FINAL Basis of Design Report

☑ APPROVED

☐ APPROVED AS NOTED

☐ REVISE AND RESUBMIT

CITY OF SCOTTSDALE

SCOTTSDALE WATER
9379 E San Salvador Dr.
Scottsdale, AZ 85258

Disclaimer: If approved; the approval is granted under the condition that the final construction documents submitted for city review will match the information herein. Any subsequent changes in the water or sewer design that materially impact design criteria or standards will require re-analysis, re-submittal, and approval of a revised basis of design report prior to the plan review submission.; this approval is not a guarantee of construction document acceptance.
For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

02/26/2018

BY Scott Anderson DATE 2/26/2018

Sewer Basis of Design
Prepared: February 2018

Asteria Highlands

Prepared for:

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February, 2018.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
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CURTIS LELAND
BROWN
Date Signed 2/5/18
ARIZONA, U.S.A.

FP 3/31/18

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1.0 INTRODUCTION

1.1 Project Description

The purpose of this sewer report is to support the proposed Asteria Highlands residential development. Asteria Highlands is adjacent to the future StoryRock Master Planned Community (formerly named Cavalliere Ranch), a development consisting of 462-acres of single family residential construction, and a future phase of the Sereno Canyon Master Plan.

Asteria Highlands is a proposed 40-acre single family residential subdivision consisting of 31 single family residential units. Asteria Highlands is proposed to be zoned R1-70 ESL (4 lots) and R1-35 ESL (27 lots). Sewer capacity for 13 of the 31 lots was previously approved and assured by the City of Scottsdale with the approval of Tiara Estates. All liens associated with the water and sewer improvements from Sereno Canyon have been released for the previous 13 lots. Capacity for the remaining 18 lots will be on a first come first serve basis for the existing lift station and will be subject to payback charges to Sereno Canyon.

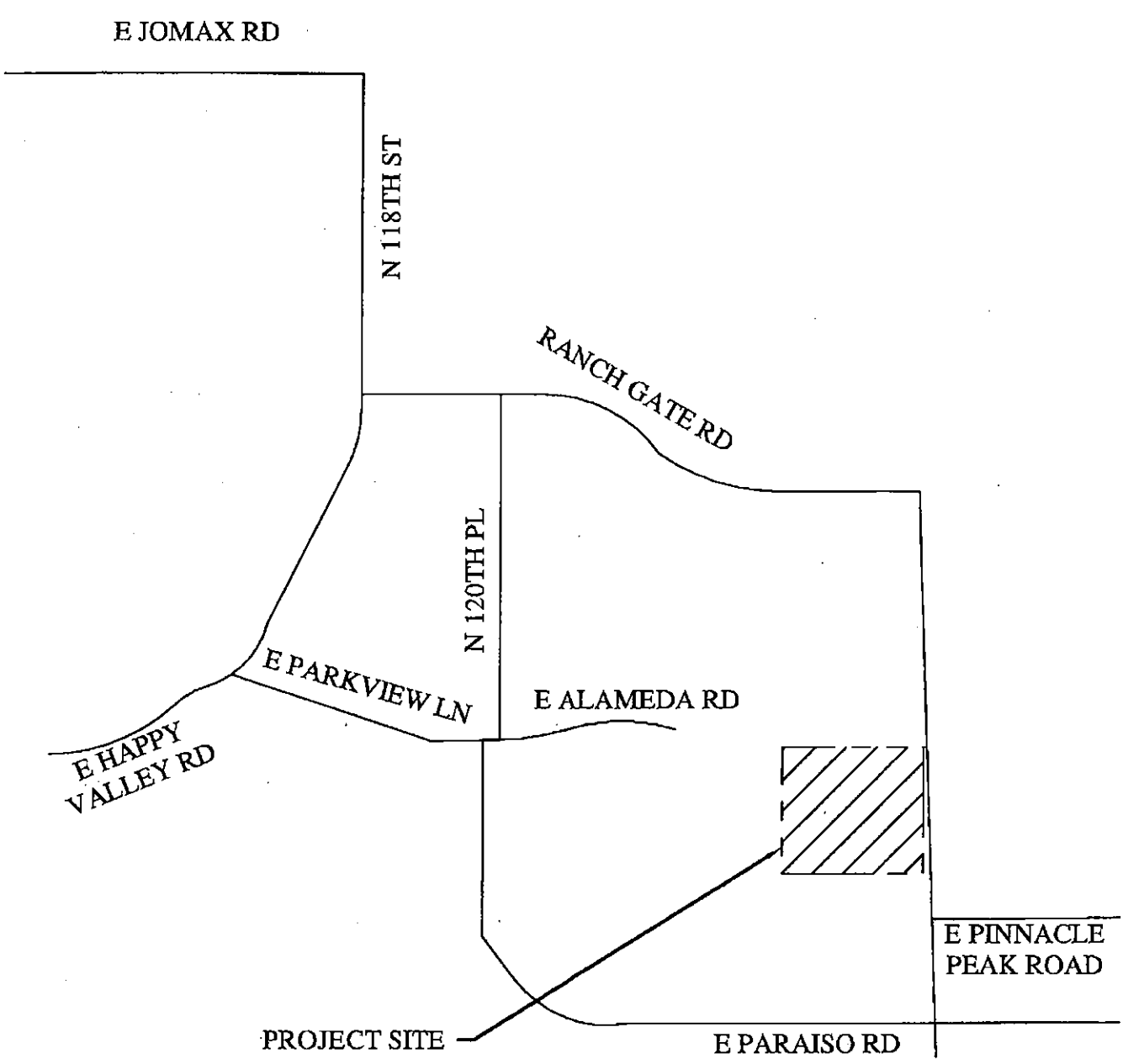
1.2 Project Location

Asteria Highlands is located within Section 11 of Township 4 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The site is bound to the north by Alameda Road alignment, and the east by 128th Street, to the South by undivided land, and to the West by existing Sereno Canyon single family residential subdivision (COS#2703-07-1). See **Figure 1: Vicinity Map.**

1.3 Scope of Sewer Plan

This report presents the basis of design criteria that will be used for the engineering design of the proposed Asteria Highlands development. This report will establish the final sewer system demands for the project and the sewer system infrastructure required to serve the development. Finally, the report will show the development of this site as a standalone project relative to the adjacent future development areas.

All design criteria that is presented in this report will conform to the City of Scottsdale Design Standards & Polices Manual (DS&PM).



ASTERIA HIGHLANDS
VICINITY MAP
NTS

Kimley»Horn

2.0 EXISTING SITE CONDITIONS AND SEWER SYSTEMS

2.1 Site Conditions

The project is undeveloped natural desert. Based on a review of City Quarter Section maps; no city wastewater infrastructure exists on-site. Many washes and rock features of varying sizes characterize the site. The on-site washes vary in size and depth, but generally flow from the southwest to the northeast or east through the site. Multiple ridgelines run though the site, in the general direction of southwest to northeast. Elevations across the Asteria Highlands site range from approximately 2775' in the southwest to 2695' in the northeast.

2.2 Adjacent Sanitary Systems

The Sereno Canyon development is located directly west of the project. Most of the infrastructure for Sereno Canyon has been constructed, though none of the lots have been developed. Wastewater generated by a large portion of Sereno Canyon is conveyed by gravity sewer to an existing lift station located on the east side of 128th Street approximately 350' north of Ranch Gate Road. From the lift station, wastewater flows are conveyed through an existing 6-inch force main west along the Happy Valley Road alignment. Flows are ultimately conveyed to the City of Scottsdale treatment facility located at Pima Road and Hualapai Drive.

2.3 Phasing and Existing Development

The Asteria Highlands project is planned as a standalone development from the future StoryRock and Sereno Canyon Phase 4 projects. The existing lift station along 128th Street near Ranch Gate Road has a planned capacity to accommodate up to 611 total units. The secured unit allocations for the existing lift station are as follows:

302 units have been allocated to Sereno Canyon.
13 units have been allocated to Asteria Highlands (formerly Tiara Estates)
297 open units (first come, first served)

Capacity for the remaining 18 lots of Asteria Highlands will be on a first come first serve basis from the remaining 297 units for the existing lift station and will be subject to payback charges to Sereno Canyon. All offsite facilities to convey the waste water flows to the existing lift station will need to be either installed or bonded prior to the recordation of the Asteria Highlands Final Plat.

3.0 PROPOSED WASTEWATER PLAN

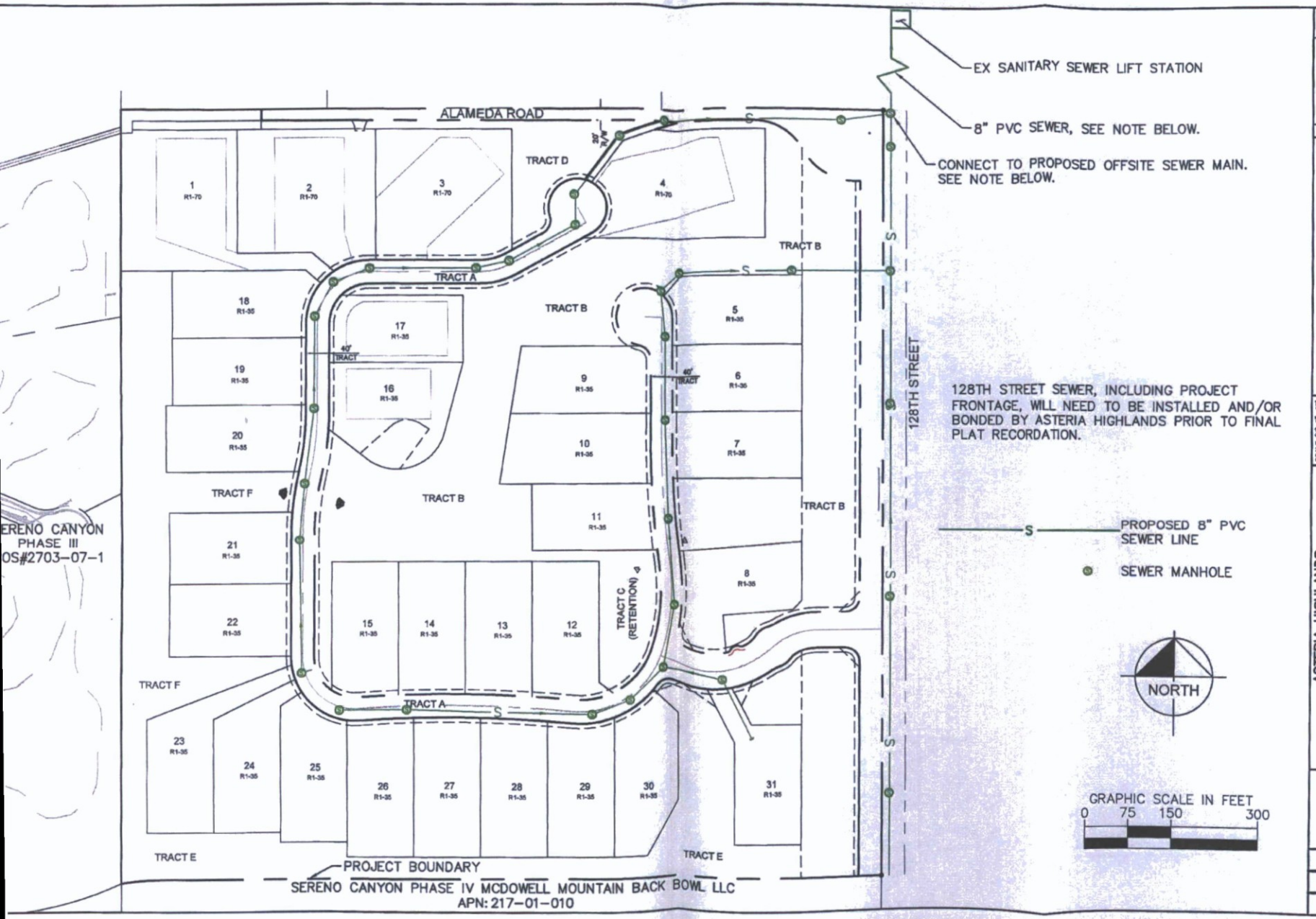
3.1 Asteria Highlands Proposed Collection System

The Asteria Highlands proposed onsite collection system will consist of 8-inch SDR 35 sewer lines, routed through the project to serve all lots in Asteria Highlands. The gravity sewer lines will discharge into the 8-inch gravity line in 128th Street. All offsite facilities to convey the waste water flows to the existing lift station will need to be either installed or bonded prior to the recordation of the Asteria Highlands Final Plat.

See **Figure 2: Sewer System Layout** for sewer line and lift station location.

3.2 Offsite Sewer Connection

All offsite facilities to convey the waste water flows to the existing lift station will need to be either installed or bonded prior to the recordation of the Asteria Highlands Final Plat.


EX SANITARY SEWER LIFT STATION
8" PVC SEWER, SEE NOTE BELOW.
CONNECT TO PROPOSED OFFSITE SEWER MAIN. SEE NOTE BELOW.
ALAMEDA ROAD
TRACT D
TRACT A
TRACT B
TRACT C (RETENTION)
TRACT E
TRACT F
128TH STREET
128TH STREET SEWER, INCLUDING PROJECT FRONTAGE, WILL NEED TO BE INSTALLED AND/OR BONDED BY ASTERIA HIGHLANDS PRIOR TO FINAL PLAT RECORDATION.
PROPOSED 8" PVC SEWER LINE
SEWER MANHOLE
NORTH
GRAPHIC SCALE IN FEET
0 75 150 300
PROJECT BOUNDARY
SERENO CANYON PHASE IV MCDOWELL MOUNTAIN BACK BOWL LLC
APN: 217-01-010
SERENO CANYON PHASE III
OS#2703-07-1
ASTERIA HIGHLANDS
FIGURE 2
Kimley»Horn
1 OF

4.0 METHODOLOGY AND CALCULATIONS

4.1 Design Criteria

Average Day Demand design flows are calculated based on design criteria detailed within the City of Scottsdale Design Standards and Polices Manual (DS&PM). Per DS&PM Chapter 7, a design flow of 100 gallons per capita per day (gpcpd) and a residential density of 2.5 persons per dwelling unit shall be used. See Table 1 below for a summary of sewer demands.

Table 1 Onsite Sewer Demands

Land Use	Dwelling units (du)	Density (persons/ du)	Population (persons)	Average Day Demand (gpd)	Peaking Factor	Peak Flow (gpd)	Peak Flow (gpm)
<2 du/ac	31	2.5	78	7,800	4	31,200	21.7

Per the DS&PM, proposed sewer lines within the development were designed to achieve a full flow velocity of between 2.5 and 10 feet per second and maintain a maximum d/D ratio 0.65 when calculated with a Manning's "n" value of 0.013. To satisfy these requirements the proposed public 8-inch sewer will meet the design with a minimum slope of 0.0052 ft/ft (0.52%) and a maximum slope of 0.0833 ft/ft (8.33%).

4.2 Wastewater System Analysis

To determine the capacity of the proposed wastewater collection system, the peak design flow was analyzed using the minimum design pipe slope. At the minimum design slope of 0.0052 ft/ft, an 8-inch line has the capacity to convey approximately 426,000 gallons per day. An 8-inch line at the minimum design slope can convey the proposed peak design flow of 31,200 gallons per day at a normal depth of 1.28" or a d/D ratio of 0.16, at a velocity of 1.34 ft/s. See **Appendix A** for pipe capacity calculations.

5.0 CONCLUSIONS

1) The proposed Asteria Highlands wastewater collection system is in conformance with the City of Scottsdale DS&PM and the Arizona Administrative Code.

2) Gravity sewer will convey flows generated by Asteria Highlands to the existing City of Scottsdale Lift Station.

3) Design criteria established by the City of Scottsdale DS&PM and the Arizona Administrative Code was used as the basis of design.

6.0 REFERENCES

City of Scottsdale, *Design Standards and Policies Manual*, January 2010.

Arizona Administrative Code, *Title 18, Chapter 9*, September 2005.

Conceptual Master Wastewater System Report for Sereno Canyon, Wood Patel and Associates, September, 2005.

Sereno Canyon Amended Master Wastewater Report, LVA, February 2014.

Facility Payback Agreement for Sewer System Improvements in the Sereno Canyon Service Area, City of Scottsdale, 12/21/2010.

Appendix A – Sewer Capacity Calculations

Worksheet for 8-Inch Actual Depth - Minimum Slope

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00520	ft/ft
Diameter	8.00	in
Discharge	0.0312	mgd

Results

Normal Depth	1.28	in
Flow Area	0.04	ft²
Wetted Perimeter	0.55	ft
Hydraulic Radius	0.79	in
Top Width	0.49	ft
Critical Depth	0.10	ft
Percent Full	16.0	%
Critical Slope	0.00690	ft/ft
Velocity	1.34	ft/s
Velocity Head	0.03	ft
Specific Energy	0.13	ft
Froude Number	0.87	
Maximum Discharge	0.94	ft³/s
Discharge Full	0.87	ft³/s
Slope Full	0.00002	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	15.98	%
Downstream Velocity	Infinity	ft/s

Worksheet for 8-inch Actual Depth - Minimum Slope

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.28	in
Critical Depth	0.10	ft
Channel Slope	0.00520	ft/ft
Critical Slope	0.00690	ft/ft

Worksheet for 8-Inch Full - Minimum Slope

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00520	ft/ft
Normal Depth	8.00	in
Diameter	8.00	in

Results

Discharge	0.5632	mgd
Flow Area	0.35	ft²
Wetted Perimeter	2.09	ft
Hydraulic Radius	2.00	in
Top Width	0.00	ft
Critical Depth	0.44	ft
Percent Full	100.0	%
Critical Slope	0.00857	ft/ft
Velocity	2.50	ft/s
Velocity Head	0.10	ft
Specific Energy	0.76	ft
Froude Number	0.00	
Maximum Discharge	0.94	ft³/s
Discharge Full	0.87	ft³/s
Slope Full	0.00520	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for 8-Inch Full - Minimum Slope

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	8.00	in
Critical Depth	0.44	ft
Channel Slope	0.00520	ft/ft
Critical Slope	0.00857	ft/ft

Worksheet for 8-Inch Full -Maximum Slope

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.08333	ft/ft
Normal Depth	8.00	in
Diameter	8.00	in

Results

Discharge	1.7050	mgd
Flow Area	0.35	ft²
Wetted Perimeter	2.09	ft
Hydraulic Radius	2.00	in
Top Width	0.00	ft
Critical Depth	0.65	ft
Percent Full	65.0	%
Critical Slope	0.04252	ft/ft
Velocity	9.99	ft/s
Velocity Head	1.55	ft
Specific Energy	2.22	ft
Froude Number	3.15	
Maximum Discharge	3.75	ft³/s
Discharge Full	3.49	ft³/s
Slope Full	0.04766	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	65.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for 8-Inch Full -Maximum Slope

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	8.00	in
Critical Depth	0.65	ft
Channel Slope	0.08333	ft/ft
Critical Slope	0.04252	ft/ft