall intensity =     2.893(In/Hr)
Area averaged loss rate (Fm) =    0.0899(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     80.79    35.200     17.01    0.098      2.556
2    106.01    42.020     13.84    0.090      2.893
Qmax(1) =
           1.000 *    1.000 *    80.790) +
           0.880 *    1.000 *   106.011) + =     174.065
Qmax(2) =
           1.137 *    0.814 *    80.790) +
           1.000 *    1.000 *   106.011) + =     180.748

Total of 2 streams to confluence:
Flow rates before confluence point:
      80.790     106.011
Maximum flow rates at confluence using above data:
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```
      174.065      180.748
Area of streams before confluence:
       35.200       42.020
Effective area values after confluence:
       77.220       70.659
Results of confluence:
Total flow rate =    180.748(CFS)
Time of concentration =    13.842 min.
Effective stream area after confluence =     70.659(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.093(In/Hr)
Study area total (this main stream) =      77.22(Ac.)


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Process from Point/Station     5295.000 to Point/Station     5300.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   715.690(Ft.)
Downstream point/station elevation =   707.900(Ft.)
Pipe length  =   950.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   180.748(CFS)
Given pipe size =     96.00(In.)
Calculated individual pipe flow  =   180.748(CFS)
Normal flow depth in pipe =   30.52(In.)
Flow top width inside pipe =   89.40(In.)
Critical Depth =   40.27(In.)
Pipe flow velocity =     13.16(Ft/s)
Travel time through pipe =    1.20 min.
Time of concentration (TC) =    15.04 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5295.000 to Point/Station     5300.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     70.659(Ac.)
Runoff from this stream =    180.748(CFS)
Time of concentration =   15.04 min.
Rainfall intensity =     2.752(In/Hr)
Area averaged loss rate (Fm) =    0.0935(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    817.54   414.539     18.65    0.206      2.419
2    180.75    70.659     15.04    0.093      2.752
Qmax(1) =
           1.000 *    1.000 *   817.538) +
           0.875 *    1.000 *   180.748) + =     975.665
```

```
Qmax(2) =
           1.150 *    0.807 *   817.538) +
           1.000 *    1.000 *   180.748) + =     939.439

Total of 2 main streams to confluence:
Flow rates before confluence point:
     818.538     181.748
Maximum flow rates at confluence using above data:
      975.665      939.439
Area of streams before confluence:
      414.539       70.659
Effective area values after confluence:
      485.198      405.081


Results of confluence:
Total flow rate =    975.665(CFS)
Time of concentration =    18.649 min.
Effective stream area after confluence  =    485.198(Ac.)
Study area average Pervious fraction(Ap) =  0.191
Study area average soil loss rate(Fm) =    0.190(In/Hr)
Study area total =     485.20(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5300.000 to Point/Station     5305.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   707.900(Ft.)
Downstream point/station elevation =   706.030(Ft.)
Pipe length  =   640.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   975.665(CFS)
Given pipe size =    108.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     7.515(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      3.906(Ft.)
 Minor friction loss =      5.478(Ft.)  K-factor =   1.50
Pipe flow velocity =     15.34(Ft/s)
Travel time through pipe =    0.70 min.
Time of concentration (TC) =    19.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5300.000 to Point/Station     5305.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    485.198(Ac.)
Runoff from this stream =    975.665(CFS)
Time of concentration =   19.34 min.
Rainfall intensity =     2.367(In/Hr)
Area averaged loss rate (Fm) =    0.1898(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1911
```

```
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      541.000 to Point/Station      542.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   650.000(Ft.)
Top (of initial area) elevation =   733.000(Ft.)
Bottom (of initial area) elevation =   730.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.00462  s(%)=       0.46
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.890 min.
Rainfall intensity =      3.169(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.872
Subarea runoff =     16.171(CFS)
Total initial stream area =        5.850(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      542.000 to Point/Station     5305.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   723.000(Ft.)
Downstream point/station elevation =   715.630(Ft.)
Pipe length  =  1380.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.171(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    16.171(CFS)
Normal flow depth in pipe =   14.27(In.)
Flow top width inside pipe =   35.22(In.)
Critical Depth =   15.41(In.)
Pipe flow velocity =      6.19(Ft/s)
Travel time through pipe =    3.71 min.
Time of concentration (TC) =    15.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      542.000 to Point/Station     5305.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SCHOOL subarea
Decimal fraction soil group A = 0.350
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 0.650
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.05
Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.440(In/Hr)
Time of concentration =    15.60 min.
Rainfall intensity =      2.692(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.784
Subarea runoff =     29.681(CFS) for   15.880(Ac.)
Total runoff =     45.852(CFS)
Effective area this stream =       21.73(Ac.)
Total Study Area (Main Stream No. 2) =      570.92(Ac.)
Area averaged Fm value =    0.348(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      542.000 to Point/Station     5305.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Time of concentration =    15.60 min.
Rainfall intensity =      2.692(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.788
Subarea runoff =      2.255(CFS) for    0.950(Ac.)
Total runoff =     48.107(CFS)
Effective area this stream =       22.68(Ac.)
Total Study Area (Main Stream No. 2) =      571.87(Ac.)
Area averaged Fm value =    0.336(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      542.000 to Point/Station     5305.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     22.680(Ac.)
Runoff from this stream =     48.107(CFS)
Time of concentration =   15.60 min.
Rainfall intensity =     2.692(In/Hr)
Area averaged loss rate (Fm) =    0.3356(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4501
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)
```

```
1    975.66   485.198     19.34    0.190      2.367
2     48.11    22.680     15.60    0.336      2.692
Qmax(1) =
           1.000 *    1.000 *   975.665) +
           0.862 *    1.000 *    48.107) + =    1017.123
Qmax(2) =
           1.150 *    0.807 *   975.665) +
           1.000 *    1.000 *    48.107) + =     952.850

Total of 2 main streams to confluence:
Flow rates before confluence point:
     976.665      49.107
Maximum flow rates at confluence using above data:
     1017.123      952.850
Area of streams before confluence:
      485.198       22.680
Effective area values after confluence:
      507.878      414.051


Results of confluence:
Total flow rate =   1017.123(CFS)
Time of concentration =    19.345 min.
Effective stream area after confluence  =    507.878(Ac.)
Study area average Pervious fraction(Ap) =  0.203
Study area average soil loss rate(Fm) =    0.196(In/Hr)
Study area total =     507.88(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5305.000 to Point/Station     5330.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________________
Upstream point/station elevation =   715.630(Ft.)
Downstream point/station elevation =   701.260(Ft.)
Pipe length  =   690.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  1017.123(CFS)
Given pipe size =    108.00(In.)
Calculated individual pipe flow  =  1017.123(CFS)
Normal flow depth in pipe =   58.08(In.)
Flow top width inside pipe =  107.69(In.)
Critical Depth =   93.23(In.)
Pipe flow velocity =     29.18(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    19.74 min.


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Process from Point/Station      545.000 to Point/Station     5330.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    507.878(Ac.)
Runoff from this stream =   1017.123(CFS)
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```
Time of concentration =   19.74 min.
Rainfall intensity =     2.338(In/Hr)
Area averaged loss rate (Fm) =    0.1963(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2027
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      546.000 to Point/Station      547.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Initial subarea data:
Initial area flow distance =   540.000(Ft.)
Top (of initial area) elevation =   733.000(Ft.)
Bottom (of initial area) elevation =   727.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.01111  s(%)=       1.11
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.871 min.
Rainfall intensity =      3.544(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =     17.568(CFS)
Total initial stream area =        5.830(Ac.)
Pervious area fraction = 0.200
Initial area Fm value =    0.196(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      547.000 to Point/Station     5330.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   727.000(Ft.)
Downstream point/station elevation =   701.260(Ft.)
Pipe length  =  1340.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.568(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    17.568(CFS)
Normal flow depth in pipe =   10.07(In.)
Flow top width inside pipe =   35.86(In.)
Critical Depth =   15.36(In.)
Pipe flow velocity =      9.91(Ft/s)
Travel time through pipe =    2.25 min.
Time of concentration (TC) =    12.12 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      547.000 to Point/Station     5330.000
**** SUBAREA FLOW ADDITION ****
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_____________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 0.900
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 35.70
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.191(In/Hr)
Time of concentration =    12.12 min.
Rainfall intensity =      3.132(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.845
Subarea runoff =     38.192(CFS) for   15.240(Ac.)
Total runoff =     55.760(CFS)
Effective area this stream =       21.07(Ac.)
Total Study Area (Main Stream No. 2) =      592.94(Ac.)
Area averaged Fm value =    0.192(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      547.000 to Point/Station     5330.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.900
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 35.70
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.095(In/Hr)
Time of concentration =    12.12 min.
Rainfall intensity =      3.132(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.854
Subarea runoff =     29.056(CFS) for   10.630(Ac.)
Total runoff =     84.817(CFS)
Effective area this stream =       31.70(Ac.)
Total Study Area (Main Stream No. 2) =      603.57(Ac.)
Area averaged Fm value =    0.160(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      547.000 to Point/Station     5330.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.650
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.350
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 44.95
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.087(In/Hr)
Time of concentration =    12.12 min.
Rainfall intensity =      3.132(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.858
Subarea runoff =     20.394(CFS) for    7.440(Ac.)
Total runoff =    105.211(CFS)
Effective area this stream =       39.14(Ac.)
Total Study Area (Main Stream No. 2) =      611.01(Ac.)
Area averaged Fm value =    0.146(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      547.000 to Point/Station     5330.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     39.140(Ac.)
Runoff from this stream =    105.211(CFS)
Time of concentration =   12.12 min.
Rainfall intensity =     3.132(In/Hr)
Area averaged loss rate (Fm) =    0.1457(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1538
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      551.000 to Point/Station      552.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 0.550
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.450
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 48.65
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.165(In/Hr)
Initial subarea data:
Initial area flow distance =   690.000(Ft.)
Top (of initial area) elevation =   729.000(Ft.)
Bottom (of initial area) elevation =   724.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00725  s(%)=       0.72
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.859 min.
Rainfall intensity =      3.174(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.853
Subarea runoff =     26.080(CFS)
Total initial stream area =        9.630(Ac.)
Pervious area fraction = 0.200
Initial area Fm value =    0.165(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      552.000 to Point/Station     5330.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   724.000(Ft.)
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Downstream point/station elevation =   701.260(Ft.)
Pipe length  =  1610.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.080(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    26.080(CFS)
Normal flow depth in pipe =   14.21(In.)
Flow top width inside pipe =   35.20(In.)
Critical Depth =   19.77(In.)
Pipe flow velocity =     10.05(Ft/s)
Travel time through pipe =    2.67 min.
Time of concentration (TC) =    14.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      552.000 to Point/Station     5330.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
RESIDENTIAL(11+ dwl/acre)
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 39.40
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.184(In/Hr)
Time of concentration =    14.53 min.
Rainfall intensity =      2.810(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.843
Subarea runoff =     45.054(CFS) for   20.400(Ac.)
Total runoff =     71.134(CFS)
Effective area this stream =       30.03(Ac.)
Total Study Area (Main Stream No. 3) =      641.04(Ac.)
Area averaged Fm value =    0.178(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      552.000 to Point/Station     5330.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.700
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 43.10
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.089(In/Hr)
Time of concentration =    14.53 min.
Rainfall intensity =      2.810(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.846
Subarea runoff =      8.157(CFS) for    3.330(Ac.)
Total runoff =     79.291(CFS)
Effective area this stream =       33.36(Ac.)
Total Study Area (Main Stream No. 3) =      644.37(Ac.)
Area averaged Fm value =    0.169(In/Hr)
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      552.000 to Point/Station     5330.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     33.360(Ac.)
Runoff from this stream =     79.291(CFS)
Time of concentration =   14.53 min.
Rainfall intensity =     2.810(In/Hr)
Area averaged loss rate (Fm) =    0.1693(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1900
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1   1017.12   507.878     19.74    0.196      2.338
2    105.21    39.140     12.12    0.146      3.132
3     79.29    33.360     14.53    0.169      2.810
Qmax(1) =
           1.000 *    1.000 *  1017.123) +
           0.734 *    1.000 *   105.211) +
           0.821 *    1.000 *    79.291) + =    1159.475
Qmax(2) =
           1.371 *    0.614 *  1017.123) +
           1.000 *    1.000 *   105.211) +
           1.122 *    0.834 *    79.291) + =    1035.863
Qmax(3) =
           1.220 *    0.736 *  1017.123) +
           0.892 *    1.000 *   105.211) +
           1.000 *    1.000 *    79.291) + =    1086.782

Total of 3 main streams to confluence:
Flow rates before confluence point:
    1018.123     106.211      80.291
Maximum flow rates at confluence using above data:
     1159.475     1035.863     1086.782
Area of streams before confluence:
      507.878       39.140       33.360
Effective area values after confluence:
      580.378      378.931      446.325


Results of confluence:
Total flow rate =   1159.475(CFS)
Time of concentration =    19.739 min.
Effective stream area after confluence  =    580.378(Ac.)
Study area average Pervious fraction(Ap) =  0.199
Study area average soil loss rate(Fm) =    0.191(In/Hr)
Study area total =     580.38(Ac.)
End of computations, Total Study Area =          644.37 (Ac.)
```

The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.199
Area averaged SCS curve number =   1.$

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018 Version 9.0
Rational Hydrology Study Date: 09/06/22

Rich-Haven Specific Plan
Hydrology Study for Allowable Q
100-yr Storm
Mill Creek Storm Drain

Program License Serial Number 6440

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.200 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 504.000 to Point/Station 504.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 25.00
Pervious ratio(Ap) = 0.3180 Max loss rate(Fm)= 0.318(In/Hr)
Rainfall intensity = 2.728(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 15.27 min. Rain intensity = 2.73(In/Hr)
Total area this stream = 232.79(Ac.)
Total Study Area (Main Stream No. 1) = 232.79(Ac.)
Total runoff = 424.99(CFS)

++

Process from Point/Station 504.000 to Point/Station 510.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 745.330(Ft.)
Downstream point/station elevation = 739.130(Ft.)
Pipe length = 880.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 424.988(CFS)
Given pipe size = 84.00(In.)
Calculated individual pipe flow = 424.988(CFS)
Normal flow depth in pipe = 56.44(In.)

```
Flow top width inside pipe =   78.88(In.)
Critical Depth =   65.10(In.)
Pipe flow velocity =     15.45(Ft/s)
Travel time through pipe =    0.95 min.
Time of concentration (TC) =    16.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      504.000 to Point/Station      510.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    232.790(Ac.)
Runoff from this stream =    424.988(CFS)
Time of concentration =   16.21 min.
Rainfall intensity =     2.631(In/Hr)
Area averaged loss rate (Fm) =    0.3180(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3180
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      506.000 to Point/Station      510.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  =  1.#R
Pervious ratio(Ap) = 0.0980     Max loss rate(Fm)=     0.100(In/Hr)
Rainfall intensity =      2.867(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  14.05 min.  Rain intensity =       2.87(In/Hr)
Total area this stream =        25.12(Ac.)
Total Study Area (Main Stream No. 2) =      257.91(Ac.)
Total runoff =     42.30(CFS)


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Process from Point/Station      506.000 to Point/Station      510.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     25.120(Ac.)
Runoff from this stream =     42.300(CFS)
Time of concentration =   14.05 min.
Rainfall intensity =     2.867(In/Hr)
Area averaged loss rate (Fm) =    0.1000(In/Hr)
Area averaged Pervious ratio (Ap) = 0.0980
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)
```

```
1    424.99   232.790     16.21    0.318      2.631
2     42.30    25.120     14.05    0.100      2.867
Qmax(1) =
           1.000 *    1.000 *   424.988) +
           0.915 *    1.000 *    42.300) + =     463.678
Qmax(2) =
           1.102 *    0.867 *   424.988) +
           1.000 *    1.000 *    42.300) + =     448.163

Total of 2 main streams to confluence:
Flow rates before confluence point:
     425.988      43.300
Maximum flow rates at confluence using above data:
      463.678      448.163
Area of streams before confluence:
      232.790       25.120
Effective area values after confluence:
      257.910      226.839


Results of confluence:
Total flow rate =    463.678(CFS)
Time of concentration =    16.214 min.
Effective stream area after confluence  =    257.910(Ac.)
Study area average Pervious fraction(Ap) =  0.297
Study area average soil loss rate(Fm) =    0.297(In/Hr)
Study area total =     257.91(Ac.)


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Process from Point/Station      510.000 to Point/Station     5141.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   739.130(Ft.)
Downstream point/station elevation =   734.200(Ft.)
Pipe length  =   690.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   463.678(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   463.678(CFS)
Normal flow depth in pipe =   60.00(In.)
Flow top width inside pipe =   75.89(In.)
Critical Depth =   67.79(In.)
Pipe flow velocity =     15.78(Ft/s)
Travel time through pipe =    0.73 min.
Time of concentration (TC) =    16.94 min.


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Process from Point/Station     5141.000 to Point/Station      520.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   734.200(Ft.)
Downstream point/station elevation =   726.560(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
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No. of pipes = 1  Required pipe flow  =   463.678(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   463.678(CFS)
Normal flow depth in pipe =   46.27(In.)
Flow top width inside pipe =   83.57(In.)
Critical Depth =   67.79(In.)
Pipe flow velocity =     21.34(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    17.33 min.


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Process from Point/Station     5141.000 to Point/Station      520.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    257.910(Ac.)
Runoff from this stream =    463.678(CFS)
Time of concentration =   17.33 min.
Rainfall intensity =     2.528(In/Hr)
Area averaged loss rate (Fm) =    0.2968(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2966
Program is now starting with Main Stream No. 2


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Process from Point/Station      516.000 to Point/Station      520.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  =  1.#R
Pervious ratio(Ap) = 0.0980     Max loss rate(Fm)=     0.100(In/Hr)
Rainfall intensity =      2.994(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  13.07 min.  Rain intensity =       2.99(In/Hr)
Total area this stream =        22.40(Ac.)
Total Study Area (Main Stream No. 2) =      280.31(Ac.)
Total runoff =     39.92(CFS)


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Process from Point/Station      516.000 to Point/Station      520.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     22.400(Ac.)
Runoff from this stream =     39.920(CFS)
Time of concentration =   13.07 min.
Rainfall intensity =     2.994(In/Hr)
Area averaged loss rate (Fm) =    0.1000(In/Hr)
Area averaged Pervious ratio (Ap) = 0.0980
Summary of stream data:
```

```
Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    463.68   257.910     17.33    0.297      2.528
2     39.92    22.400     13.07    0.100      2.994
Qmax(1) =
           1.000 *    1.000 *   463.678) +
           0.839 *    1.000 *    39.920) + =     497.163
Qmax(2) =
           1.209 *    0.754 *   463.678) +
           1.000 *    1.000 *    39.920) + =     462.668

Total of 2 main streams to confluence:
Flow rates before confluence point:
     464.678      40.920
Maximum flow rates at confluence using above data:
      497.163      462.668
Area of streams before confluence:
      257.910       22.400
Effective area values after confluence:
      280.310      216.871


Results of confluence:
Total flow rate =    497.163(CFS)
Time of concentration =    17.334 min.
Effective stream area after confluence  =    280.310(Ac.)
Study area average Pervious fraction(Ap) =  0.281
Study area average soil loss rate(Fm) =    0.281(In/Hr)
Study area total =     280.31(Ac.)


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Process from Point/Station      520.000 to Point/Station     5215.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   726.560(Ft.)
Downstream point/station elevation =   720.420(Ft.)
Pipe length  =   400.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   497.163(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   497.163(CFS)
Normal flow depth in pipe =   48.28(In.)
Flow top width inside pipe =   83.06(In.)
Critical Depth =   69.89(In.)
Pipe flow velocity =     21.73(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    17.64 min.


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Process from Point/Station      520.000 to Point/Station     5215.000
**** CONFLUENCE OF MAIN STREAMS ****
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_____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    280.310(Ac.)
Runoff from this stream =    497.163(CFS)
Time of concentration =   17.64 min.
Rainfall intensity =     2.501(In/Hr)
Area averaged loss rate (Fm) =    0.2810(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2807
Program is now starting with Main Stream No. 2


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Process from Point/Station      521.000 to Point/Station     5215.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
_____________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 31.61
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      2.937(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  13.50 min.  Rain intensity =       2.94(In/Hr)
Total area this stream =         6.14(Ac.)
Total Study Area (Main Stream No. 2) =      286.45(Ac.)
Total runoff =     15.70(CFS)


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Process from Point/Station      521.000 to Point/Station     5215.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.140(Ac.)
Runoff from this stream =     15.700(CFS)
Time of concentration =   13.50 min.
Rainfall intensity =     2.937(In/Hr)
Area averaged loss rate (Fm) =    0.0980(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5210.000 to Point/Station     5210.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
_____________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 25.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Rainfall intensity =      1.904(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  27.80 min.  Rain intensity =       1.90(In/Hr)
Total area this stream =       153.70(Ac.)
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Total Study Area (Main Stream No. 3) =      440.15(Ac.)
Total runoff =    245.60(CFS)


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Process from Point/Station     5210.000 to Point/Station     5215.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   728.800(Ft.)
Downstream point/station elevation =   720.420(Ft.)
Pipe length  =   420.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   245.600(CFS)
Given pipe size =     72.00(In.)
Calculated individual pipe flow  =   245.600(CFS)
Normal flow depth in pipe =   32.13(In.)
Flow top width inside pipe =   71.58(In.)
Critical Depth =   51.52(In.)
Pipe flow velocity =     20.12(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =    28.15 min.


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Process from Point/Station     5210.000 to Point/Station     5215.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =    153.700(Ac.)
Runoff from this stream =    245.600(CFS)
Time of concentration =   28.15 min.
Rainfall intensity =     1.890(In/Hr)
Area averaged loss rate (Fm) =    0.1000(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    497.16   280.310     17.64    0.281      2.501
2     15.70     6.140     13.50    0.098      2.937
3    245.60   153.700     28.15    0.100      1.890
Qmax(1) =
           1.000 *    1.000 *   497.163) +
           0.847 *    1.000 *    15.700) +
           1.342 *    0.627 *   245.600) + =     716.966
Qmax(2) =
           1.196 *    0.765 *   497.163) +
           1.000 *    1.000 *    15.700) +
           1.585 *    0.480 *   245.600) + =     657.500
Qmax(3) =
           0.725 *    1.000 *   497.163) +
           0.631 *    1.000 *    15.700) +
           1.000 *    1.000 *   245.600) + =     615.731
```

```
Total of 3 main streams to confluence:
Flow rates before confluence point:
     498.163      16.700     246.600
Maximum flow rates at confluence using above data:
      716.966      657.500      615.731
Area of streams before confluence:
      280.310        6.140      153.700
Effective area values after confluence:
      382.774      294.374      440.150


Results of confluence:
Total flow rate =    716.966(CFS)
Time of concentration =    17.640 min.
Effective stream area after confluence  =    382.774(Ac.)
Study area average Pervious fraction(Ap) =  0.215
Study area average soil loss rate(Fm) =    0.215(In/Hr)
Study area total =     440.15(Ac.)


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Process from Point/Station     5215.000 to Point/Station      525.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   720.420(Ft.)
Downstream point/station elevation =   712.540(Ft.)
Pipe length  =   920.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   716.966(CFS)
Given pipe size =     84.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    11.788(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     11.584(Ft.)
 Minor friction loss =      8.084(Ft.)  K-factor =   1.50
Pipe flow velocity =     18.63(Ft/s)
Travel time through pipe =    0.82 min.
Time of concentration (TC) =    18.46 min.


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Process from Point/Station      525.000 to Point/Station     5248.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   712.540(Ft.)
Downstream point/station elevation =   710.460(Ft.)
Pipe length  =   250.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   716.966(CFS)
Given pipe size =     96.00(In.)
Calculated individual pipe flow  =   716.966(CFS)
Normal flow depth in pipe =   68.72(In.)
Flow top width inside pipe =   86.60(In.)
Critical Depth =   81.08(In.)
Pipe flow velocity =     18.62(Ft/s)
Travel time through pipe =    0.22 min.
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Time of concentration (TC) =    18.69 min.


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Process from Point/Station      525.000 to Point/Station     5248.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    382.774(Ac.)
Runoff from this stream =    716.966(CFS)
Time of concentration =   18.69 min.
Rainfall intensity =     2.416(In/Hr)
Area averaged loss rate (Fm) =    0.2153(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2151
Program is now starting with Main Stream No. 2


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Process from Point/Station      526.000 to Point/Station     5248.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 33.29
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.097(In/Hr)
Rainfall intensity =      3.008(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.97 min.  Rain intensity =       3.01(In/Hr)
Total area this stream =        31.78(Ac.)
Total Study Area (Main Stream No. 2) =      471.93(Ac.)
Total runoff =     61.14(CFS)


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Process from Point/Station      526.000 to Point/Station     5248.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     31.780(Ac.)
Runoff from this stream =     61.140(CFS)
Time of concentration =   12.97 min.
Rainfall intensity =     3.008(In/Hr)
Area averaged loss rate (Fm) =    0.0970(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    716.97   382.774     18.69    0.215      2.416
2     61.14    31.780     12.97    0.097      3.008
Qmax(1) =
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```
           1.000 *    1.000 *   716.966) +
           0.797 *    1.000 *    61.140) + =     765.675
Qmax(2) =
           1.269 *    0.694 *   716.966) +
           1.000 *    1.000 *    61.140) + =     692.585

Total of 2 main streams to confluence:
Flow rates before confluence point:
     717.966      62.140
Maximum flow rates at confluence using above data:
      765.675      692.585
Area of streams before confluence:
      382.774       31.780
Effective area values after confluence:
      414.554      297.447


Results of confluence:
Total flow rate =    765.675(CFS)
Time of concentration =    18.687 min.
Effective stream area after confluence  =    414.554(Ac.)
Study area average Pervious fraction(Ap) =  0.206
Study area average soil loss rate(Fm) =    0.206(In/Hr)
Study area total =     414.55(Ac.)


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Process from Point/Station     5248.000 to Point/Station     5300.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   710.460(Ft.)
Downstream point/station elevation =   707.900(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   765.675(CFS)
Given pipe size =     96.00(In.)
Calculated individual pipe flow  =   765.675(CFS)
Normal flow depth in pipe =   35.23(In.)
Flow top width inside pipe =   92.54(In.)
Critical Depth =   83.18(In.)
Pipe flow velocity =     45.79(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    18.70 min.


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Process from Point/Station     5248.000 to Point/Station     5300.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    414.554(Ac.)
Runoff from this stream =    765.675(CFS)
Time of concentration =   18.70 min.
Rainfall intensity =     2.415(In/Hr)
Area averaged loss rate (Fm) =    0.2062(In/Hr)
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Area averaged Pervious ratio (Ap) = 0.2063
Program is now starting with Main Stream No. 2


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Process from Point/Station     5295.000 to Point/Station     5295.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  =  1.#R
Pervious ratio(Ap) = 0.0930     Max loss rate(Fm)=     0.100(In/Hr)
Rainfall intensity =      2.893(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  13.84 min.  Rain intensity =       2.89(In/Hr)
Total area this stream =        77.22(Ac.)
Total Study Area (Main Stream No. 2) =      549.15(Ac.)
Total runoff =    131.58(CFS)


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Process from Point/Station     5295.000 to Point/Station     5300.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   715.690(Ft.)
Downstream point/station elevation =   707.900(Ft.)
Pipe length  =   950.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   131.580(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =   131.580(CFS)
Normal flow depth in pipe =   34.55(In.)
Flow top width inside pipe =   51.85(In.)
Critical Depth =   40.50(In.)
Pipe flow velocity =     12.25(Ft/s)
Travel time through pipe =    1.29 min.
Time of concentration (TC) =    15.13 min.


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Process from Point/Station     5295.000 to Point/Station     5300.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     77.220(Ac.)
Runoff from this stream =    131.580(CFS)
Time of concentration =   15.13 min.
Rainfall intensity =     2.742(In/Hr)
Area averaged loss rate (Fm) =    0.1000(In/Hr)
Area averaged Pervious ratio (Ap) = 0.0930
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)
```

```
1    765.67   414.554     18.70    0.206      2.415
2    131.58    77.220     15.13    0.100      2.742
Qmax(1) =
           1.000 *    1.000 *   765.675) +
           0.876 *    1.000 *   131.580) + =     880.973
Qmax(2) =
           1.148 *    0.809 *   765.675) +
           1.000 *    1.000 *   131.580) + =     842.945

Total of 2 main streams to confluence:
Flow rates before confluence point:
     766.675     132.580
Maximum flow rates at confluence using above data:
      880.973      842.945
Area of streams before confluence:
      414.554       77.220
Effective area values after confluence:
      491.774      412.715


Results of confluence:
Total flow rate =    880.973(CFS)
Time of concentration =    18.698 min.
Effective stream area after confluence  =    491.774(Ac.)
Study area average Pervious fraction(Ap) =  0.188
Study area average soil loss rate(Fm) =    0.190(In/Hr)
Study area total =     491.77(Ac.)


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Process from Point/Station     5300.000 to Point/Station     5305.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   707.900(Ft.)
Downstream point/station elevation =   706.030(Ft.)
Pipe length  =   640.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   880.973(CFS)
Given pipe size =    108.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     5.781(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      3.185(Ft.)
 Minor friction loss =      4.467(Ft.)  K-factor =   1.50
Pipe flow velocity =     13.85(Ft/s)
Travel time through pipe =    0.77 min.
Time of concentration (TC) =    19.47 min.


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Process from Point/Station     5300.000 to Point/Station     5305.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
```

```
Stream flow area =    491.774(Ac.)
Runoff from this stream =    880.973(CFS)
Time of concentration =   19.47 min.
Rainfall intensity =     2.358(In/Hr)
Area averaged loss rate (Fm) =    0.1895(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1885
Program is now starting with Main Stream No. 2


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Process from Point/Station      542.000 to Point/Station     5305.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 55.03
Pervious ratio(Ap) = 0.4500     Max loss rate(Fm)=     0.336(In/Hr)
Rainfall intensity =      2.693(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  15.60 min.  Rain intensity =       2.69(In/Hr)
Total area this stream =        22.68(Ac.)
Total Study Area (Main Stream No. 2) =      571.83(Ac.)
Total runoff =     32.14(CFS)


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Process from Point/Station      542.000 to Point/Station     5305.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     22.680(Ac.)
Runoff from this stream =     32.140(CFS)
Time of concentration =   15.60 min.
Rainfall intensity =     2.693(In/Hr)
Area averaged loss rate (Fm) =    0.3360(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4500
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    880.97   491.774     19.47    0.190      2.358
2     32.14    22.680     15.60    0.336      2.693
Qmax(1) =
           1.000 *    1.000 *   880.973) +
           0.858 *    1.000 *    32.140) + =     908.542
Qmax(2) =
           1.155 *    0.801 *   880.973) +
           1.000 *    1.000 *    32.140) + =     847.181

Total of 2 main streams to confluence:
Flow rates before confluence point:
     881.973      33.140
```

```
Maximum flow rates at confluence using above data:
      908.542      847.181
Area of streams before confluence:
      491.774       22.680
Effective area values after confluence:
      514.454      416.737


Results of confluence:
Total flow rate =    908.542(CFS)
Time of concentration =    19.468 min.
Effective stream area after confluence  =    514.454(Ac.)
Study area average Pervious fraction(Ap) =  0.200
Study area average soil loss rate(Fm) =    0.196(In/Hr)
Study area total =     514.45(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5305.000 to Point/Station     5330.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   706.030(Ft.)
Downstream point/station elevation =   701.260(Ft.)
Pipe length  =   690.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   908.542(CFS)
Given pipe size =    108.00(In.)
Calculated individual pipe flow  =   908.542(CFS)
Normal flow depth in pipe =   78.28(In.)
Flow top width inside pipe =   96.47(In.)
Critical Depth =   88.93(In.)
Pipe flow velocity =     18.40(Ft/s)
Travel time through pipe =    0.63 min.
Time of concentration (TC) =    20.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5305.000 to Point/Station     5330.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    514.454(Ac.)
Runoff from this stream =    908.542(CFS)
Time of concentration =   20.09 min.
Rainfall intensity =     2.313(In/Hr)
Area averaged loss rate (Fm) =    0.1960(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      546.000 to Point/Station     5330.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
```

```
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 36.35
Pervious ratio(Ap) = 0.1540     Max loss rate(Fm)=     0.146(In/Hr)
Rainfall intensity =      3.133(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.12 min.  Rain intensity =       3.13(In/Hr)
Total area this stream =        39.14(Ac.)
Total Study Area (Main Stream No. 2) =      610.97(Ac.)
Total runoff =     78.63(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      546.000 to Point/Station     5330.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     39.140(Ac.)
Runoff from this stream =     78.630(CFS)
Time of concentration =   12.12 min.
Rainfall intensity =     3.133(In/Hr)
Area averaged loss rate (Fm) =    0.1460(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1540
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      551.000 to Point/Station     5330.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 42.80
Pervious ratio(Ap) = 0.1900     Max loss rate(Fm)=     0.169(In/Hr)
Rainfall intensity =      2.810(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  14.53 min.  Rain intensity =       2.81(In/Hr)
Total area this stream =        33.36(Ac.)
Total Study Area (Main Stream No. 3) =      644.33(Ac.)
Total runoff =     70.18(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      551.000 to Point/Station     5330.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     33.360(Ac.)
Runoff from this stream =     70.180(CFS)
Time of concentration =   14.53 min.
Rainfall intensity =     2.810(In/Hr)
Area averaged loss rate (Fm) =    0.1690(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1900
Summary of stream data:
```

```
Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    908.54   514.454     20.09    0.196      2.313
2     78.63    39.140     12.12    0.146      3.133
3     70.18    33.360     14.53    0.169      2.810
Qmax(1) =
           1.000 *    1.000 *   908.542) +
           0.726 *    1.000 *    78.630) +
           0.812 *    1.000 *    70.180) + =    1022.575
Qmax(2) =
           1.387 *    0.603 *   908.542) +
           1.000 *    1.000 *    78.630) +
           1.122 *    0.834 *    70.180) + =     904.510
Qmax(3) =
           1.235 *    0.723 *   908.542) +
           0.892 *    1.000 *    78.630) +
           1.000 *    1.000 *    70.180) + =     951.412

Total of 3 main streams to confluence:
Flow rates before confluence point:
     909.542      79.630      71.180
Maximum flow rates at confluence using above data:
     1022.575      904.510      951.412
Area of streams before confluence:
      514.454       39.140       33.360
Effective area values after confluence:
      586.954      377.276      444.512


Results of confluence:
Total flow rate =   1022.575(CFS)
Time of concentration =    20.093 min.
Effective stream area after confluence  =    586.954(Ac.)
Study area average Pervious fraction(Ap) =  0.196
Study area average soil loss rate(Fm) =    0.191(In/Hr)
Study area total =     586.95(Ac.)
End of computations, Total Study Area =          644.33 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.198
Area averaged SCS curve number =   1.$
```

APPENDIX C
HYDRAULIC CALCULATIONS

```
T1 RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE                                        0
T2 100 YR PRELIMINARY HYDRAULICS (PEAK FLOW MITIGATION)
T3 09-06-2022
SO    992.840 667.230  1                            681.360
JX   1011.480 667.290  1  3   .013    0.001          667.290         90.0         .000
R    1035.820 667.360  1      .013                                -30.991    .000 0
R    1120.200 667.620  1      .013                                  .000    .000 0
JX   1120.210 667.620  1  2   .013    0.001          671.290         60.0         .000
R    1137.420 667.670  1      .013                                  .000    .000 0
JX   1137.430 667.670  1  2   .013    0.001          671.600        -85.0         .000
R    1329.560 668.250  1      .013                                  .000    .000 0
R    1398.280 668.450  1      .013                                 3.265         0
R    1751.200 669.560  1      .013                                  .000    .000 0
R    1773.590 669.629  1      .013                                -1.074    .000 0
JX   1795.000 669.629  1  3   .013   10.752          671.200         30.0         .000
R    1819.250 669.780  1      .013                                -2.191    .000 0
R    1877.510 669.990  1      .013                                  .000    .000 0
JX   1877.520 669.990  1  2   .013    1.920          674.280         85.0         .000
R    2200.000 670.970  1      .013                                  .000    .000 0
JX   2325.081 671.358  1 12   .013    0.001          671.350         85.0         .000
R    2401.000 671.610  1      .013                                  .000    .000 0
JX   2421.000 671.950  1 12   .013    0.001          671.820         85.0         .000
R    2462.340 676.430  1      .013                                  .000    .000 0
TS   2471.670 676.620  5      .013                                  .000    .000 0
R    2479.670 676.690  5      .013                                  .000
JX   2493.830 676.980  5  4   .013   76.510          678.940         30.0         .000
R    2519.760 677.080  5      .013                                  .000    .000 0
JX   2519.770 677.081  5  6   .013    0.001          680.220        -45.0         .000
R    2609.730 677.960  5      .013                                  .000    .000 0
JX   2609.740 677.961  5  2   .013    4.810          682.450         60.0         .000
R    2629.210 678.150  5      .013                                  .000    .000 0
JX   2629.220 678.151  5  2   .013    4.810          683.070        -85.0         .000
R    2988.780 681.640  5      .013                                  .000    .000 0
JX   2993.440 681.700  5      .013
R    3031.000 682.090  5      .013                                  .000    .000 0
JX   3043.670 682.220  5      .013
R    3048.480 682.270  5      .013                                  .000    .000 0
JX   3259.440 684.422  5  3   .013   56.400          687.640        -45.0         .000
R    3488.770 686.780  5      .013                                  .000    .000 0
JX   3493.440 686.880  5      .013
JX   3524.396 687.214  5  2   .013    0.001          691.830        -45.0         .000
R    3988.780 692.230  5      .013                                  .000    .000 0
JX   3993.440 692.330  5      .013
R    4428.910 696.790  5      .013                                  .000    .000 0
JX   4440.570 697.020  5  3   .013    0.001          700.020         30.0         .000
R    4514.280 697.440  5      .013                                  .000    .000 0
JX   4514.290 697.441  5  2   .013    0.001          701.760         60.0         .000
R    4531.740 697.540  5      .013                                  .000    .000 0
JX   4531.750 697.541  5  2   .013    0.001          702.100        -85.0         .000
R    5121.880 700.910  5      .013                                  .000    .000 1
JX   5121.890 700.911  5  3   .013  140.790          703.990         45.0         .000
JX   5121.890 700.911  5  3   .013    0.001          703.990        -45.0         .000
R    5228.010 701.510  5      .013                                  .000    .000 0
JX   5228.020 701.511  5  2   .013    0.001          705.770         60.0         .000
R    5245.470 701.610  5      .013                                  .000    .000 0
JX   5245.480 701.611  5  2   .013    0.001          705.920        -85.0         .000
R    5419.290 702.580  5      .013                                  .000    .000 0
JX   5423.950 702.680  5      .013
R    5798.050 704.470  5      .013                                  .000    .000 0
JX   5806.230 704.630  5  3   .013   41.350          707.840         45.0         .000
R    5867.860 704.900  5      .013                                  .000    .000 0
JX   5867.870 704.901  5  2   .013    0.001          709.130         85.0         .000
R    6119.290 705.970  5      .013                                  .000    .000 0
JX   6123.950 706.070  5      .013
R    6443.570 707.730  5      .013                                  .000    .000 0
JX   6459.740 708.060  5  8   .013  115.310          710.150         30.0         .000
R    6475.570 708.200  5      .013                                  .000    .000 0
JX   6486.730 708.420  9  8   .013   48.710          710.060        -45.0         .000
R    6656.620 709.310  9      .013                                  .000    .000 0
JX   6656.630 709.311  9  2   .013    0.001          712.850         60.0         .000
R    6674.320 709.410  9      .013                                  .000    .000 0
```

JX	6674.330	709.411	9	2	.013	0.001	712.910	-85.0	.000	
R	6719.280	709.640	9		.013			.000	.000	0
TS	6728.440	709.830	10		.013			.000		
R	6789.570	710.890	10		.013			.000	.000	0
R	6892.180	712.700	10		.013			-6.576	.000	0
JX	6896.840	712.800	10		.013					
R	6937.050	713.360	10		.013			-2.577	.000	0
R	7000.000	714.248	10		.013			.000	.000	0
R	7329.270	718.900	10		.013			.000	.000	0
JX	7333.930	719.000	10		.013					
JX	7590.813	720.053	10	2	.013	0.001	723.550	-45.0	.000	
R	7600.000	720.091	10		.013			.000	.000	0
JX	7609.750	720.131	10	2	.013	0.001	723.960	-45.0	.000	
R	7704.430	720.530	10		.013			.000	.000	0
JX	7723.090	720.910	10	11	.013	219.810	721.210	45.0	.000	
R	7848.980	723.314	10		.013			.000	.000	0
R	8097.070	727.930	10		.013			.000	.000	0
JX	8115.730	728.320	10	4	.013	33.480	729.490	-45.0	.000	
R	8167.900	729.420	10		.013			19.856	.000	0
R	8182.670	729.730	10		.013			.000	.000	0
JX	8187.340	729.830	10		.013					
R	8200.000	729.976	10		.013			.000	.000	0
JX	8250.000	730.551	10	2	.013	0.001	733.210	-45.0	.000	
R	8300.000	731.120	10		.013			.000	.000	
JX	8547.271	733.964	10	2	.013	0.001	736.920	-45.0	.000	
R	8571.070	734.250	10		.013			.000	.000	0
JX	8574.740	734.460	10		.013			.000	.000	0
R	8666.520	735.200	10		.013			.000	.000	0
JX	8666.530	735.201	10	2	.013	0.001	737.830	-85.0	.000	
R	8830.110	736.520	10		.013			.000	.000	0
R	8992.980	737.830	10		.013			-10.451	.000	0
R	9070.580	738.460	10		.013			.000	.000	0
JX	9074.240	738.560	10		.013					
R	9229.660	740.150	10		.013			.000	.000	0
JX	9248.320	740.330	10	4	.013	38.690	741.140	-45.0	.000	
R	9300.000	740.830	10		.013			.000	.000	0
JX	9326.580	741.101	10	2	.013	0.001	742.800	-45.0	.000	
R	9537.670	743.270	10		.013			.000	.000	0
JX	9542.330	743.370	10		.013					
JX	9726.610	744.421	10	2	.013	0.001	747.130	-85.0	.000	
R	10037.670	746.220	10		.013			.000	.000	0
JX	10042.330	746.320	11		.013					
R	10115.650	746.530	11		.013			.000	.000	0
JX	10115.660	746.531	11	6	.013	11.900	748.840	-45.0	.000	
R	10116.000	746.532	11		.013			.000	.000	0
JX	10150.000	746.634	11	2	.013	0.001	749.220	-45.0	.000	
R	10152.580	746.640	11		.013			.000	.000	0
R	10231.660	746.880	11		.013			5.000	.000	0
R	10427.390	747.470	11		.013			.000	.000	0
JX	10435.000	747.605	11	11	.013	39.490	747.650	-45.0	.000	
JX	10446.050	747.850	11	11	.013	293.710	747.650	30.0	.000	
R	10464.120	748.170	11		.013			.000	.000	0
JX	10464.130	748.171	11	2	.013	0.001	750.620	-60.0	.000	
R	10519.630	749.150	11		.013			.000	.000	0
JX	10538.790	749.510	4	2	.013	0.001	752.060	55.0	.000	
R	10556.740	749.820	4		.013			.000	.000	0
JX	10556.750	749.821	4	2	.013	0.001	751.570	-85.0	.000	
R	10925.140	756.190	4		.013			.000	.000	0
JX	10928.800	756.270	4		.013					
R	11355.740	759.810	4		.013			.000	.000	0
R	11407.890	760.240	4		.013			.000	.000	0
JX	11412.550	760.340	4		.013					
JX	11433.240	760.420	4	2	.013	0.001	761.850	-45.0	.000	
R	11450.000	760.480	4		.013			.000	.000	0
JX	11452.660	760.490	4	2	.013	3.160	761.810	60.0	.000	
R	11486.700	760.610	4		.013			.000	.000	0
R	11526.700	760.770	4		.013			20.835	.000	0
R	11576.860	760.970	4		.013			-26.127	.000	0
R	11891.640	762.230	4		.013			.000	.000	0
JX	11895.800	762.310	4		.013					
R	12374.890	767.760	4		.013			.000	.000	0

```
JX  12378.550 767.830  4      .013
R   12857.640 773.530  4      .013                                  .000    .000 0
JX  12862.300 773.630  4      .013
R   13004.900 778.160  4      .013                                  .000    .000 0
R   13009.570 778.260  4      .013                                  .000    .000 1
R   13183.020 778.780  4      .013                                99.380    .000 0
R   13418.690 779.480  4      .013                                  .000    .000 0
JX  13423.360 779.580  4  2   .013    0.001          780.790         85.0         .000
R   13878.600 780.950  4      .013                                  .000    .000 0
JX  13883.270 781.050  4  2   .013    0.001          782.250         85.0         .000
R   14360.440 782.480  4      .013                                  .000    .000 0
JX  14365.110 782.580  4  2   .013    0.001          783.780         72.4         .000
R   14385.630 782.640  4      .013                                13.063    .000 0
R   14426.930 782.770  4      .013                                  .000    .000 0
R   14447.460 782.830  4      .013                               -13.070    .000 0
R   14818.590 783.940  4      .013                                  .000    .000 0
R   14839.460 784.000  4      .013                               -26.573    .000 0
JX  14845.460 784.100  4  6   .013    0.220          785.030         45.0        -7.639
R   14889.300 784.230  4      .013                               -55.819    .000 0
R   14917.900 784.320  4      .013                                  .000    .000 0
SH  14917.900 784.320  4                         784.320
CD   1  3   0    .000   8.000   10.000  .000  .000   .00
CD   2  4   1    .000   1.500     .000  .000  .000   .00
CD   3  4   1    .000   3.000     .000  .000  .000   .00
CD   4  4   1    .000   4.000     .000  .000  .000   .00
CD   5  4   1    .000   9.000     .000  .000  .000   .00
CD   6  4   1    .000   2.000     .000  .000  .000   .00
CD   7  4   1    .000   9.000     .000  .000  .000   .00
CD   8  4   1    .000   4.500     .000  .000  .000   .00
CD   9  4   1    .000   8.000     .000  .000  .000   .00
CD  10  4   1    .000   7.000     .000  .000  .000   .00
CD  11  4   1    .000   6.000     .000  .000  .000   .00
CD  12  4   1    .000   5.000     .000  .000  .000   .00
Q            76.510   .0
```

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE

100 YR PRELIMINARY HYDRAULICS (PEAK FLOW MITIGATION)

09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
992.840	667.230	14.130	681.360	1218.37	15.23	3.60	684.96	.00	7.72	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0032					.0061	.11	.00	.95		.013	.00	.00	BOX
1011.480	667.290	14.184	681.474	1218.37	15.23	3.60	685.08	.00	7.73	10.00	8.000	10.000	.00	0 .0
24.340	.0029					.0061	.15	.00	.95	8.00	.013	.00	.00	BOX
1035.820	667.360	14.686	682.046	1218.37	15.23	3.60	685.65	.00	7.73	10.00	8.000	10.000	.00	0 .0
84.380	.0031					.0061	.52	14.69	.95	8.00	.013	.00	.00	BOX
1120.200	667.620	14.942	682.562	1218.37	15.23	3.60	686.16	.00	7.73	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0000					.0061	.00	14.94	.95		.013	.00	.00	BOX
1120.210	667.620	14.942	682.562	1218.37	15.23	3.60	686.16	.00	7.73	10.00	8.000	10.000	.00	0 .0
17.210	.0029					.0061	.11	14.94	.95	8.00	.013	.00	.00	BOX
1137.420	667.670	14.998	682.668	1218.37	15.23	3.60	686.27	.00	7.73	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0000					.0061	.00	15.00	.95		.013	.00	.00	BOX
1137.430	667.670	14.998	682.668	1218.37	15.23	3.60	686.27	.00	7.73	10.00	8.000	10.000	.00	0 .0
192.130	.0030					.0061	1.18	15.00	.95	8.00	.013	.00	.00	BOX
1329.560	668.250	15.594	683.844	1218.37	15.23	3.60	687.45	.00	7.73	10.00	8.000	10.000	.00	0 .0
68.720	.0029					.0061	.42	.00	.95	8.00	.013	.00	.00	BOX
1398.280	668.450	15.952	684.402	1218.37	15.23	3.60	688.00	.00	7.73	10.00	8.000	10.000	.00	0 .0
352.920	.0031					.0061	2.16	15.95	.95	8.00	.013	.00	.00	BOX

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1751.200	669.560	17.002	686.562	1218.37	15.23	3.60	690.16	.00	7.73	10.00	8.000	10.000	.00	0 .0
22.390	.0031					.0061	.14	.00	.95	8.00	.013	.00	.00	BOX
1773.590	669.629	17.149	686.778	1218.37	15.23	3.60	690.38	.00	7.73	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0000					.0060	.13	.00	.95		.013	.00	.00	BOX
1795.000	669.629	17.400	687.029	1207.61	15.10	3.54	690.57	.00	7.68	10.00	8.000	10.000	.00	0 .0
24.250	.0062					.0060	.15	.00	.94	6.65	.013	.00	.00	BOX
1819.250	669.780	17.505	687.285	1207.61	15.10	3.54	690.82	.00	7.68	10.00	8.000	10.000	.00	0 .0
58.260	.0036					.0060	.35	17.51	.94	8.00	.013	.00	.00	BOX
1877.510	669.990	17.645	687.635	1207.61	15.10	3.54	691.17	.00	7.68	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0000					.0060	.00	17.65	.94		.013	.00	.00	BOX
1877.520	669.990	17.668	687.658	1205.69	15.07	3.53	691.18	.00	7.67	10.00	8.000	10.000	.00	0 .0
322.480	.0030					.0060	1.93	17.67	.94	8.00	.013	.00	.00	BOX
2200.000	670.970	18.621	689.591	1205.69	15.07	3.53	693.12	.00	7.67	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0031					.0060	.75	18.62	.94		.013	.00	.00	BOX
2325.081	671.358	18.983	690.341	1205.69	15.07	3.53	693.87	.00	7.67	10.00	8.000	10.000	.00	0 .0
75.919	.0033					.0060	.46	18.98	.94	8.00	.013	.00	.00	BOX
2401.000	671.610	19.186	690.796	1205.69	15.07	3.53	694.32	.00	7.67	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0170					.0060	.12	19.19	.94		.013	.00	.00	BOX

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2421.000	671.950	18.966	690.916	1205.69	15.07	3.53	694.44	.00	7.67	10.00	8.000	10.000	.00	0 .0
41.340	.1084					.0060	.25	18.97	.94	2.35	.013	.00	.00	BOX
2462.340	676.430	14.734	691.164	1205.69	15.07	3.53	694.69	.00	7.67	10.00	8.000	10.000	.00	0 .0
TRANS STR	.0204					.0077	.07	14.73	.94		.013	.00	.00	BOX
2471.670	676.620	12.975	689.595	1205.69	18.95	5.58	695.17	.00	8.23	.00	9.000	.000	.00	1 .0
8.000	.0088					.0093	.07	12.97	.00	7.67	.013	.00	.00	PIPE
2479.670	676.690	12.979	689.669	1205.69	18.95	5.58	695.25	.00	8.23	.00	9.000	.000	.00	1 .0
JUNCT STR	.0205					.0088	.12	12.98	.00		.013	.00	.00	PIPE
2493.830	676.980	13.987	690.967	1129.18	17.75	4.89	695.86	.00	8.07	.00	9.000	.000	.00	1 .0
25.930	.0039					.0082	.21	13.99	.00	9.00	.013	.00	.00	PIPE
2519.760	677.080	14.099	691.179	1129.18	17.75	4.89	696.07	.00	8.07	.00	9.000	.000	.00	1 .0
JUNCT STR	.0976					.0082	.00	14.10	.00		.013	.00	.00	PIPE
2519.770	677.081	14.098	691.179	1129.18	17.75	4.89	696.07	.00	8.07	.00	9.000	.000	.00	1 .0
89.960	.0098					.0082	.74	14.10	.00	6.77	.013	.00	.00	PIPE
2609.730	677.960	13.955	691.915	1129.18	17.75	4.89	696.81	.00	8.07	.00	9.000	.000	.00	1 .0
JUNCT STR	.0976					.0081	.00	13.95	.00		.013	.00	.00	PIPE
2609.740	677.961	14.034	691.995	1124.37	17.67	4.85	696.85	.00	8.06	.00	9.000	.000	.00	1 .0
19.470	.0097					.0081	.16	14.03	.00	6.76	.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2629.210	678.150	14.003	692.153	1124.37	17.67	4.85	697.00	.00	8.06	.00	9.000	.000	.00	1 .0
JUNCT STR	.0976					.0081	.00	14.00	.00		.013	.00	.00	PIPE
2629.220	678.151	14.084	692.235	1119.56	17.60	4.81	697.04	.00	8.04	.00	9.000	.000	.00	1 .0
359.560	.0097					.0080	2.89	14.08	.00	6.74	.013	.00	.00	PIPE
2988.780	681.640	13.486	695.126	1119.56	17.60	4.81	699.93	.00	8.04	.00	9.000	.000	.00	1 .0
JUNCT STR	.0129					.0080	.04	13.49	.00		.013	.00	.00	PIPE
2993.440	681.700	13.463	695.163	1119.56	17.60	4.81	699.97	.00	8.04	.00	9.000	.000	.00	1 .0
37.560	.0104					.0080	.30	13.46	.00	6.55	.013	.00	.00	PIPE
3031.000	682.090	13.375	695.465	1119.56	17.60	4.81	700.27	.00	8.04	.00	9.000	.000	.00	1 .0
JUNCT STR	.0103					.0080	.10	13.38	.00		.013	.00	.00	PIPE
3043.670	682.220	13.347	695.567	1119.56	17.60	4.81	700.38	.00	8.04	.00	9.000	.000	.00	1 .0
4.810	.0104					.0080	.04	13.35	.00	6.55	.013	.00	.00	PIPE
3048.480	682.270	13.336	695.606	1119.56	17.60	4.81	700.41	.00	8.04	.00	9.000	.000	.00	1 .0
JUNCT STR	.0102					.0076	1.61	13.34	.00		.013	.00	.00	PIPE
3259.440	684.422	13.586	698.008	1063.16	16.71	4.34	702.34	.00	7.90	.00	9.000	.000	.00	1 .0
229.330	.0103					.0072	1.66	13.59	.00	6.31	.013	.00	.00	PIPE
3488.770	686.780	12.890	699.670	1063.16	16.71	4.34	704.01	.00	7.90	.00	9.000	.000	.00	1 .0
JUNCT STR	.0214					.0072	.03	12.89	.00		.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
3493.440	686.880	12.824	699.704	1063.16	16.71	4.34	704.04	.00	7.90	.00	9.000	.000	.00	1 .0
JUNCT STR	.0108					.0072	.22	12.82	.00		.013	.00	.00	PIPE
3524.396	687.214	12.715	699.929	1063.16	16.71	4.34	704.27	.00	7.90	.00	9.000	.000	.00	1 .0
464.384	.0108					.0072	3.37	12.71	.00	6.20	.013	.00	.00	PIPE
3988.780	692.230	11.065	703.295	1063.16	16.71	4.34	707.63	.00	7.90	.00	9.000	.000	.00	1 .0
JUNCT STR	.0215					.0072	.03	11.07	.00		.013	.00	.00	PIPE
3993.440	692.330	10.999	703.329	1063.16	16.71	4.34	707.67	.00	7.90	.00	9.000	.000	.00	1 .0
435.470	.0102					.0072	3.16	11.00	.00	6.32	.013	.00	.00	PIPE
4428.910	696.790	9.696	706.486	1063.16	16.71	4.34	710.82	.00	7.90	.00	9.000	.000	.00	1 .0
JUNCT STR	.0197					.0072	.08	9.70	.00		.013	.00	.00	PIPE
4440.570	697.020	9.551	706.571	1063.16	16.71	4.34	710.91	.00	7.90	.00	9.000	.000	.00	1 .0
73.710	.0057					.0072	.53	9.55	.00	9.00	.013	.00	.00	PIPE
4514.280	697.440	9.665	707.105	1063.16	16.71	4.34	711.44	.00	7.90	.00	9.000	.000	.00	1 .0
JUNCT STR	.0952					.0072	.00	9.67	.00		.013	.00	.00	PIPE
4514.290	697.441	9.664	707.105	1063.16	16.71	4.34	711.44	.00	7.90	.00	9.000	.000	.00	1 .0
17.450	.0057					.0072	.13	9.66	.00	9.00	.013	.00	.00	PIPE
JUNCT STR	.1063					.0072	.00	9.69	.00		.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
4531.750	697.541	9.691	707.232	1063.16	16.71	4.34	711.57	.00	7.90	.00	9.000	.000	.00	1 .0
590.130	.0057				.0072	4.28	9.69	.00	9.00	.013	.00	.00		PIPE
5121.880	700.910	10.817	711.727	1063.16	16.71	4.34	716.06	.00	7.90	.00	9.000	.000	.00	1 .0
JUNCT STR	.1012				.0064	.00	10.82	.00		.013	.00	.00		PIPE
JUNCT STR	.0000				.0055	.00	11.99	.00		.013	.00	.00		PIPE
5121.890	700.911	11.993	712.904	922.37	14.50	3.26	716.17	.00	7.46	.00	9.000	.000	.00	1 .0
106.120	.0056				.0055	.58	11.99	.00	7.24	.013	.00	.00		PIPE
5228.010	701.510	11.973	713.483	922.37	14.50	3.26	716.75	.00	7.46	.00	9.000	.000	.00	1 .0
JUNCT STR	.0952				.0055	.00	11.97	.00		.013	.00	.00		PIPE
5228.020	701.511	11.972	713.483	922.37	14.50	3.26	716.75	.00	7.46	.00	9.000	.000	.00	1 .0
17.450	.0057				.0055	.10	11.97	.00	7.22	.013	.00	.00		PIPE
JUNCT STR	.1063				.0055	.00	11.97	.00		.013	.00	.00		PIPE
5245.480	701.611	11.967	713.578	922.36	14.50	3.26	716.84	.00	7.46	.00	9.000	.000	.00	1 .0
173.810	.0056				.0055	.95	11.97	.00	7.29	.013	.00	.00		PIPE
5419.290	702.580	11.947	714.527	922.36	14.50	3.26	717.79	.00	7.46	.00	9.000	.000	.00	1 .0
JUNCT STR	.0215				.0055	.03	11.95	.00		.013	.00	.00		PIPE

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
5423.950	702.680	11.872	714.552	922.36	14.50	3.26	717.82	.00	7.46	.00	9.000	.000	.00	1 .0
374.100	.0048					.0055	2.04	11.87	.00	8.14	.013	.00	.00	PIPE
5798.050	704.470	12.124	716.594	922.36	14.50	3.26	719.86	.00	7.46	.00	9.000	.000	.00	1 .0
JUNCT STR	.0196					.0052	.04	12.12	.00		.013	.00	.00	PIPE
5806.230	704.630	12.495	717.125	881.01	13.85	2.98	720.10	.00	7.31	.00	9.000	.000	.00	1 .0
61.630	.0044					.0050	.31	12.50	.00	8.10	.013	.00	.00	PIPE
5867.860	704.900	12.532	717.432	881.01	13.85	2.98	720.41	.00	7.31	.00	9.000	.000	.00	1 .0
JUNCT STR	.0952					.0050	.00	12.53	.00		.013	.00	.00	PIPE
5867.870	704.901	12.531	717.432	881.01	13.85	2.98	720.41	.00	7.31	.00	9.000	.000	.00	1 .0
251.420	.0043					.0050	1.25	12.53	.00	9.00	.013	.00	.00	PIPE
6119.290	705.970	12.714	718.684	881.01	13.85	2.98	721.66	.00	7.31	.00	9.000	.000	.00	1 .0
JUNCT STR	.0215					.0050	.02	12.71	.00		.013	.00	.00	PIPE
6123.950	706.070	12.637	718.707	881.01	13.85	2.98	721.68	.00	7.31	.00	9.000	.000	.00	1 .0
319.620	.0052					.0050	1.59	12.64	.00	7.21	.013	.00	.00	PIPE
6443.570	707.730	12.568	720.298	881.01	13.85	2.98	723.28	.00	7.31	.00	9.000	.000	.00	1 .0
JUNCT STR	.0204					.0044	.07	12.57	.00		.013	.00	.00	PIPE
6459.740	708.060	13.412	721.472	765.70	12.04	2.25	723.72	.00	6.84	.00	9.000	.000	.00	1 .0
15.830	.0088					.0038	.06	13.41	.00	5.30	.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
6475.570	708.200	13.332	721.532	765.70	12.04	2.25	723.78	.00	6.84	.00	9.000	.000	.00	1 .0
JUNCT STR	.0197					.0050	.06	13.33	.00		.013	.00	.00	PIPE
6486.730	708.420	12.558	720.978	716.99	14.26	3.16	724.14	.00	6.75	.00	8.000	.000	.00	1 .0
169.890	.0052					.0062	1.05	12.56	.00	8.00	.013	.00	.00	PIPE
JUNCT STR	.1000					.0062	.00	12.72	.00		.013	.00	.00	PIPE
6656.630	709.311	12.717	722.028	716.99	14.26	3.16	725.19	.00	6.75	.00	8.000	.000	.00	1 .0
17.690	.0056					.0062	.11	12.72	.00	7.00	.013	.00	.00	PIPE
6674.320	709.410	12.727	722.137	716.99	14.26	3.16	725.30	.00	6.75	.00	8.000	.000	.00	1 .0
JUNCT STR	.1012					.0062	.00	12.73	.00		.013	.00	.00	PIPE
6674.330	709.411	12.726	722.137	716.99	14.26	3.16	725.30	.00	6.75	.00	8.000	.000	.00	1 .0
44.950	.0051					.0062	.28	12.73	.00	8.00	.013	.00	.00	PIPE
6719.280	709.640	12.775	722.415	716.99	14.26	3.16	725.57	.00	6.75	.00	8.000	.000	.00	1 .0
TRANS STR	.0207					.0094	.09	12.78	.00		.013	.00	.00	PIPE
6728.440	709.830	10.887	720.717	716.99	18.63	5.39	726.11	.00	6.58	.00	7.000	.000	.00	1 .0
61.130	.0173					.0126	.77	10.89	.00	4.97	.013	.00	.00	PIPE
6789.570	710.890	10.597	721.487	716.99	18.63	5.39	726.88	.00	6.58	.00	7.000	.000	.00	1 .0
102.610	.0176					.0126	1.29	.00	.00	4.94	.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
6892.180	712.700	10.371	723.071	716.99	18.63	5.39	728.46	.00	6.58	.00	7.000	.000	.00	1 .0
JUNCT STR	.0215					.0126	.06	.00	.00		.013	.00	.00	PIPE
6896.840	712.800	10.330	723.130	716.99	18.63	5.39	728.52	.00	6.58	.00	7.000	.000	.00	1 .0
40.210	.0139					.0126	.51	.00	.00	5.45	.013	.00	.00	PIPE
6937.050	713.360	10.459	723.818	716.99	18.63	5.39	729.21	.00	6.58	.00	7.000	.000	.00	1 .0
62.950	.0141					.0126	.79	10.46	.00	5.42	.013	.00	.00	PIPE
7000.000	714.248	10.363	724.611	716.99	18.63	5.39	730.00	.00	6.58	.00	7.000	.000	.00	1 .0
329.270	.0141					.0126	4.15	10.36	.00	5.42	.013	.00	.00	PIPE
7329.270	718.900	9.859	728.759	716.99	18.63	5.39	734.15	.00	6.58	.00	7.000	.000	.00	1 .0
JUNCT STR	.0215					.0126	.06	9.86	.00		.013	.00	.00	PIPE
7333.930	719.000	9.818	728.818	716.99	18.63	5.39	734.21	.00	6.58	.00	7.000	.000	.00	1 .0
JUNCT STR	.0041					.0126	3.24	9.82	.00		.013	.00	.00	PIPE
7590.813	720.053	12.001	732.054	716.99	18.63	5.39	737.44	.00	6.58	.00	7.000	.000	.00	1 .0
9.187	.0041					.0126	.12	12.00	.00	7.00	.013	.00	.00	PIPE
7600.000	720.091	12.078	732.169	716.99	18.63	5.39	737.56	.00	6.58	.00	7.000	.000	.00	1 .0
JUNCT STR	.0041					.0126	.12	12.08	.00		.013	.00	.00	PIPE
7609.750	720.131	12.161	732.292	716.99	18.63	5.39	737.68	.00	6.58	.00	7.000	.000	.00	1 .0
94.680	.0042					.0126	1.19	12.16	.00	7.00	.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
7704.430	720.530	12.955	733.485	716.99	18.63	5.39	738.87	.00	6.58	.00	7.000	.000	.00	1 .0
JUNCT STR	.0204					.0093	.17	12.95	.00		.013	.00	.00	PIPE
7723.090	720.910	17.370	738.280	497.18	12.92	2.59	740.87	.00	5.83	.00	7.000	.000	.00	1 .0
125.890	.0191					.0061	.76	17.37	.00	3.76	.013	.00	.00	PIPE
7848.980	723.314	15.729	739.043	497.18	12.92	2.59	741.63	.00	5.83	.00	7.000	.000	.00	1 .0
248.090	.0186					.0061	1.50	15.73	.00	3.79	.013	.00	.00	PIPE
8097.070	727.930	12.615	740.545	497.18	12.92	2.59	743.14	.00	5.83	.00	7.000	.000	.00	1 .0
JUNCT STR	.0209					.0057	.11	.00	.00		.013	.00	.00	PIPE
8115.730	728.320	12.955	741.275	463.69	12.05	2.25	743.53	.00	5.65	.00	7.000	.000	.00	1 .0
52.170	.0211					.0053	.27	.00	.00	3.50	.013	.00	.00	PIPE
8167.900	729.420	12.341	741.761	463.69	12.05	2.25	744.02	.00	5.65	.00	7.000	.000	.00	1 .0
14.770	.0210					.0053	.08	12.34	.00	3.50	.013	.00	.00	PIPE
8182.670	729.730	12.109	741.839	463.69	12.05	2.25	744.09	.00	5.65	.00	7.000	.000	.00	1 .0
JUNCT STR	.0214					.0053	.02	12.11	.00		.013	.00	.00	PIPE
8187.340	729.830	12.034	741.864	463.69	12.05	2.25	744.12	.00	5.65	.00	7.000	.000	.00	1 .0
12.660	.0115					.0053	.07	12.03	.00	4.22	.013	.00	.00	PIPE
8200.000	729.976	11.955	741.931	463.69	12.05	2.25	744.18	.00	5.65	.00	7.000	.000	.00	1 .0
JUNCT STR	.0115					.0053	.26	11.95	.00		.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
8250.000	730.551	11.643	742.194	463.69	12.05	2.25	744.45	.00	5.65	.00	7.000	.000	.00	1 .0
50.000	.0114					.0053	.26	11.64	.00	4.24	.013	.00	.00	PIPE
8300.000	731.120	11.337	742.457	463.69	12.05	2.25	744.71	.00	5.65	.00	7.000	.000	.00	1 .0
JUNCT STR	.0115					.0053	1.30	11.34	.00		.013	.00	.00	PIPE
8547.271	733.964	9.796	743.760	463.69	12.05	2.25	746.01	.00	5.65	.00	7.000	.000	.00	1 .0
23.799	.0120					.0053	.13	9.80	.00	4.16	.013	.00	.00	PIPE
8571.070	734.250	9.636	743.885	463.69	12.05	2.25	746.14	.00	5.65	.00	7.000	.000	.00	1 .0
JUNCT STR	.0572					.0053	.02	9.64	.00		.013	.00	.00	PIPE
8574.740	734.460	9.445	743.905	463.69	12.05	2.25	746.16	.00	5.65	.00	7.000	.000	.00	1 .0
91.779	.0081					.0053	.48	9.44	.00	4.77	.013	.00	.00	PIPE
8666.520	735.200	9.188	744.388	463.69	12.05	2.25	746.64	.00	5.65	.00	7.000	.000	.00	1 .0
JUNCT STR	.0909					.0053	.00	9.19	.00		.013	.00	.00	PIPE
8666.530	735.201	9.187	744.388	463.69	12.05	2.25	746.64	.00	5.65	.00	7.000	.000	.00	1 .0
163.580	.0081					.0053	.86	9.19	.00	4.77	.013	.00	.00	PIPE
8830.110	736.520	8.730	745.250	463.69	12.05	2.25	747.50	.00	5.65	.00	7.000	.000	.00	1 .0
162.870	.0080					.0053	.86	.00	.00	4.78	.013	.00	.00	PIPE
8992.980	737.830	8.432	746.262	463.69	12.05	2.25	748.52	.00	5.65	.00	7.000	.000	.00	1 .0
77.600	.0081					.0053	.41	8.43	.00	4.76	.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/ Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
9070.580	738.460	8.211	746.671	463.69	12.05	2.25	748.93	.00	5.65	.00	7.000	.000	.00	1 .0
JUNCT STR	.0273				.0053	.02	8.21	.00		.013		.00	.00	PIPE
9074.240	738.560	8.130	746.690	463.69	12.05	2.25	748.94	.00	5.65	.00	7.000	.000	.00	1 .0
155.420	.0102				.0053	.82	8.13	.00	4.39	.013		.00	.00	PIPE
9229.660	740.150	7.359	747.509	463.69	12.05	2.25	749.76	.00	5.65	.00	7.000	.000	.00	1 .0
JUNCT STR	.0096				.0048	.09	7.36	.00		.013		.00	.00	PIPE
9248.320	740.330	7.922	748.252	425.00	11.04	1.89	750.15	.00	5.43	.00	7.000	.000	.00	1 .0
51.680	.0097				.0044	.23	7.92	.00	4.22	.013		.00	.00	PIPE
9300.000	740.830	7.651	748.481	425.00	11.04	1.89	750.37	.00	5.43	.00	7.000	.000	.00	1 .0
JUNCT STR	.0102				.0044	.12	7.65	.00		.013		.00	.00	PIPE
9326.580	741.101	7.498	748.599	425.00	11.04	1.89	750.49	.00	5.43	.00	7.000	.000	.00	1 .0
85.085	.0103				.0044	.37	7.50	.00	4.14	.013		.00	.00	PIPE
9411.665	741.975	7.000	748.975	425.00	11.04	1.89	750.87	.00	5.43	.00	7.000	.000	.00	1 .0
74.558	.0103				.0041	.31	7.00	.00	4.14	.013		.00	.00	PIPE
9486.223	742.741	6.351	749.093	425.00	11.58	2.08	751.18	.00	5.43	4.06	7.000	.000	.00	1 .0
.913	.0103				.0039	.00	6.35	.68	4.14	.013		.00	.00	PIPE
9487.136	742.751	6.340	749.091	425.00	11.60	2.09	751.18	.00	5.43	4.09	7.000	.000	.00	1 .0
HYDRAULIC JUMP														

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
9487.136	742.751	4.611	747.361	425.00	15.81	3.88	751.24	.00	5.43	6.64	7.000	.000	.00	1 .0
5.289	.0103					.0074	.04	4.61	1.38	4.14	.013	.00	.00	PIPE
9492.425	742.805	4.625	747.431	425.00	15.75	3.85	751.28	.00	5.43	6.63	7.000	.000	.00	1 .0
45.245	.0103					.0070	.32	4.63	1.38	4.14	.013	.00	.00	PIPE
9537.670	743.270	4.826	748.096	425.00	15.02	3.50	751.60	.00	5.43	6.48	7.000	.000	.00	1 .0
JUNCT STR	.0215					.0063	.03	4.83	1.27		.013	.00	.00	PIPE
9542.330	743.370	4.963	748.333	425.00	14.57	3.30	751.63	.00	5.43	6.36	7.000	.000	.00	1 .0
JUNCT STR	.0057					.0066	1.22	4.96	1.20		.013	.00	.00	PIPE
9726.610	744.421	4.687	749.108	425.00	15.52	3.74	752.85	.00	5.43	6.59	7.000	.000	.00	1 .0
78.378	.0058					.0074	.58	4.69	1.34	5.07	.013	.00	.00	PIPE
9804.988	744.874	4.544	749.418	425.00	16.07	4.01	753.43	.00	5.43	6.68	7.000	.000	.00	1 .0
88.304	.0058					.0083	.73	4.54	1.42	5.07	.013	.00	.00	PIPE
9893.292	745.385	4.362	749.746	425.00	16.86	4.41	754.16	.00	5.43	6.78	7.000	.000	.00	1 .0
76.235	.0058					.0093	.71	4.36	1.54	5.07	.013	.00	.00	PIPE
9969.527	745.826	4.190	750.015	425.00	17.68	4.85	754.87	.00	5.43	6.86	7.000	.000	.00	1 .0
68.143	.0058					.0105	.72	4.19	1.66	5.07	.013	.00	.00	PIPE
10037.670	746.220	4.027	750.247	425.00	18.54	5.34	755.59	.00	5.43	6.92	7.000	.000	.00	1 .0
JUNCT STR	.0215					.0100	.05	4.03	1.80		.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
10042.330	746.320	5.441	751.761	425.00	15.77	3.86	755.62	.00	5.44	3.49	6.000	.000	.00	1 .0
29.342	.0029					.0092	.27	5.44	1.00	6.00	.013	.00	.00	PIPE
10071.670	746.404	5.978	752.382	425.00	15.04	3.51	755.89	.00	5.44	.73	6.000	.000	.00	1 .0
2.891	.0029					.0096	.03	5.98	.43	6.00	.013	.00	.00	PIPE
10074.560	746.412	6.000	752.412	425.00	15.03	3.51	755.92	.00	5.44	.00	6.000	.000	.00	1 .0
41.088	.0029					.0099	.41	6.00	.00	6.00	.013	.00	.00	PIPE
10115.650	746.530	6.296	752.826	425.00	15.03	3.51	756.33	.00	5.44	.00	6.000	.000	.00	1 .0
JUNCT STR	.1000					.0098	.00	6.30	.00		.013	.00	.00	PIPE
10115.660	746.531	6.648	753.179	413.10	14.61	3.31	756.49	.00	5.39	.00	6.000	.000	.00	1 .0
.340	.0029					.0095	.00	6.65	.00	6.00	.013	.00	.00	PIPE
10116.000	746.532	6.650	753.182	413.10	14.61	3.31	756.50	.00	5.39	.00	6.000	.000	.00	1 .0
JUNCT STR	.0030					.0095	.32	6.65	.00		.013	.00	.00	PIPE
10150.000	746.634	6.871	753.505	413.10	14.61	3.31	756.82	.00	5.39	.00	6.000	.000	.00	1 .0
2.580	.0023					.0095	.02	6.87	.00	6.00	.013	.00	.00	PIPE
10152.580	746.640	6.890	753.530	413.10	14.61	3.31	756.84	.00	5.39	.00	6.000	.000	.00	1 .0
79.080	.0030					.0095	.75	.00	.00	6.00	.013	.00	.00	PIPE
10231.660	746.880	7.559	754.439	413.10	14.61	3.31	757.75	.00	5.39	.00	6.000	.000	.00	1 .0
195.729	.0030					.0095	1.86	7.56	.00	6.00	.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
10427.390	747.470	8.831	756.301	413.10	14.61	3.31	759.62	.00	5.39	.00	6.000	.000	.00	1 .0
JUNCT STR	.0177					.0086	.07	8.83	.00		.013	.00	.00	PIPE
10435.000	747.605	9.926	757.531	373.61	13.21	2.71	760.24	.00	5.20	.00	6.000	.000	.00	1 .0
JUNCT STR	.0222					.0041	.04	9.93	.00		.013	.00	.00	PIPE
10446.050	747.850	12.313	760.163	79.90	2.83	.12	760.29	.00	2.39	.00	6.000	.000	.00	1 .0
18.070	.0177					.0004	.01	12.31	.00	1.53	.013	.00	.00	PIPE
JUNCT STR	.1063					.0004	.00	12.00	.00		.013	.00	.00	PIPE
10464.130	748.171	11.998	760.169	79.90	2.83	.12	760.29	.00	2.39	.00	6.000	.000	.00	1 .0
55.500	.0176					.0004	.02	12.00	.00	1.53	.013	.00	.00	PIPE
10519.630	749.150	11.039	760.189	79.90	2.83	.12	760.31	.00	2.39	.00	6.000	.000	.00	1 .0
JUNCT STR	.0188					.0017	.03	11.04	.00		.013	.00	.00	PIPE
10538.790	749.510	10.283	759.793	79.90	6.36	.63	760.42	.00	2.71	.00	4.000	.000	.00	1 .0
17.950	.0173					.0031	.06	10.28	.00	1.82	.013	.00	.00	PIPE
JUNCT STR	.1000					.0031	.00	10.03	.00		.013	.00	.00	PIPE
10556.750	749.821	10.028	759.849	79.89	6.36	.63	760.48	.00	2.71	.00	4.000	.000	.00	1 .0
368.390	.0173					.0031	1.14	10.03	.00	1.82	.013	.00	.00	PIPE

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
10925.140	756.190	4.798	760.988	79.89	6.36	.63	761.62	.00	2.71	.00	4.000	.000	.00	1 .0
JUNCT STR	.0219					.0031	.01	4.80	.00		.013	.00	.00	PIPE
10928.800	756.270	4.730	761.000	79.89	6.36	.63	761.63	.00	2.71	.00	4.000	.000	.00	1 .0
140.345	.0083					.0031	.43	4.73	.00	2.26	.013	.00	.00	PIPE
11069.140	757.434	4.000	761.434	79.89	6.36	.63	762.06	.00	2.71	.00	4.000	.000	.00	1 .0
56.729	.0083					.0029	.16	4.00	.00	2.26	.013	.00	.00	PIPE
11125.870	757.904	3.629	761.533	79.89	6.67	.69	762.22	.00	2.71	2.32	4.000	.000	.00	1 .0
26.640	.0083					.0028	.07	3.63	.52	2.26	.013	.00	.00	PIPE
11152.510	758.125	3.414	761.539	79.89	6.99	.76	762.30	.00	2.71	2.83	4.000	.000	.00	1 .0
19.347	.0083					.0030	.06	3.41	.61	2.26	.013	.00	.00	PIPE
11171.860	758.285	3.236	761.522	79.89	7.33	.84	762.36	.00	2.71	3.14	4.000	.000	.00	1 .0
1.139	.0083					.0032	.00	3.24	.69	2.26	.013	.00	.00	PIPE
11173.000	758.295	3.225	761.520	79.89	7.36	.84	762.36	.00	2.71	3.16	4.000	.000	.00	1 .0
HYDRAULIC JUMP														
11173.000	758.295	2.258	760.553	79.89	10.92	1.85	762.41	.00	2.71	3.97	4.000	.000	.00	1 .0
17.910	.0083					.0083	.15	2.26	1.42	2.26	.013	.00	.00	PIPE
11190.910	758.443	2.258	760.701	79.89	10.92	1.85	762.55	.00	2.71	3.97	4.000	.000	.00	1 .0
164.831	.0083					.0079	1.30	2.26	1.42	2.26	.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
11355.740	759.810	2.327	762.137	79.89	10.53	1.72	763.86	.00	2.71	3.95	4.000	.000	.00	1 .0
52.149	.0082					.0071	.37	2.33	1.34	2.26	.013	.00	.00	PIPE
11407.890	760.240	2.413	762.653	79.89	10.08	1.58	764.23	.00	2.71	3.91	4.000	.000	.00	1 .0
JUNCT STR	.0215					.0058	.03	2.41	1.25		.013	.00	.00	PIPE
11412.550	760.340	2.707	763.047	79.89	8.83	1.21	764.26	.00	2.71	3.74	4.000	.000	.00	1 .0
JUNCT STR	.0039					.0045	.09	2.71	1.00		.013	.00	.00	PIPE
11433.240	760.420	2.850	763.270	79.89	8.34	1.08	764.35	.00	2.71	3.62	4.000	.000	.00	1 .0
16.760	.0036					.0041	.07	2.85	.90	3.05	.013	.00	.00	PIPE
11450.000	760.480	2.895	763.375	79.89	8.20	1.04	764.42	.00	2.71	3.58	4.000	.000	.00	1 .0
JUNCT STR	.0038					.0035	.01	2.89	.88		.013	.00	.00	PIPE
11452.660	760.490	3.228	763.718	76.73	7.06	.77	764.49	.00	2.65	3.16	4.000	.000	.00	1 .0
34.040	.0035					.0030	.10	3.23	.67	2.97	.013	.00	.00	PIPE
11486.700	760.610	3.193	763.803	76.73	7.14	.79	764.59	.02	2.65	3.21	4.000	.000	.00	1 .0
40.000	.0040					.0031	.12	3.22	.69	2.82	.013	.00	.00	PIPE
11526.700	760.770	3.119	763.889	76.73	7.30	.83	764.72	.02	2.65	3.32	4.000	.000	.00	1 .0
50.160	.0040					.0032	.16	3.14	.72	2.82	.013	.00	.00	PIPE
11576.860	760.970	3.036	764.006	76.73	7.50	.87	764.88	.00	2.65	3.42	4.000	.000	.00	1 .0
103.610	.0040					.0035	.37	3.04	.76	2.82	.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
11680.470	761.385	2.900	764.284	76.73	7.86	.96	765.24	.00	2.65	3.57	4.000	.000	.00	1 .0
98.186	.0040					.0038	.37	2.90	.84	2.82	.013	.00	.00	PIPE
11778.660	761.778	2.844	764.621	76.73	8.03	1.00	765.62	.00	2.65	3.63	4.000	.000	.00	1 .0
HYDRAULIC JUMP														
11778.660	761.778	2.468	764.245	76.73	9.43	1.38	765.63	.00	2.65	3.89	4.000	.000	.00	1 .0
12.118	.0040					.0060	.07	2.47	1.15	2.82	.013	.00	.00	PIPE
11790.770	761.826	2.407	764.234	76.73	9.71	1.46	765.70	.00	2.65	3.92	4.000	.000	.00	1 .0
19.838	.0040					.0067	.13	2.41	1.20	2.82	.013	.00	.00	PIPE
11810.610	761.906	2.314	764.220	76.73	10.19	1.61	765.83	.00	2.65	3.95	4.000	.000	.00	1 .0
20.478	.0040					.0075	.15	2.31	1.30	2.82	.013	.00	.00	PIPE
11831.090	761.988	2.225	764.213	76.73	10.68	1.77	765.98	.00	2.65	3.97	4.000	.000	.00	1 .0
20.524	.0040					.0085	.18	2.23	1.40	2.82	.013	.00	.00	PIPE
11851.610	762.070	2.142	764.211	76.73	11.20	1.95	766.16	.00	2.65	3.99	4.000	.000	.00	1 .0
20.233	.0040					.0097	.20	2.14	1.51	2.82	.013	.00	.00	PIPE
11871.850	762.151	2.062	764.212	76.73	11.75	2.14	766.36	.00	2.65	4.00	4.000	.000	.00	1 .0
19.792	.0040					.0110	.22	2.06	1.62	2.82	.013	.00	.00	PIPE
11891.640	762.230	1.986	764.216	76.73	12.32	2.36	766.57	.00	2.65	4.00	4.000	.000	.00	1 .0
JUNCT STR	.0192					.0115	.05	1.99	1.74		.013	.00	.00	PIPE

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
11895.800	762.310	2.002	764.312	76.73	12.20	2.31	766.62	.00	2.65	4.00	4.000	.000	.00	1 .0
276.379	.0114					.0114	3.14	2.00	1.71	2.00	.013	.00	.00	PIPE
12172.180	765.454	2.002	767.456	76.73	12.20	2.31	769.77	.00	2.65	4.00	4.000	.000	.00	1 .0
202.711	.0114					.0118	2.38	2.00	1.71	2.00	.013	.00	.00	PIPE
12374.890	767.760	1.963	769.723	76.73	12.50	2.43	772.15	.00	2.65	4.00	4.000	.000	.00	1 .0
JUNCT STR	.0191					.0120	.04	1.96	1.78		.013	.00	.00	PIPE
12378.550	767.830	1.976	769.806	76.73	12.40	2.39	772.19	.00	2.65	4.00	4.000	.000	.00	1 .0
42.729	.0119					.0119	.51	1.98	1.76	1.98	.013	.00	.00	PIPE
12421.280	768.338	1.976	770.314	76.73	12.40	2.39	772.70	.00	2.65	4.00	4.000	.000	.00	1 .0
205.624	.0119					.0126	2.59	1.98	1.76	1.98	.013	.00	.00	PIPE
12626.900	770.785	1.912	772.697	76.73	12.93	2.60	775.29	.00	2.65	4.00	4.000	.000	.00	1 .0
82.207	.0119					.0142	1.17	1.91	1.87	1.98	.013	.00	.00	PIPE
12709.110	771.763	1.843	773.606	76.73	13.56	2.86	776.46	.00	2.65	3.99	4.000	.000	.00	1 .0
51.433	.0119					.0162	.83	1.84	2.01	1.98	.013	.00	.00	PIPE
12760.540	772.375	1.777	774.152	76.73	14.23	3.14	777.29	.00	2.65	3.98	4.000	.000	.00	1 .0
38.622	.0119					.0184	.71	1.78	2.15	1.98	.013	.00	.00	PIPE
12799.170	772.834	1.714	774.548	76.73	14.92	3.46	778.01	.00	2.65	3.96	4.000	.000	.00	1 .0
31.521	.0119					.0209	.66	1.71	2.31	1.98	.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
12830.690	773.209	1.653	774.863	76.73	15.65	3.80	778.67	.00	2.65	3.94	4.000	.000	.00	1 .0
26.952	.0119					.0239	.64	1.65	2.47	1.98	.013	.00	.00	PIPE
12857.640	773.530	1.595	775.125	76.73	16.41	4.18	779.31	.00	2.65	3.92	4.000	.000	.00	1 .0
JUNCT STR	.0215					.0255	.12	1.60	2.65		.013	.00	.00	PIPE
12862.300	773.630	1.592	775.222	76.73	16.45	4.20	779.43	.00	2.65	3.92	4.000	.000	.00	1 .0
28.557	.0318					.0246	.70	1.59	2.66	1.50	.013	.00	.00	PIPE
12890.860	774.537	1.628	776.165	76.73	15.98	3.96	780.13	.00	2.65	3.93	4.000	.000	.00	1 .0
31.314	.0318					.0222	.69	1.63	2.55	1.50	.013	.00	.00	PIPE
12922.170	775.532	1.687	777.219	76.73	15.23	3.60	780.82	.00	2.65	3.95	4.000	.000	.00	1 .0
21.574	.0318					.0195	.42	1.69	2.38	1.50	.013	.00	.00	PIPE
12943.750	776.217	1.749	777.967	76.73	14.52	3.28	781.24	.00	2.65	3.97	4.000	.000	.00	1 .0
15.886	.0318					.0171	.27	1.75	2.22	1.50	.013	.00	.00	PIPE
12959.630	776.722	1.814	778.536	76.73	13.85	2.98	781.51	.00	2.65	3.98	4.000	.000	.00	1 .0
12.126	.0318					.0150	.18	1.81	2.07	1.50	.013	.00	.00	PIPE
12971.760	777.107	1.882	778.989	76.73	13.20	2.71	781.70	.00	2.65	3.99	4.000	.000	.00	1 .0
9.443	.0318					.0132	.12	1.88	1.93	1.50	.013	.00	.00	PIPE
12981.200	777.407	1.953	779.360	76.73	12.59	2.46	781.82	.00	2.65	4.00	4.000	.000	.00	1 .0
7.420	.0318					.0116	.09	1.95	1.80	1.50	.013	.00	.00	PIPE

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
12988.620	777.643	2.027	779.670	76.73	12.00	2.24	781.91	.00	2.65	4.00	4.000	.000	.00	1 .0
5.829	.0318					.0103	.06	2.03	1.67	1.50	.013	.00	.00	PIPE
12994.450	777.828	2.105	779.933	76.73	11.44	2.03	781.97	.00	2.65	3.99	4.000	.000	.00	1 .0
4.523	.0318					.0090	.04	2.11	1.56	1.50	.013	.00	.00	PIPE
12998.970	777.972	2.187	780.159	76.73	10.91	1.85	782.01	.00	2.65	3.98	4.000	.000	.00	1 .0
3.435	.0318					.0080	.03	2.19	1.45	1.50	.013	.00	.00	PIPE
13002.410	778.081	2.274	780.355	76.73	10.40	1.68	782.04	.00	2.65	3.96	4.000	.000	.00	1 .0
2.493	.0318					.0070	.02	2.27	1.34	1.50	.013	.00	.00	PIPE
13004.900	778.160	2.365	780.525	76.73	9.92	1.53	782.05	.00	2.65	3.93	4.000	.000	.00	1 .0
2.367	.0214					.0063	.01	2.36	1.25	1.67	.013	.00	.00	PIPE
13007.270	778.211	2.442	780.653	76.73	9.55	1.42	782.07	.00	2.65	3.90	4.000	.000	.00	1 .0
1.743	.0214					.0057	.01	2.44	1.17	1.67	.013	.00	.00	PIPE
13009.010	778.248	2.543	780.791	76.73	9.10	1.29	782.08	.00	2.65	3.85	4.000	.000	.00	1 .0
.560	.0214					.0050	.00	2.54	1.08	1.67	.013	.00	.00	PIPE
13009.570	778.260	2.652	780.912	76.73	8.68	1.17	782.08	.04	2.65	3.78	4.000	.000	.00	1 .0
6.266	.0030					.0045	.03	2.70	1.00	3.19	.013	.00	.00	PIPE
13015.840	778.279	2.767	781.046	76.73	8.27	1.06	782.11	.04	2.65	3.69	4.000	.000	.00	1 .0
28.503	.0030					.0040	.11	2.81	.92	3.19	.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
13044.340	778.364	2.892	781.256	76.73	7.89	.97	782.22	.03	2.65	3.58	4.000	.000	.00	1 .0
85.453	.0030					.0036	.30	2.93	.84	3.19	.013	.00	.00	PIPE
13129.790	778.620	3.027	781.648	76.73	7.52	.88	782.53	.03	2.65	3.43	4.000	.000	.00	1 .0
53.229	.0030					.0033	.18	3.06	.77	3.19	.013	.00	.00	PIPE
13183.020	778.780	3.067	781.847	76.73	7.42	.86	782.70	.00	2.65	3.38	4.000	.000	.00	1 .0
235.671	.0030					.0032	.75	3.07	.75	3.21	.013	.00	.00	PIPE
13418.690	779.480	3.162	782.642	76.73	7.20	.81	783.45	.00	2.65	3.26	4.000	.000	.00	1 .0
JUNCT STR	.0214					.0033	.02	3.16	.70		.013	.00	.00	PIPE
13423.360	779.580	2.969	782.549	76.73	7.67	.91	783.46	.00	2.65	3.50	4.000	.000	.00	1 .0
180.772	.0030					.0033	.60	2.97	.80	3.19	.013	.00	.00	PIPE
13604.130	780.124	3.112	783.236	76.73	7.32	.83	784.07	.00	2.65	3.33	4.000	.000	.00	1 .0
274.467	.0030					.0031	.85	3.11	.73	3.19	.013	.00	.00	PIPE
13878.600	780.950	3.166	784.116	76.73	7.19	.80	784.92	.00	2.65	3.25	4.000	.000	.00	1 .0
JUNCT STR	.0214					.0033	.02	3.17	.70		.013	.00	.00	PIPE
13883.270	781.050	2.975	784.025	76.73	7.66	.91	784.94	.00	2.65	3.49	4.000	.000	.00	1 .0
185.726	.0030					.0033	.62	2.97	.80	3.19	.013	.00	.00	PIPE
14069.000	781.607	3.118	784.725	76.73	7.30	.83	785.55	.00	2.65	3.32	4.000	.000	.00	1 .0
291.445	.0030					.0031	.90	3.12	.72	3.19	.013	.00	.00	PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE
100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION
09-06-2022

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/ Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
14360.440	782.480	3.175	785.655	76.73	7.17	.80	786.45	.00	2.65	3.24	4.000	.000	.00	1 .0
JUNCT STR	.0214				.0033	.02	3.23	.70		.013	.00	.00		PIPE
14365.110	782.580	2.986	785.566	76.73	7.63	.90	786.47	.03	2.65	3.48	4.000	.000	.00	1 .0
20.520	.0029				.0034	.07	3.02	.79	3.24	.013	.00	.00		PIPE
14385.630	782.640	3.013	785.653	76.73	7.56	.89	786.54	.00	2.65	3.45	4.000	.000	.00	1 .0
41.300	.0031				.0034	.14	3.01	.78	3.12	.013	.00	.00		PIPE
14426.930	782.770	3.036	785.806	76.73	7.50	.87	786.68	.03	2.65	3.42	4.000	.000	.00	1 .0
20.530	.0029				.0033	.07	3.07	.76	3.24	.013	.00	.00		PIPE
14447.460	782.830	3.055	785.885	76.73	7.45	.86	786.75	.00	2.65	3.40	4.000	.000	.00	1 .0
371.130	.0030				.0032	1.17	3.05	.75	3.20	.013	.00	.00		PIPE
14818.590	783.940	3.183	787.123	76.73	7.16	.80	787.92	.06	2.65	3.23	4.000	.000	.00	1 .0
20.870	.0029				.0030	.06	3.24	.69	3.26	.013	.00	.00		PIPE
14839.460	784.000	3.189	787.189	76.73	7.14	.79	787.98	.11	2.65	3.22	4.000	.000	.00	1 .0
JUNCT STR	.0167				.0031	.02	3.30	.69		.013	.00	.00		PIPE
14845.460	784.100	3.071	787.171	76.51	7.39	.85	788.02	.06	2.65	3.38	4.000	.000	.00	1 .0
43.840	.0030				.0032	.14	3.14	.74	3.20	.013	.00	.00		PIPE
14889.300	784.230	3.095	787.325	76.51	7.33	.84	788.16	.00	2.65	3.35	4.000	.000	.00	1 .0
28.601	.0031				.0032	.09	3.09	.73	3.11	.013	.00	.00		PIPE

Program Package Serial Number: 7247

WATER SURFACE PROFILE LISTING Date: 9- 7-2022 Time:11:56: 9

RHSP-MILLCREEK-A1 MILLCREEK MAIN LINE

100 YR PRELIMINARY HYDRAULICS w/ 35% DETENTION

09-06-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
14917.900	784.320	3.097	787.417	76.51	7.33	.83	788.25	.00	2.65	3.34	4.000	.000	.00	1 .0