

DS #: 5005, 1

APN: 137.14.401-006, 137-23-101-002

PROJECT: Master Conceptual Drainage Study for Update #1
Summerlin West Village 22

SUBMITTAL: 54R

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: April 4, 2019
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for:	
Master Conceptual Drainage Study for – Update #1 Summerlin West Village 22		COPIES TO: VTN Nevada
Cross Streets:	I-215 Western Beltway & Summerlin Parkway	Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5005E.doc	Bart Anderson, P.E., DevCo
Parcel Number:	137-14-401-006, 137-23-101-002	CCRFCFCD
Zoning Action:	MDR-73901	CCPW
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES X NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	6/12/2018	6/28/2018 & 7/13/2018	Not Approved	\$400.00	49696: \$400
2 nd Submittal	7/31/2018	8/22/2018	Not Approved	\$400.00	497790: \$400
3 rd Submittal	11/5/2018	11/27/2018	Conditional Approval	\$400.00	500639: \$400
Memo Revision	12/3/2018	12/3/2018	Conditional Approval	N/C	N/C
CCRFCFCD	1/10/2019	1/10/2019	Concurrence Recv'd	N/C	N/C
4 th Submittal	2/12/2019	3/6/2019	Not Approved	\$100.00	503164: \$100
5 th Submittal	3/21/2019	4/4/2019	See Comments Below	\$400.00	3057847: \$400
TOTAL FEES (LDDRS):				\$1,700.00	----

REMARKS:

4th & 5th Submittals: Update #1 & Addendum #1 to revise Village 22 in accordance to the Update of the latest overall Summerlin West Master Plan Drainage Study

The Drainage Study for the subject project has been reviewed and:

	is approved subject to conformance to all City standards and the following conditions:
	must be resubmitted or supplemented including the following:
X	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
X	is conditionally approved subject to Clark County Public Works Department concurrence.

- This drainage study is acceptable in concept;** however, *City of Las Vegas* will not formally accept the study until the *Clark County Regional Flood Control District (CCRFCFCD)* has issued a letter of concurrence. The engineer should contact the CCRFCFCD to confirm that they have begun their review.

Please note that effective March 15, 2019, the CCRFCFCD adopts new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

<http://gustfront.ccrfcd.org/LandDev/LandDev.aspx>

2. The site is also adjacent to the Clark County Western Beltway project. The engineer must coordinate with *Clark County Department of Public Works (CCPW)* and incorporate any concerns for mutual boundary conditions. CCPW concurrence is required prior to the final approval of the master conceptual drainage study.
3. The *Master Drainage Study Update* for *Summerlin West Planning Area* proposes a modification to internal flow patterns that alters the flow patterns to the *Beltway Channel* system downstream of the *Summerlin Parkway* interchange. The modification proposes a storm drain system within *Summerlin Village 22* area (Storm Drain F) that will collect flows from the Gowan channel tributary area and route them into the *Beltway Channel* (MPU Facility APBE 0122). This resulted in increased flows in the *Beltway Channel* segment between *Summerlin Parkway* and *Far Hills Boulevard*, ie, mitigation measures are required for the impacted *Beltway Channel* segment.

A technical drainage study for the analysis, design and construction plans for the *Beltway Channel* modifications must be submitted and approved by the City prior to the individual onsite parcel developments.

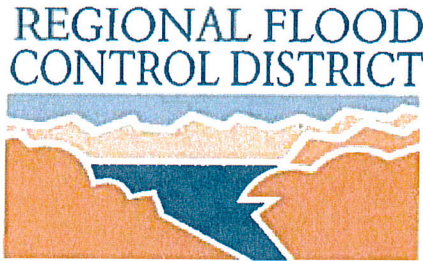
4. The *Grand Park Detention Basin* is proposed to regulate and meter outflow to match the previously approved downstream flow conditions at the junction of *Far Hills* storm drain and the *Beltway Channel*. Without the *Grand Park Detention Basin*, there will be a net increase in flows at the *Beltway Channel* downstream of *Far Hills* intersection exceeding the previously approved flow.

A technical drainage study for the analysis, design and construction plans for the *Grand Park Detention Basin* must be submitted and approved by the City prior to the individual onsite parcel developments.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS
WSP/AYS

T/R/S: T20S/R59E/14
AREA K-14



Rec'd: 4/25/19
DS 05005
K-14
N/C

Steven C. Parrish, P.E.
General Manager/Chief
Engineer

BOARD OF DIRECTORS

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City of Las Vegas

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City of Boulder City

April 25, 2019

Mr. Oh Sang Kwon, P.E.
City of Las Vegas Department of Public Works
333 North Rancho Drive
Las Vegas, NV 89106

**DISTRICT CONCURRENCE: MASTER CONCEPTUAL STUDY FOR UPDATE #1
FOR SUMMERLIN WEST VILLAGE 22
(DS5005E) (RFCD No. 19-11248)**

Dear Mr. Kwon:

Clark County Regional Flood Control District (District) reviewed Technical Drainage Study dated February 12, 2019, and Addendum No. 1 dated March 20, 2019 for above-mentioned project as submitted by VTN NEVADA. In addition, District is in receipt of the Conditional Letter of Acceptance from City of Las Vegas Department of Public Works dated April 4, 2019.

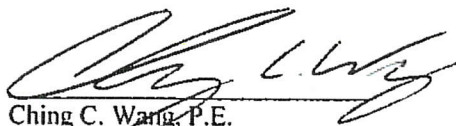
District concurs with acceptance of this Technical Drainage Study by City of Las Vegas Department of Public Works.

District's review of this project was limited to issues of Regional Flood Control Significance as defined in *Uniform Regulations for the Control of Drainage*.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, information submitted by VTN NEVADA may be superseded. Compliance with regulatory elements and design standards specified in *Uniform Regulations for the Control of Drainage* does not imply a guarantee that properties will be free from flooding or flood damage. The District, its officials, or employees assume no liability for information, data, or conclusions presented by consulting engineers. We, therefore, make no warranties, either expressed or implied, in conducting this review.

STEVEN C. PARRISH, P.E.
General Manager/Chief Engineer

BY:


Ching C. Wang, P.E.
Senior Civil Engineer

CCW:dd

c: Brian Troy Ruiz, P.E., VTN Nevada

P:\Letters and Memos\Local Drainage\Land Development & Drainage\2019\L-19-11248 doc

Addendum #1 Update #1 to the Master Conceptual Drainage Study for

Summerlin West Village 22

Las Vegas, Nevada

W.O. # 7861-3A

Prepared for:

Howard Hughes Company, LLC

Submitted to:

City of Las Vegas
Public Works



HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Summerlin West Village 22 Date: March 20, 2019

Location of Development: a) Descriptive (Cross Streets) North/South: I-215 Western Beltway

East/West: Summerlin Parkway

b) Section: 23 and 14 Township: 20S Range: 59E

c) APN : 137-14-401-006, 137-23-101-002

Name of Owner: The Howard Hughes Company, LLC

Telephone No.: (702) 791-4336 Fax No.: (702) 791-4453 E-Mail Address: chris.anderson@howardhughes.com

Address: 10801 W. Charleston Blvd. LV, NV, 89135

Contact Person-Name: Joanna Ayson Telephone No.: (702)-873-7550

* E-Mail Address: jayson@vtnnv.com Fax No.: (702)-362-2597

Firm: VTN Nevada

Address: 2727 S. Rainbow Blvd, LV, NV, 89146

Type of Land Development/Land Disturbance Process:

☐	Rezoning	☐	Subdivision Map	☐	Clearing and Grading Only
☐	Parcel Map	☒	Planned Unit Development	☐	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit		

1. Total Owned Land Area: At Site: +/-446 Acres Being Developed/Disturbed: +/-446 Acres

2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No

3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ Yes** ☐ No

4. Proposed type of development (Residential, Commercial, Etc.): Mixed-use master plan

5. Approximate upstream land area which drains to the subject site: +/- 61 acres

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: SWPA MPU (DS4926), Western Segment Las Vegas Beltway from Summerlin to Cheyenne (DS2610), Summerlin Lake Mead Blvd Improvements (DS4146)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing 66" RCP in Lake Mead Pkwy, Existing I-215 Western Beltway Channel, future SWPA CCRFCD storm drain facilities

8. Briefly describe your proposed schedule for the subject project: As soon as possible



Engineer's Seal

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

***New Required Field**

****Review and concurrence of the Clark County Regional Flood Control District is required.**

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		March 6, 2019
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for:	
	Master Conceptual Drainage Study for – Update #1 Summerlin West Village 22	
Cross Streets:	I-215 Western Beltway & Summerlin Parkway	Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5005D.doc	Bart Anderson, P.E., DevCo
Parcel Number:	137-14-401-006, 137-23-101-002	CCRFCD
Zoning Action:	MDR-73901	CCPW
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES X	NO

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	6/12/2018	6/28/2018 & 7/13/2018	Not Approved	\$400.00	49696: \$400
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Memo Revision	12/3/2018	12/3/2018	Conditional Approval	N/C	N/C
4 th Submittal	2/12/2019	3/6/2019	See Comments Below	\$100.00	503164: \$100
TOTAL FEES (LDDRS):				\$1,300.00	----

REMARKS:

4th Submittal: Update #1 to revise Village 22 in accordance to the Update of the latest overall Summerlin West Master Plan Drainage Study

The Drainage Study for the subject project has been reviewed and:

	is approved subject to conformance to all City standards and the following conditions:
X	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	is conditionally approved subject to Clark County Public Works Department concurrence.

1. The subject Update #1 to *Summerlin West Village 22* will not be approved prior to the final approval of the *Update to Summerlin West Planning Area Master Drainage Study*.
2. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

Please note that effective March 15, 2019, the CCRFCD adopts new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

<http://gustfront.ccrfcd.org/LandDev/LandDev.aspx>

3. The site is also adjacent to the Clark County Western Beltway project. The engineer must coordinate with *Clark County Department of Public Works (CCPW)* and incorporate any concerns for mutual boundary conditions. CCPW concurrence is required prior to the final approval of the master conceptual drainage study.
4. Atkins is working on the 2018 MPU. Coordinate and verify the proposed regional flood control facilities as shown on Figure 7 with Atkins for inclusion of the *Summerlin West Village 22* regional facilities into the ongoing 2018 MPU.
5. The *Master Drainage Study Update for Summerlin West Planning Area* proposes a modification to internal flow patterns that alters the flow patterns to the *Beltway Channel* system downstream of the *Summerlin Parkway* interchange. The modification proposes a storm drain system within *Summerlin Village 22* area (Storm Drain F) that will collect flows from the Gowan channel tributary area and route them into the *Beltway Channel* (MPU Facility APBE 0122). This resulted in increased flows in the *Beltway Channel* segment between *Summerlin Parkway* and *Far Hills Boulevard*, ie, mitigation measures are required for the impacted *Beltway Channel* segment.

A technical drainage study for the analysis, design and construction plans for the *Beltway Channel* modifications must be submitted and approved by the City prior to the individual onsite parcel developments.

6. The *Grand Park Detention Basin* is proposed to regulate and meter outflow to match the previously approved downstream flow conditions at the junction of *Far Hills* storm drain and the *Beltway Channel*. Without the *Grand Park Detention Basin*, there will be a net increase in flows at the *Beltway Channel* downstream of *Far Hills* intersection exceeding the previously approved flow.

A technical drainage study for the analysis, design and construction plans for the *Grand Park Detention Basin* must be submitted and approved by the City prior to the individual onsite parcel developments.

7. **Page 2** of the *Update #1*, in the Table of "*Re-Evaluation of SWPA MPU CCRFCD Facilities*", Facility *SD-F1C* and *SD-F1D* are shown as 6'x5' RCB, however, they are 7'x5' RCB per **Figure 7**. Same for Facility *SD-F3* has a discrepancy of 8'x7' vs. 8'x8'. Review and revise accordingly in the next submittal.
8. Facility 11, a 66"-RCP in *Lake Mead Boulevard* is proposed to accept 583cfs, an increase of 210cfs from 373cfs in the original study. Provide an update study to the *Lake Mead Boulevard Street Improvements Project* concurrently with the next submittal.
9. **Figure 8 (Interim Condition Ditch Locations):** Channel Facility Legend Yellow dotted line is wrongly identified as Carriage Hill Drive (Desert Foothills to Street F). The correct section of Carriage Hill Drive is from Street F to Street I.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS
WSP/AYS

T/R/S: T20S/R59E/14
AREA K-14

**ADDENDUM #1 TO UPDATE #1
TO THE MASTER CONCEPTUAL DRAINAGE STUDY
FOR
SUMMERLIN WEST VILLAGE 22
CLARK COUNTY, NEVADA
W.O. # 7861**

Prepared for:
HOWARD HUGHES COMPANY LLC

Submitted to:
**CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS**



March 20, 2019
W.O. #7861

City of Las Vegas
Department of Public Works
333 N. Rancho Blvd., 7th Floor
Las Vegas, NV 89106

Attention: Albert Sung, P.E.
Flood Control Project Engineer

SUBJECT: ADDENDUM #1 TO UPDATE #1 TO THE MASTER CONCEPTUAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22

Mr. Sung:

This *Addendum #1 to Update #1 to the Master Conceptual Drainage Study for Summerlin West Village 22* is being submitted to the City of Las Vegas to address your review comments dated March 6, 2019.

Comment #1

The subject Update #1 to Summerlin Village 22 will not be approved prior to the final approval of the Update to Summerlin West Planning Area Master Drainage Study,

RESPONSE: The Update to the Drainage Study for Summerlin West Planning Area Master Plan Update (referred to as the Overall MCDS) was conditionally approved by the City of Las Vegas on March 13, 2019 subject to Clark County Regional Flood Control District (CCRFCD) and Clark County Public Works (CCPW) concurrence. The Overall MCDS is currently under review by CCRFCD and CCPW.

Comment #2

The site is adjacent to or crosses an existing or proposed Clark County Regional Flood Control District (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

Please note that effective March 15, 2019, the CCRFCD adopts new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

<http://gustfront.ccrfcd.org/LandDev/LandDev.aspx>

RESPONSE: A copy of the drainage study and all associated addenda will be submitted to CCRFCD for concurrence after approval by CLV.

Comment #3

The site is also adjacent to the Clark County Western Beltway project. The engineer must coordinate with Clark County Department of Public Works (CCPW) and incorporate any concerns for mutual boundary conditions. CCPW concurrence is required prior to the final approval of the master conceptual study

RESPONSE: VTN agrees to coordinate with CCPW to address any concerns for the mutual boundary conditions. A copy of the conceptual drainage study and all associated addenda will be submitted to CCPW for concurrence.

Comment #4

Atkins is working on the 2018 MPU. Coordinate and verify the proposed regional flood control facilities as shown on Figure 7 with Atkins for inclusion of the Summerlin West Village 22 regional facilities into the ongoing 2018 MPU.

RESPONSE: VTN agrees to coordinate with Atkins for inclusion of the proposed facilities in the ongoing 2018 MPU.

Comment #5

The Master Drainage Study Update for Summerlin West Planning Area proposes a modification to internal flow patterns that alters the flow patterns to the Beltway Channel system downstream of the Summerlin Parkway interchange. The modification proposes a storm drain system within Summerlin Village 22 area (Storm Drain F) that will collect flows from the Gowan channel tributary area and route them into the Beltway Channel (MPU Facility APBE 0122). This resulted in increased flows in the Beltway Channel segment between Summerlin Parkway and Far Hills Boulevard, ie, mitigation measures are required for the impacted Beltway Channel segment.

A technical drainage study for the analysis, design and construction plans for the Beltway Channel modifications must be submitted and approved by the City prior to the individual onsite parcel developments.

RESPONSE: Acknowledged. This comment was also included as a condition on the conditional approval letter of the original study.

Comment #6

The Grand Park Detention Basin is proposed to regulate and meter outflow to match the previously approved downstream flow conditions at the junction of Far Hills storm drain and the Beltway Channel. Without the Grand Park Detention Basin, there will be a net increase in flows at the Beltway Channel downstream of Far Hills intersection exceeding the previously approved flow.

A technical drainage study for the analysis, design and construction plans for the Grand Park Detention Basin must be submitted and approved by the City prior to the individual onsite parcel developments.

RESPONSE: Acknowledged. This comment was also included as a condition on the conditional approval letter of the original study.

Comment #7

Page 2 of the Update #1, in the Table of “Re-Evaluation of SWPA MPU CCRFCD Facilities”, Facility SD-F1C and SD-F1D are shown as 6’X5’ RCB, however, they are 7’X5’ RCB per Figure 7. Same for Facility SD-F3 has a discrepancy of 8X7’ vs. 8’X8’. Review and revise accordingly in the next submittal.

RESPONSE: The following table was submitted on Page 2 of the text. Please note that the name of concentration point CE has been revised to CES-1 since the previous submittal. No other values have changed.

RE-EVALUATION OF SWPA MPU CCRFCD FACILITIES						
Facility Per Overall SWPA MCDS	Design Slope	Q100	Tributary Basin/CP	Velocity ft/s	New Facility Size	Facility Size Per Overall SWPA MCDS
	%	cfs				
SD-F	7.0	189	3-0*	30.02	42" RCP	42" RCP
SD-F1A	7.0	242	COFFCOS2	26.98	5'X5' RCB	5'X5' RCB
SD-F1B	1.0	317	CSTJ1	13.69	5'X5' RCB	6'X5' RCB
SD-F1C	1.0	382	CES-1	14.68	7'X5' RCB	6'X5' RCB
SD-F1D	0.5	642	CES-1 + CSTG1	12.72	8'X7' RCB	6'X5' RCB
SD-F2	4.5	749	DUMMY3	30.40	8'X8' RCB	8'X7' RCB
SD-F3	0.5	779	CP3-Q*	13.22	8'X8' RCB	8'X7' RCB

Please refer to the column “New Facility Size” for the sizes that are proposed with this study. The last column, “Facility Size per Overall SWPA MCDS” refers to the sizes established in the SWPA MCDS and are superseded by the sizes shown in this study. The table above indicates that facility SD-F1C and SDF-1D are a 7’X5’ RCB and a 8’X7’ RCB, respectively. The label for SD-F1C on Figure 7 was correct and therefore has not been revised. The label for SD-F1D on Figure 7 was revised to callout 8’X7’ RCB to match the table and calculations. SD-F3 was shown as an 8’x8’ RCB on both the table and Figure 7 in the previous submittal, therefore the label for SD-F3 has not been revised.

Comment #8

Facility 11, a 66”-RCP in Lake Mead Boulevard is proposed to accept 583cfs, an increase of 210 cfs from 373 cfs in the original study. Provide an update study to the Lake Mead Boulevard Street Improvements Project concurrently with the next submittal.

RESPONSE: The offsite basins OFF1, OFF2, OFF3, and OFF-ST have been removed from the analysis and are no longer shown to drain to the existing Lake Mead Boulevard storm drain. The offsite basins will drain north towards Village 26, which is consistent with the drainage patterns shown in the Overall MCDS. In addition, basin COS-1 has been removed because it is assumed that the area will be

preserved and will continue to drain north to Village 26. The basins have been removed from Figure 6, and the revised Figure 6 been included in Appendix A. The revised hydrologic calculations have been included in Appendix B.

Facilities 1 and 2 in Lake Mead Boulevard are no longer required and have been removed from Figure 7. Facility 4 is now only intended for the street flow generated by basin LM. The flow rate in the existing Lake Mead Boulevard storm drain has reduced to 201 cfs (CP1) as a result of the revisions. Therefore, the flow rate within the existing 66-inch RCP is now within the referenced design flow of 383 cfs, and an update to the Lake Mead Boulevard Street Improvements project is no longer required. Revised hydrologic calculations have been included in Appendix B.

Comment #9

Figure 8 (Interim Condition Ditch Locations): Channel facility Legend Yellow dotted line is wrongly identified as Carriage Hill Drive (Desert Foothills to Street F). The correct section of Carriage Hill Drive is form Street F to Street I.

RESPONSE: The legend has been revised to call out the correct street names. Since the submittal of this drainage study, several street names for Summerlin West Planning Area have been established and are summarized in the following table. The drainage maps have been revised to show the correct street names and have been included in Appendix A.

Old Name	New Name
Street A	Redpoint Drive
Street B	Kindle Corner Ave
Street C	Red Pass Drive
Street D	Clowder Spring Way
Street E	Flight Range Ave
Street F	Kindle Rise Way
Street G	Fleet Wing Avenue
Street H	Clowder Pass Way
Street I	Kestrel Creek Avenue
Street J	Kettle Ridge Drive
Street K	Park Drift Trail
Street L	Bask Ridge Drive
Street M	N/A
Street N	Scurry Bend Drive
Street O	Calico Bend Drive
Street P	Highland Pride Lane
Street Q	Sunset Run Drive
Street AA	N/A
Street EE	Flight Edge Way
Street FF	Hive Bluff Lane
Street KK	N/A
Street LL	Grand Park Boulevard

FGH Connector	Meadow Run Street
V22 Carriage Hill	Kettle Bend Road
Summerlin Pkwy WB	Sunset Run Drive
Summerlin Pkwy EB	Sky Vista Drive

Additional Revisions:

The basin boundary for CARR1 has been revised as a result of a land plan revision. The revised alignment of CARR1 also affected the areas of the surrounding basins DES1, DES2, B, and I. The area and flow changes for the affected basins and concentration points are summarized in the following table.

Basin	Previous Submittal		Addendum #1		Difference	
	Area (Acres)	Q100 (cfs)	Area (Acres)	Q100 (cfs)	Area (Acres)	Q100 (cfs)
DES1	3.83	15	3.76	14	-0.07	-1
C-COS2	-	94	-	93	-	-1
DES2	3.58	16	3.40	15	-0.18	-1
CDES2	-	75	-	74	-	-1
CP2	-	199	-	198	-	-1
CARR1	4.93	22	6.68	29	1.75	7
I	9.22	33	10.56	38	1.34	5
CCARR1	-	253	-	265	-	12
CP4	-	377	-	389	-	12
B	90.03	339	87.82	328	-2.21	-11

The normal depth calculations for the proposed facilities have been revised according to the new flow rates summarized in the above table. In addition, proposed parcel stubs been updated to be a minimum size of 30-inches for flexibility. Figure 7 has been updated accordingly and included in Appendix A. Hydraulic calculations have been included in Appendix C.

Parcels ES-1 and E have exchanged locations. Basins ES-1 and E utilize the same land use assumption (Commercial/Urban District) in the curve number calculations, therefore curve numbers for the basins are not affected by the revision. Other hydrologic parameters including rainfall depths, travel times, and areas are also not affected by the location exchange. The label for ES-1 and E have been swapped on all calculations and figures. The label changes do not affect hydraulic calculations.

I hope this addresses your concerns regarding this project. If there are any questions or any additional information is required, please contact this office.

Respectfully Submitted,

VTN Consulting

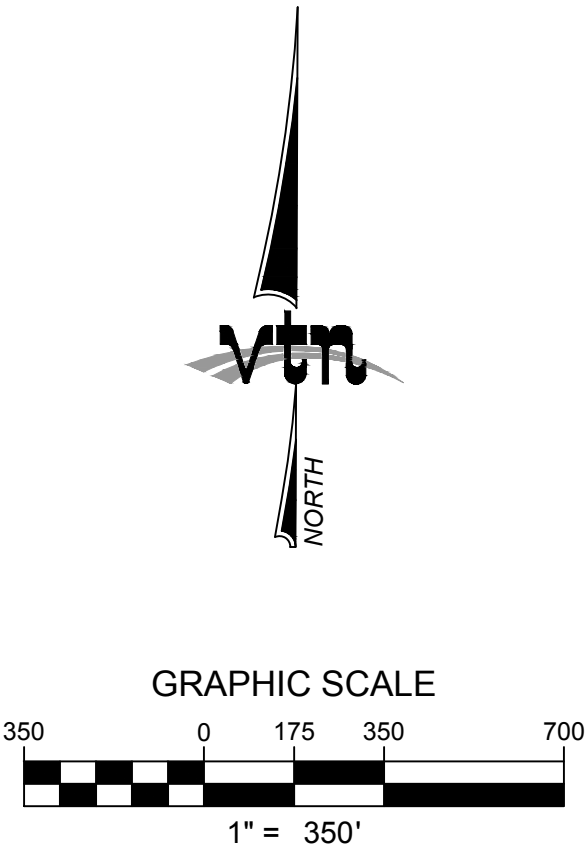


Joanna Ayson, E.I.

APPENDIX

APPENDIX A

FIGURES



- LEGEND**
- BASIN BOUNDARY
 - BASIN DESIGNATION
 - CONCENTRATION POINT
 - FLOW ARROW

ULTIMATE CONDITION HEC-1 SUMMARY TABLE					
BASIN ID	AREA (ac)	Q100 (CFS)	BASIN ID	AREA (ac)	Q100 (CFS)
LM	9.16	41	STJ1	3.76	17
D	11.27	47	CSTJ1	-	317
DES1	3.76	14	NP-2	1.53	6
CDES1	-	62	ES-1	14.05	59
COS-2	10.17	32	CES-1	-	382
COCOS-2	-	93	OFF4	52.68	209
A	16.92	66	L	8.09	35
CA	-	160	STL1	1.78	8
CP1	-	201	CSTL1	-	43
STI	2.46	11	STG1	1.77	8
C	11.68	50	CSTG1	-	260
CSTI	-	61	M	11.24	48
G	7.08	30	STJ2	3.10	13
CG	-	91	S	3.01	11
H	7.65	33	STF	1.83	8
CH	-	124	NP-3	3.61	9
STH	2.29	10	U	3.49	11
J	5.8	25	DES4	1.72	8
CJ	-	35	CDES4	-	19
K	5.17	22	V	3.85	14
CK	-	58	W	3.97	15
NP-1	0.49	2	CVW	-	29
CNP-1	-	59	CARR3	2.95	13
DES2	3.40	15	STE3	1.11	5
CDES2	-	74	EE	6.65	24
CP2	-	198	STEE3	1.49	7
CARR1	6.68	29	HH	4.60	19
I	10.56	38	CARR4	3.10	13
CCARR1	-	265	OFF5	12.73	53
N	6.67	28	STE1	1.72	8
STFF	1.08	5	Y	8.07	31
CSTFF	-	33	CY	-	92
STG2	2.83	13	STL2	1.79	8
CSTG2	-	46	CSTL2	-	100
O	3.25	13	Z	7.04	22
P	3.37	13	STJ3	2.44	11
COP	-	26	CSTJ3	-	33
DES3	1.84	8	STE2	1.78	8
CDES3	-	34	BB	6.18	23
CP3	-	80	T	4.02	16
Q	3.62	14	CC	5.50	20
R	3.49	15	DD	4.57	16
CQR	-	29	DES5	1.80	8
CARR2	3.58	15	NP-4	0.71	2
CCARR2	-	44	AA	4.64	19
CP4	-	389	STJ4	1.05	4
II	19.56	77	CSTJ4	-	23
X	16.47	56	STEE1	1.45	7
B	87.12	328	CSTEE2	-	30
DC-1	10.84	48	STEE2	2.40	11
COS-3	1.75	4	FF	3.08	13
3-O*	-	189	CFF	-	53
OFF-COS2	19.16	53	GG	3.74	16
COFFCOS2	-	242	DES6	1.11	5
E	13.96	58			

THE HOWARD HUGHES CORPORATION
10801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

FIGURE 6
ULTIMATE CONDITION BASIN MAP

DRAWN BY: AH
DESIGNED BY: J/A
CHECKED BY: J/A
PROJECT NO: 7801

AUGUST 2018

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 813-7500 FAX: (702) 362-2897 WEB: WWW.VTNV.COM
CONSULTING ENGINEERS PLANNERS & LAND SURVEYORS

SUMMERLIN WEST VILLAGE 22

SCALE: 1" = 300' HORIZ.
NA VERT.

SHEET

OF SHEETS

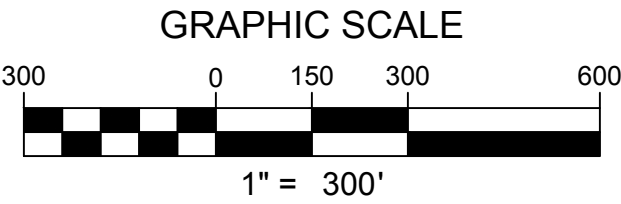
DRAWING NO.

REV

DATE

BY

REVISION



LEGEND

- CCRFGD STORM DRAIN ALIGNMENT
- EXISTING FACILITY
- VILLAGE 22 LOCAL STORM DRAIN
- W51 BASIN DESIGNATION
- CONCENTRATION POINT
- LOCAL FACILITY DESIGNATION
- DEVELOPED CONDITION FLOW ARROW

VILLAGE 22 LOCAL FLOOD PROTECTION FACILITIES									
Facility #	Design Slope %	Q100 cfs	Velocity ft/s	Facility	Facility #	Design Slope %	Q100 cfs	Velocity ft/s	Facility
4	5.4	41	18.69	30" RCP	56	1.5	44	11.54	30" RCP
5	2.0	47	13.16	30" RCP	58	1.5	15	8.93	30" RCP
6	2.7	62	15.58	30" RCP	61	3.1	389	26.21	60" RCP
7	2.0	32	12.11	30" RCP	62	8.0	35	20.39	30" RCP
8	2.9	93	17.93	36" RCP	63	1.5	43	11.50	30" RCP
9	8.0	66	14.44	36" RCP	64	8.0	48	22.29	36" RCP
10	3.0	160	20.54	42" RCP	65	8.2	260	33.90	42" RCP
11	N/A	201	N/A	EX 66" RCP**	66	3.1	11	10.63	30" RCP
12A	8.0	53	22.91	36" RCP	68	1.3	9	7.36	30" RCP
12B	2.6	53	15.05	36" RCP	69	8.0	11	14.88	30" RCP
13	8.0	58	10.63	36" RCP	72	7.0	29	18.72	30" RCP
19	0.5	50	8.01	42" RCP	74	6.3	5	10.83	30" RCP
20	5.8	61	20.97	42" RCP	77A	8.0	53	22.91	36" RCP
21	0.5	30	7.07	36" RCP	77B	7.4	209	31.33	42" RCP
22	9.7	91	28.22	42" RCP	78	8.0	31	20.01	30" RCP
23	0.8	33	8.46	30" RCP	79	8.1	92	26.52	36" RCP
24	10.1	124	31.13	42" RCP	80	3.1	8	9.69	30" RCP
25	1.5	6	6.89	30" RCP	81	8.0	100	27.08	36" RCP
27	2.3	59	14.86	36" RCP	82	2.9	22	12.60	30" RCP
29	0.5	25	6.65	30" RCP	83	3.2	23	13.22	30" RCP
30	7.0	35	19.71	30" RCP	84	0.5	16	6.05	30" RCP
33	0.6	22	6.99	30" RCP	85	2.3	20	11.29	30" RCP
34	5.0	58	19.78	36" RCP	86	8.0	16	16.59	30" RCP
35	1.0	2	4.32	30" RCP	87	8.0	19	17.43	30" RCP
36	1.0	74	11.43	42" RCP	88	7.8	30	19.83	30" RCP
37	0.9	198	13.98	60" RCP	89	8.0	13	15.62	30" RCP
40	7.6	38	20.77	30" RCP	90	7.8	53	22.70	36" RCP
41	0.9	265	13.39	6"X6" RCB	91	0.5	2	3.39	30" RCP
43	0.5	28	6.73	30" RCP	92	2.7	16	11.25	30" RCP
44	3.3	33	14.72	30" RCP	93	7.4	24	18.12	30" RCP
45	6.8	46	20.97	30" RCP	94	6.2	19	15.91	30" RCP
50	7.9	26	18.97	30" RCP	95	4.0	77	19.52	42" RCP
51	2.5	34	13.37	30" RCP	96	5.0	56	23.05	36" RCP
52	7.1	80	24.48	36" RCP	97	5.0	339	30.51	54" RCP
55	7.3	29	19.01	30" RCP	98	N/A	138	N/A	EX 48" RCP***

*Replaces existing 30" RCP stub provided in Lake Mead Study
**Existing 66" RCP per Lake Mead Blvd Study
***Existing Facility (Per Lake Mead Blvd Study) can accept 138 cfs and may be used for flexibility

THE HOWARD HUGHES CORPORATION
10801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

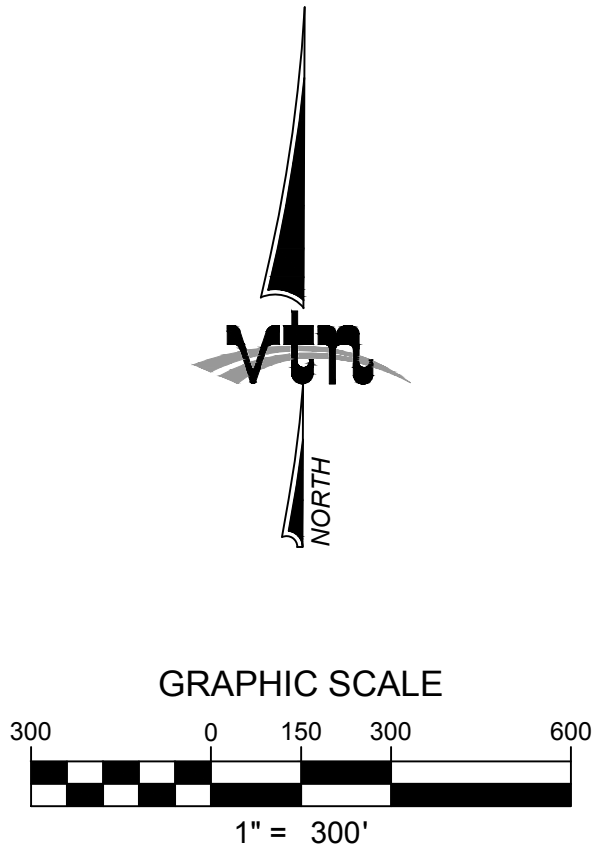
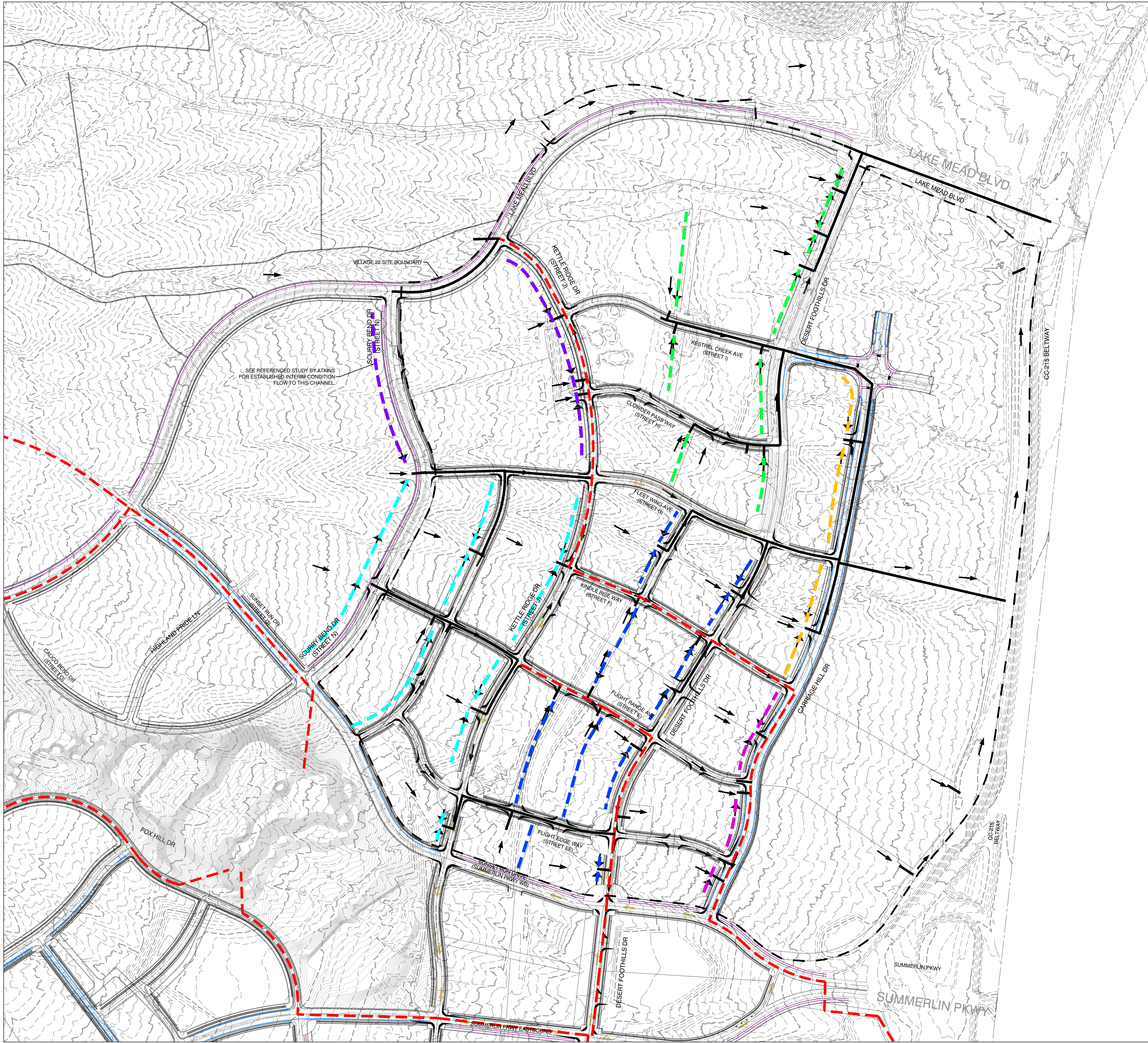
FIGURE 7
LOCAL STORM DRAIN
FACILITIES MAP

SUMMERLIN WEST VILLAGE 22

DRAWN BY: ATM	MAY 2018
DESIGNED BY: STG/TA	MAY 2018
CHECKED BY: JYA	MAY 2018
PROJECT NO.: 2801	SCALE: 1"=300' HORIZ. VERT.

SHEET
OF SHEETS
DRAWING NO.

H:\7861 Village 22 Master\Drawings\4_ADD1 TO UP\A_Figures\Figure 7 - Local Flood Control Facilities Map.dwg



CHANNEL FACILITY LEGEND

- TO BE CONSTRUCTED WITH CARRIAGE HILL DR (KESTREL CREEK AVE TO KINDLE RISE WAY)
- TO BE CONSTRUCTED WITH CARRIAGE HILL DR (SUNSET RUN DR TO KINDLE RISE WAY)
- TO BE CONSTRUCTED WITH DESERT FOOTHILLS DR (LAKE MEAD BLVD TO FLEET WING AVE)
- TO BE CONSTRUCTED WITH DESERT FOOTHILLS DR (SUNSET RUN DR TO FLEET WING AVE)
- TO BE CONSTRUCTED WITH KETTLE RIDGE DR (LAKE MEAD BLVD TO FLEET WING AVE)
- TO BE CONSTRUCTED WITH KETTLE RIDGE DR (SUNSET RUN DR TO FLEET WING AVE)

STORM DRAIN LEGEND

- CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT STORM DRAIN
- VILLAGE 22 LOCAL STORM DRAIN

DRAWN BY: AH		AUGUST 2018	
DESIGNED BY: Z/A			
CHECKED BY: J/A			
PROJECT NO: 7801		SCALE: 1" = 300' HORIZ. N/A VERT.	
SHEET			
OF SHEETS			
DRAWING NO.			
THE HOWARD HUGHES CORPORATION 10801 WEST CHARLESTON BLVD, 3RD FLOOR LAS VEGAS, NEVADA 89135		2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH: (702) 893-7500 FAX: (702) 362-2897 WEB: WWW.VTNV.COM CONSULTING ENGINEERS & LAND SURVEYORS	
FIGURE 8 INTERIM CONDITION DITCH LOCATIONS		SUMMERLIN WEST VILLAGE 22	
REV		DATE	
BY		REVISION	

APPENDIX B

HYDROLOGIC

CALCULATIONS

CURVE NUMBERS FOR SOILS - W.O. #7861

Soil # 152 Cave gravelly fine sandy loam, 0 to 4 percent slopes							
Soil	Percent	Group	Apartment/Condo ₁	Townhouses ₂	Open Space ₃	Urban Districts ₄	Impervious ₅
Cave	100%	D	93	92	89	95	98
Total	100%		93	92	89	95	98

Soil # 155 Cave gravelly fine sandy loam, 4 to 15 percent slopes							
Soil	Percent	Group	Apartment/Condo ₁	Townhouses ₂	Open Space ₃	Urban Districts ₄	Impervious ₅
Cave	100%	D	93	92	89	95	98
Total	100%		93	92	89	95	98

Soil # 156 Vace - Wechech association							
Soil	Percent	Group	Apartment/Condo ₁	Townhouses ₂	Open Space ₃	Urban Districts ₄	Impervious ₅
Vace and Similar	45%	D	93	92	89	95	98
Wechech and Similar	25%	D	93	92	89	95	98
Wechech, steep, and similar	15%	D	93	92	89	95	98
Weiser	8%	B	88	87	79	92	98
Irongold	4%	D	93	92	89	95	98
Commski	2%	B	88	87	79	92	98
Threelakes	1%	A	81	80	68	89	98
Total	100%		93	92	88	95	98

Soil # 502 Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes							
Soil	Percent	Group	Apartment/Condo ₁	Townhouses ₂	Open Space ₃	Urban Districts ₄	Impervious ₅
Canutio	55%	A	81	80	68	89	98
Cave	40%	D	93	92	89	95	98
Arizo	5%	D	93	92	89	95	98
Total	100%		87	86	78	92	98

1-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A

* Residential (Apartments / Condos)

2-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A

* Residential (Townhouses)

3-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4

* Open spaces in poor condition (grass cover < 50%)

4-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4

* Urban Districts (Commercial / Business & Residential with average lot size <6000 sqft)

5-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4

*Impervious (Paved Streets)

Curve Number calculations for ONSITE Basins

Basin	Type	Soil Percentage	Apartment/Condo ₁	Townhouses ₂	Open Space ₃	Urban Districts ₄	Impervious ₅	CN Value
A	155	100%				100%		95.0
B	152	7%	40%			60%		93.5
	155	76%	40%			60%		
	502	17%	40%			60%		
C	155	100%				100%		95.0
D	155	100%				100%		95.0
E	155	100%				100%		95.0
ES-1	155	100%				100%		95.0
G	155	100%				100%		95.0
H	155	100%				100%		95.0
I	152	15%		100%				92.0
	155	85%		100%				
J	152	2%				100%		95.0
	155	98%				100%		
K	152	38%				100%		95.0
	155	62%				100%		
L	155	87%				100%		94.6
	502	13%				100%		
M	155	76%				100%		94.3
	502	24%				100%		
N	152	3%				100%		95.0
	155	97%				100%		
O	155	100%		95%		5%		92.2
P	155	100%		95%		5%		92.2
Q	155	100%		95%		5%		92.2
R	155	77%		95%		5%		94.3
	502	23%		95%		5%		
S	155	35%		95%		5%		88.3
	502	65%		95%		5%		
T	502	100%				100%		92.0
U	502	100%		95%		5%		86.3
V	155	0%	40%			60%		90.0
	502	100%	40%			60%		
W	502	100%	40%			60%		90.0
X	502	100%	40%			60%		90.0
Y	156	14%				100%		92.4
	502	86%				100%		
Z	156	27%		100%				87.6
	502	73%		100%				
AA	156	100%	100%					93.0
BB	156	24%	40%			60%		91.0
	502	76%	40%			60%		
CC	156	16%	40%			60%		90.7
	502	84%	40%			60%		

DD	156	15%	40%			60%		90.6
	502	85%	40%			60%		
EE	156	11%	40%			60%		90.5
	502	89%	40%			60%		
FF	156	100%	40%			60%		94.2
GG	156	100%	40%			60%		94.2
HH	156	100%	40%			60%		94.2
II	156	64%	40%			60%		92.7
	502	36%	40%			60%		
COS-1	155	16%			100%			79.8
	502	84%			100%			
COS-2	155	100%			100%			89.0
COS-3	156	67%			100%			84.7
	502	33%			100%			
NP-1	155	100%			100%			89.0
NP-2	155	100%			100%			89.0
NP-3	155	21%			100%			80.3
	502	79%			100%			
NP-4	156	61%			100%			84.1
	502	39%			100%			
DC-1	152	16%					100%	98.0
	155	53%					100%	
	502	31%					100%	
LM	155	95%					100%	98.0
	502	5%					100%	
DES1	155	100%					100%	98.0
DES2	152	24%					100%	98.0
	155	76%					100%	
DES3	155	100%					100%	98.0
DES4	155	18%					100%	98.0
	502	82%					100%	
DES5	156	16%					100%	98.0
	502	84%					100%	
DES6	156	100%					100%	98.0
CARR1	152	6%					100%	98.0
	155	94%					100%	
CARR2	155	77%					100%	98.0
	502	23%					100%	
CARR3	155	6%					100%	98.0
	502	94%					100%	
CARR4	156	57%					100%	98.0
	502	43%					100%	
STI	155	100%					100%	98.0
STJ1	155	100%					100%	98.0
STJ2	155	70%					100%	98.0
	502	30%					100%	

STJ3	156	33%					100%	98.0
	502	67%					100%	
STJ4	156	100%					100%	98.0
STH	155	100%					100%	98.0
STG1	155	100%					100%	98.0
STG2	152	42%					100%	98.0
	155	58%					100%	
STF	155	100%					100%	98.0
STE1	502	100%					100%	98.0
STE2	502	100%					100%	98.0
STE3	502	100%					100%	98.0
STEE1	156	99%					100%	98.0
STEE2	156	99%					100%	98.0
STEE3	156	100%					100%	98.0
STFF	155	100%					100%	98.0
STL1	155	82%					100%	98.0
	502	18%					100%	
STL2	156	32%					100%	98.0
	502	68%					100%	

TRAVEL TIME CALCULATIONS

DEVELOPMENT: **Summerlin West Village 22**

W.O. # **7861**

CALCULATED BY: **AH**

$$Velocity = CS^{\frac{1}{2}}$$

C1 applies to the first 500 feet of travel distance
C2 applies to the remaining travel distance

Existing:	Developed
C1=14.8 C2=29.4	C1=20.2 C2=30.6

					First 500 feet		Remaining Travel Distance	
Basin	Length (ft)	High Elev (ft)	Low Elev (ft)	Slope (ft/ft)	C1	V1 (fps)	C2	V2 (fps)
DEVELOPED CONDITION ONSITE								
A	1651	3448	3310	0.084	20.2	5.8	30.6	8.8
B	1355	3336	3230	0.078	20.2	5.6	30.6	8.6
C	538	3454	3371	0.154	20.2	7.9	30.6	12.0
D	541	3368	3327	0.076	20.2	5.6	30.6	8.4
E	849	3526	3447	0.093	20.2	6.2	30.6	9.3
ES-1	941	3514	3422	0.098	20.2	6.3	30.6	9.6
G	419	3435	3408	0.064	20.2	5.1	30.6	7.8
H	494	3408	3336	0.146	20.2	7.7	30.6	11.7
I	1044	3347	3299	0.046	20.2	4.3	30.6	6.6
J	403	3433	3371	0.154	20.2	7.9	30.6	12.0
K	326	3389	3346	0.132	20.2	7.3	30.6	11.1
L	341	3524	3462	0.182	20.2	8.6	30.6	13.0
M	406	3486	3423	0.155	20.2	8.0	30.6	12.1
N	468	3436	3382	0.115	20.2	6.9	30.6	10.4
O	267	3386	3352	0.127	20.2	7.2	30.6	10.9
P	392	3399	3361	0.097	20.2	6.3	30.6	9.5
Q	311	3353	3315	0.122	20.2	7.1	30.6	10.7
R	361	3365	3328	0.102	20.2	6.5	30.6	9.8
S	256	3440	3398	0.164	20.2	8.2	30.6	12.4
T	284	3451	3403	0.169	20.2	8.3	30.6	12.6
U	276	3421	3384	0.134	20.2	7.4	30.6	11.2
V	253	3376	3337	0.154	20.2	7.9	30.6	12.0
W	413	3383	3344	0.094	20.2	6.2	30.6	9.4
X	1072	3338	3254	0.078	20.2	5.7	30.6	8.6
Y	774	3543	3496	0.061	20.2	5.0	30.6	7.5
Z	800	3500	3460	0.050	20.2	4.5	30.6	6.8
AA	674	3513	3456	0.085	20.2	5.9	30.6	8.9
BB	703	3468	3428	0.057	20.2	4.8	30.6	7.3
CC	652	3431	3408	0.035	20.2	3.8	30.6	5.7
DD	621	3421	3391	0.048	20.2	4.4	30.6	6.7
EE	555	3393	3341	0.094	20.2	6.2	30.6	9.4
FF	269	3469	3416	0.197	20.2	9.0	30.6	13.6
GG	392	3426	3392	0.087	20.2	5.9	30.6	9.0
HH	505	3387	3343	0.087	20.2	6.0	30.6	9.0
II	962	3337	3268	0.072	20.2	5.4	30.6	8.2
COS-1	1373	3450	3350	0.073	20.2	5.5	30.6	8.3
COS-2	1676	3452	3417	0.021	20.2	2.9	30.6	4.4
COS-3	1333	3309	3248	0.046	20.2	4.3	30.6	6.5
NP-1	98	3359	3343	0.163	20.2	8.2	30.6	12.4

TRAVEL TIME CALCULATIONS

DEVELOPMENT: **Summerlin West Village 22**

W.O. # **7861**

CALCULATED BY: **AH**

$$Velocity = CS^{\frac{1}{2}}$$

C1 applies to the first 500 feet of travel distance
C2 applies to the remaining travel distance

Existing:	Developed
C1=14.8 C2=29.4	C1=20.2 C2=30.6

Basin	Length (ft)	High Elev (ft)	Low Elev (ft)	Slope (ft/ft)	First 500 feet		Remaining Travel Distance	
					C1	V1 (fps)	C2	V2 (fps)
NP-2	95	3460	3420	0.421	20.2	13.1	30.6	19.9
NP-3	237	3408	3373	0.148	20.2	7.8	30.6	11.8
NP-4	123	3391	3376	0.122	20.2	7.1	30.6	10.7
DC-1	3630	3252	3219	0.009	20.2	1.9	30.6	2.9
LM	3472	3515	3305	0.060	20.2	5.0	30.6	7.5
DES1	1148	3344	3303	0.036	20.2	3.8	30.6	5.8
DES2	1035	3354	3336	0.017	20.2	2.7	30.6	4.0
DES3	552	3369	3337	0.058	20.2	4.9	30.6	7.4
DES4	652	3385	3366	0.029	20.2	3.4	30.6	5.2
DES5	696	3393	3380	0.019	20.2	2.8	30.6	4.2
DES6	318	3400	3391	0.028	20.2	3.4	30.6	5.1
CARR1	1512	3340	3296	0.029	20.2	3.4	30.6	5.2
CARR2	795	3355	3305	0.063	20.2	5.1	30.6	7.7
CARR3	1079	3365	3326	0.036	20.2	3.8	30.6	5.8
CARR4	842	3345	3324	0.025	20.2	3.2	30.6	4.8
STI	1262	3442	3345	0.077	20.2	5.6	30.6	8.5
STJ1	1498	3457	3415	0.028	20.2	3.4	30.6	5.1
STJ2	1025	3440	3413	0.026	20.2	3.3	30.6	5.0
STJ3	926	3473	3453	0.022	20.2	3.0	30.6	4.5
STJ4	268	3473	3454	0.071	20.2	5.4	30.6	8.1
STH	1102	3421	3343	0.071	20.2	5.4	30.6	8.1
STG1	890	3513	3421	0.103	20.2	6.5	30.6	9.8
STG2	1025	3424	3348	0.074	20.2	5.5	30.6	8.3
STF	887	3436	3370	0.074	20.2	5.5	30.6	8.3
STE1	831	3522	3458	0.077	20.2	5.6	30.6	8.5
STE2	867	3455	3384	0.082	20.2	5.8	30.6	8.8
STE3	505	3384	3341	0.085	20.2	5.9	30.6	8.9
STEE1	532	3503	3461	0.079	20.2	5.7	30.6	8.6
STEE2	791	3470	3393	0.097	20.2	6.3	30.6	9.5
STEE3	575	3386	3342	0.077	20.2	5.6	30.6	8.5
STFF	509	3401	3374	0.053	20.2	4.7	30.6	7.0
STL1	895	3489	3456	0.037	20.2	3.9	30.6	5.9
STL2	865	3526	3488	0.044	20.2	4.2	30.6	6.4

STANDARD FORM 4

DEVELOPMENT: Summerlin West Village 22

W.O. # 7861

CALCULATED BY: AH

V1 applies to the first 500 feet of travel distance V2 applies to the remaining travel distance			
Existing:		Developed	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1 - k)L^{1/2}}{S^{1/3}}$$

$$T_i = \frac{L}{60V}$$

$$k = 0.0132C_n - 0.39$$

$$T_c = T_i + T_t$$

SUB-BASIN DATA					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG.	Cn	K	AREA Ac.	AREA Mi^2	LENGTH Ft	SLOPE %	Ti Min.	LENGTH Ft.	SLOPE %	V1 fps (9a)	V2 fps (9b)	Tt Min.	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
(1)		(2)	(3)		(4)	(5)	(6)	(7)	(8)			(10)		(12)			
DEVELOPED CONDITION ONSITE																	
A	95.0	0.864	16.92	0.0264	100	1.0	4.25	1651	8.4	5.8	8.8	3.60	1751	19.73	7.84	0.078	
B	93.5	0.844	87.12	0.1361	100	1.0	4.61	1355	7.8	5.6	8.6	3.14	1455	18.08	7.75	0.077	
C	95.0	0.864	11.68	0.0183	100	1.0	4.25	538	15.4	7.9	12.0	1.10	638	13.54	5.35	0.054	
D	95.0	0.864	11.27	0.0176	100	1.0	4.25	541	7.6	5.6	8.4	1.58	641	13.56	5.83	0.058	
E	95.0	0.864	13.96	0.0218	100	1.0	4.25	849	9.3	6.2	9.3	1.98	949	15.27	6.22	0.062	
ES-1	95.0	0.864	14.05	0.0220	100	1.0	4.25	941	9.8	6.3	9.6	2.09	1041	15.78	6.34	0.063	
G	95.0	0.864	7.08	0.0111	100	1.0	4.25	419	6.4	5.1	7.8	1.36	519	12.88	5.61	0.056	
H	95.0	0.864	7.65	0.0120	100	1.0	4.25	494	14.6	7.7	11.7	1.07	594	13.30	5.32	0.053	
I	92.0	0.824	10.56	0.0165	100	1.0	4.96	1044	4.6	4.3	6.6	3.31	1144	16.36	8.27	0.083	
J	95.0	0.864	5.80	0.0091	100	1.0	4.25	403	15.4	7.9	12.0	0.85	503	12.79	5.10	0.051	
K	95.0	0.864	5.17	0.0081	100	1.0	4.25	326	13.2	7.3	11.1	0.74	426	12.37	4.99	0.050	
L	94.6	0.859	8.09	0.0126	100	1.0	4.34	341	18.2	8.6	13.0	0.66	441	12.45	5.00	0.050	
M	94.3	0.854	11.24	0.0176	100	1.0	4.42	406	15.5	8.0	12.1	0.85	506	12.81	5.27	0.053	
N	95.0	0.864	6.67	0.0104	100	1.0	4.25	468	11.5	6.9	10.4	1.14	568	13.16	5.38	0.054	
O	92.2	0.826	3.25	0.0051	100	1.0	4.93	267	12.7	7.2	10.9	0.62	367	12.04	5.54	0.055	
P	92.2	0.826	3.37	0.0053	100	1.0	4.93	392	9.7	6.3	9.5	1.04	492	12.73	5.96	0.060	
Q	92.2	0.826	3.62	0.0057	100	1.0	4.93	311	12.2	7.1	10.7	0.73	411	12.28	5.66	0.057	
R	94.3	0.855	3.49	0.0055	100	1.0	4.40	361	10.2	6.5	9.8	0.93	461	12.56	5.33	0.053	
S	88.3	0.776	3.01	0.0047	100	1.0	5.83	256	16.4	8.2	12.4	0.52	356	11.98	6.35	0.064	
T	92.0	0.824	4.02	0.0063	100	1.0	4.96	284	16.9	8.3	12.6	0.57	384	12.13	5.53	0.055	
U	86.3	0.749	3.49	0.0055	100	1.0	6.32	276	13.4	7.4	11.2	0.62	376	12.09	6.94	0.069	
V	90.0	0.798	3.85	0.0060	100	1.0	5.44	253	15.4	7.9	12.0	0.53	353	11.96	5.97	0.060	
W	90.0	0.798	3.97	0.0062	100	1.0	5.44	413	9.4	6.2	9.4	1.11	513	12.85	6.54	0.065	
X	90.0	0.798	16.47	0.0257	100	1.0	5.44	1072	7.8	5.7	8.6	2.59	1172	16.51	8.02	0.080	
Y	92.4	0.830	8.07	0.0126	100	1.0	4.86	774	6.1	5.0	7.5	2.28	874	14.86	7.14	0.071	
Z	87.6	0.767	7.04	0.0110	100	1.0	6.00	800	5.0	4.5	6.8	2.58	900	15.00	8.58	0.086	
AA	93.0	0.838	4.64	0.0073	100	1.0	4.72	674	8.5	5.9	8.9	1.74	774	14.30	6.47	0.065	
BB	91.0	0.811	6.18	0.0097	100	1.0	5.20	703	5.7	4.8	7.3	2.19	803	14.46	7.39	0.074	
CC	90.7	0.807	5.53	0.0086	100	1.0	5.28	652	3.5	3.8	5.7	2.64	752	14.18	7.91	0.079	
DD	90.6	0.806	4.57	0.0071	100	1.0	5.29	652	3.5	3.8	5.7	2.64	752	14.18	7.92	0.079	
EE	90.5	0.804	6.65	0.0104	100	1.0	5.33	621	4.8	4.4	6.7	2.18	721	14.01	7.50	0.075	
FF	94.2	0.853	3.08	0.0048	100	1.0	4.44	555	9.4	6.2	9.4	1.45	655	13.64	5.88	0.059	
GG	94.2	0.853	3.74	0.0058	100	1.0	4.44	269	19.7	9.0	13.6	0.50	369	12.05	4.94	0.049	Use Min TLAG = 0.050 per HCDDM
HH	94.2	0.853	4.60	0.0072	100	1.0	4.44	392	8.7	5.9	9.0	1.10	492	12.73	5.54	0.055	
II	92.7	0.833	19.56	0.0306	100	1.0	4.80	505	8.7	6.0	9.0	1.41	605	13.36	6.20	0.062	
COS-1	79.8	0.663	2.86	0.0045	100	1.0	7.87	962	7.2	5.4	8.2	2.48	1062	15.90	10.35	0.103	
COS-2	89.0	0.785	10.17	0.0159	100	1.0	5.67	1373	7.3	5.5	8.3	3.29	1473	18.18	8.96	0.090	Use Min TLAG = 0.100 per HCDDM
COS-3	84.7	0.728	1.75	0.0027	100	1.0	6.70	1676	2.1	2.9	4.4	7.29	1776	19.87	13.98	0.140	
NP-1	89.0	0.785	0.49	0.0008	100	1.0	5.67	1333	4.6	4.3	6.5	4.05	1433	17.96	9.72	0.097	
NP-2	89.0	0.785	1.53	0.0024	100	1.0	5.67	98	16.3	8.2	12.4	0.20	198	11.10	5.87	0.059	
NP-3	80.3	0.670	3.61	0.0056	100	1.0	7.74	95	42.1	13.1	19.9	0.12	195	11.08	7.86	0.079	
NP-4	84.1	0.720	0.71	0.0011	100	1.0	6.84	237	14.8	7.8	11.8	0.51	337	11.87	7.35	0.073	

STANDARD FORM 4

DEVELOPMENT: Summerlin West Village 22

W.O. # 7861

CALCULATED BY: AH

V1 applies to the first 500 feet of travel distance V2 applies to the remaining travel distance			
Existing:		Developed	
V1=148*S ^{1/2}	V2=294*S ^{1/2}	V1=202*S ^{1/2}	V2=306*S ^{1/2}

$$T_i = \frac{1.8(1.1 - k)L^{1/2}}{S^{1/3}}$$

$$T_t = \frac{L}{60V}$$

$$k = 0.0132C_n - 0.39$$

$$T_c = T_i + T_t$$

SUB-BASIN DATA					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG. (1)	Cn	K (2)	AREA Ac. (3)	AREA Mi ²	LENGTH Ft (4)	SLOPE % (5)	Ti Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	V1 fps (9a)	V2 fps (9b)	Tt Min. (10)	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
DC-1	98.0	0.904	10.84	0.0169	100	1.0	3.54	123	12.2	7.1	10.7	0.29	223	11.24	3.83	0.038	Use Min TLAG = 0.050 per HCDDM
LM	98.0	0.904	9.16	0.0143	100	1.0	3.54	237	14.8	7.8	11.8	0.51	337	11.87	4.04	0.040	Use Min TLAG = 0.050 per HCDDM
DES1	98.0	0.904	3.76	0.0059	38	2.0	1.73	3472	6.0	5.0	7.5	8.26	3510	29.50	9.99	0.100	
DES2	98.0	0.904	3.40	0.0053	38	2.0	1.73	1148	3.6	3.8	5.8	4.05	1186	16.59	5.78	0.058	
DES3	98.0	0.904	1.84	0.0029	30	2.0	1.54	1035	1.7	2.7	4.0	5.34	1065	15.92	6.87	0.069	
DES4	98.0	0.904	1.72	0.0027	30	2.0	1.54	552	5.8	4.9	7.4	1.83	582	13.23	3.37	0.034	Use Min TLAG = 0.050 per HCDDM
DES5	98.0	0.904	1.80	0.0028	30	2.0	1.54	652	2.9	3.4	5.2	2.90	682	13.79	4.44	0.044	Use Min TLAG = 0.050 per HCDDM
DES6	98.0	0.904	1.11	0.0017	30	2.0	1.54	696	1.9	2.8	4.2	3.80	726	14.03	5.34	0.053	
CARR1	98.0	0.904	6.68	0.0104	42	2.0	1.82	696	1.9	2.8	4.2	3.80	738	14.10	5.62	0.056	
CARR2	98.0	0.904	3.58	0.0056	42	2.0	1.82	1512	2.9	3.4	5.2	5.65	1554	18.63	7.47	0.075	
CARR3	98.0	0.904	2.95	0.0046	42	2.0	1.82	795	6.3	5.1	7.7	2.29	837	14.65	4.10	0.041	Use Min TLAG = 0.050 per HCDDM
CARR4	98.0	0.904	3.10	0.0048	42	2.0	1.82	1079	3.6	3.8	5.8	3.83	1121	16.23	5.65	0.056	
ST1	98.0	0.904	2.46	0.0038	19	2.0	1.22	842	2.5	3.2	4.8	3.79	861	14.78	5.01	0.050	
STJ1	98.0	0.904	3.76	0.0059	19	2.0	1.22	1262	7.7	5.6	8.5	2.99	1281	17.12	4.21	0.042	Use Min TLAG = 0.050 per HCDDM
STJ2	98.0	0.904	3.10	0.0048	30	2.0	1.54	1498	2.8	3.4	5.1	5.71	1528	18.49	7.25	0.072	
STJ3	98.0	0.904	2.44	0.0038	30	2.0	1.54	1025	2.6	3.3	5.0	4.30	1055	15.86	5.84	0.058	
STJ4	98.0	0.904	1.05	0.0016	30	2.0	1.54	926	2.2	3.0	4.5	4.39	956	15.31	5.92	0.059	
STH	98.0	0.904	2.29	0.0036	21	2.0	1.29	926	2.2	3.0	4.5	4.39	947	15.26	5.67	0.057	
STG1	98.0	0.904	1.77	0.0028	19	2.0	1.22	1102	7.1	5.4	8.1	2.78	1121	16.23	4.01	0.040	Use Min TLAG = 0.050 per HCDDM
STG2	98.0	0.904	2.83	0.0044	30	2.0	1.54	890	10.3	6.5	9.8	1.94	920	15.11	3.48	0.035	Use Min TLAG = 0.050 per HCDDM
STF	98.0	0.904	1.83	0.0029	21	2.0	1.29	1025	7.4	5.5	8.3	2.57	1046	15.81	3.85	0.039	Use Min TLAG = 0.050 per HCDDM
STE1	98.0	0.904	1.72	0.0027	21	2.0	1.29	887	7.4	5.5	8.3	2.29	908	15.04	3.57	0.036	Use Min TLAG = 0.050 per HCDDM
STE2	98.0	0.904	1.78	0.0028	21	2.0	1.29	831	7.7	5.6	8.5	2.14	852	14.73	3.42	0.034	Use Min TLAG = 0.050 per HCDDM
STE3	98.0	0.904	1.11	0.0017	21	2.0	1.29	867	8.2	5.8	8.8	2.14	888	14.93	3.43	0.034	Use Min TLAG = 0.050 per HCDDM
STEE1	98.0	0.904	1.49	0.0023	21	2.0	1.29	505	8.5	5.9	8.9	1.42	526	12.92	2.71	0.027	Use Min TLAG = 0.050 per HCDDM
STEE2	98.0	0.904	2.41	0.0038	21	2.0	1.29	532	7.9	5.7	8.6	1.53	553	13.07	2.82	0.028	Use Min TLAG = 0.050 per HCDDM
STEE3	98.0	0.904	1.49	0.0023	21	2.0	1.29	791	9.7	6.3	9.5	1.83	812	14.51	3.12	0.031	Use Min TLAG = 0.050 per HCDDM
STFF	98.0	0.904	1.08	0.0017	19	2.0	1.22	575	7.7	5.6	8.5	1.64	594	13.30	2.86	0.029	Use Min TLAG = 0.050 per HCDDM
STL1	98.0	0.904	1.78	0.0028	19	2.0	1.22	509	5.3	4.7	7.0	1.81	528	12.93	3.04	0.030	Use Min TLAG = 0.050 per HCDDM
STL2	98.0	0.904	1.79	0.0028	21	2.0	1.29	895	3.7	3.9	5.9	3.27	916	15.09	4.55	0.046	Use Min TLAG = 0.050 per HCDDM
																Tc Min (Urban)= 5 min	
																Tc Min (Non Urb)= 10 min	


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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 19MAR19 TIME 11:17:59
*
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V22.OUT

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*****
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

*DIAGRAM

*** FREE ***

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1 ID ULTIMATE CONDITION HYDROLOGIC MODEL
2 ID INPUT FILE DATE = NOVEMBER 1, 2018
3 ID DESIGN STORM = 100-YEAR 6-HR STORM
4 ID STORM DISTRIBUTION = SDN #3
5 ID MODELED BY VTN (JYA)
6 ID
7 ID
8 ID *****
9 ID * UPDATE #1 - SUMMERLIN WEST VILLAGE 22 *
10 ID *****
11 ID
12 ID
13 ID
14 ID JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
15 ID
16 ID 100-YEAR, 6-HOUR STORM, SDN3
17 ID
18 IT 5 0 0 100
19 IO 5 0 0
20 IN 5 0 0
21 JR PREC 1.00
*

22 KK LM
23 BA 0.0143
24 PB 3.41
25 PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
26 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
27 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
28 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
29 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
30 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
31 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
32 PC 0.998 0.999 1
33 LS 0 98.0
34 UD 0.050
*

35 KK D
36 BA 0.0176
37 PB 3.39
38 LS 0 95.0
39 UD 0.058
*

40 KK DES1
41 BA .0059
42 PB 3.39
43 LS 0 98.0

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44 UD 0.100
*
HEC-1 INPUT PAGE 2

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

45 KK CDES1
46 KM COMBINE D AND DES1
47 HC 2
*
48 KK COS-2
49 BA 0.0159
50 PB 3.41
51 LS 0 89.0
52 UD 0.100
*
53 KK CCOS-2
54 KM COMBINE CDES1 AND COS-2
55 HC 2
*
56 KK A
57 BA 0.0264
58 PB 3.41
59 LS 0 95.0
60 UD 0.078
*
61 KK CA
62 KM COMBINE CCOS-2 AND A
63 HC 2
*
64 KK CP1
65 KM COMBINE LM AND CA
66 HC 2
*
67 KK STI
68 KM STREET I
69 BA 0.0038
70 PB 3.41
71 LS 0 98.0
72 UD 0.050
*
73 KK C
74 BA 0.0183
75 PB 3.41
76 LS 0 95.0
77 UD 0.054
*

1

HEC-1 INPUT PAGE 3

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

78 KK CSTI
79 KM COMBINE C AND STI
80 HC 2
*
81 KK G
82 BA 0.0111
83 PB 3.41
84 LS 0 95.0
85 UD 0.056
*
86 KK CG
87 KM COMBINE CSTI AND CG
88 HC 2
*
89 KK H
90 BA 0.0120
91 PB 3.41
92 LS 0 95.0
93 UD 0.053
*
94 KK CH
95 KM COMBINE CG AND CH
96 HC 2
*

V22.OUT

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97      KK      STH
98      KM      STREET H
99      BA      0.0036
100     PB      3.41
101     LS      0      98.0
102     UD      0.057
      *

103     KK      J
104     BA      0.0091
105     PB      3.41
106     LS      0      95.0
107     UD      0.051
      *

108     KK      CJ
109     KM      COMBINE J AND STH
110     HC      2
      *

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1 HEC-1 INPUT PAGE 4

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

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111     KK      K
112     BA      0.0081
113     PB      3.40
114     LS      0      95.0
115     UD      0.050
      *

116     KK      CK
117     KM      COMBINE CJ AND K
118     HC      2
      *

119     KK      NP-1
120     BA      0.0008
121     PB      3.38
122     LS      0      89.0
123     UD      0.097
      *

124     KK      CNP-1
125     KM      COMBINE CK AND NP-1
126     HC      2
      *

127     KK      DES2
128     BA      .0053
129     PB      3.38
130     LS      0      98.0
131     UD      0.058
      *

132     KK      CDES2
133     KM      COMBINE DES2 & CNP-1
134     HC      2
      *

135     KK      CP2
136     KM      COMBINE CDES2 & CH
137     HC      2
      *

138     KK      CARR1
139     BA      0.0104
140     PB      3.38
141     LS      0      98.0
142     UD      0.056
      *

143     KK      I
144     BA      0.0165
145     PB      3.38
146     LS      0      92.0
147     UD      0.083
      *

```

1 HEC-1 INPUT PAGE 5

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

```

148     KK      CCARR1
149     KM      COMBINE CP2, I, CARR1
150     HC      3
      *

151     KK      N

```

V22.OUT

152	BA	0.0104	
153	PB	3.40	
154	LS	0	95.0
155	UD	0.054	
	*		
156	KK	STFF	
157	BA	0.0017	
158	PB	3.40	
159	LS	0	98.0
160	UD	0.050	
	*		
161	KK	CSTFF	
162	KM	COMBINE N AND STFF	
163	HC	2	
	*		
164	KK	STG2	
165	BA	0.0044	
166	PB	3.40	
167	LS	0	98.0
168	UD	0.050	
	*		
169	KK	CSTG2	
170	KM	COMBINE CSTFF AND STG2	
171	HC	2	
	*		
172	KK	0	
173	BA	0.0051	
174	PB	3.40	
175	LS	0	92.2
176	UD	0.055	
	*		
177	KK	P	
178	BA	0.0053	
179	PB	3.40	
180	LS	0	92.2
181	UD	0.060	
	*		

1

HEC-1 INPUT

PAGE 6

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

182	KK	COP	
183	KM	COMBINE P AND O	
184	HC	2	
	*		
185	KK	DES3	
186	BA	0.0029	
187	PB	3.38	
188	LS	0	98.0
189	UD	0.069	
	*		
190	KK	CDES3	
191	KM	COMBINE COP & DES3	
192	HC	2	
	*		
193	KK	CP3	
194	KM	COMBINES CSTG2 & CDES3	
195	HC	2	
	*		
196	KK	Q	
197	BA	0.0057	
198	PB	3.38	
199	LS	0	92.2
200	UD	0.057	
	*		
201	KK	R	
202	BA	0.0055	
203	PB	3.37	
204	LS	0	94.3
205	UD	0.053	
	*		
206	KK	CQR	
207	KM	COMBINE R AND Q	
208	HC	2	
	*		

V22.OUT

209	KK	CARR2		
210	BA	0.0056		
211	PB	3.38		
212	LS	0	98.0	
213	UD	0.075		
	*			
214	KK	CCARR2		
215	KM	COMBINE CQR AND CARR2		
216	HC	2		
	*			

1 HEC-1 INPUT PAGE 7

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

217	KK	CP4		
218	KM	COMBINE CP3, CCARR1, AND CCARR2		
219	HC	3		
	*			
220	KK	II		
221	BA	0.0306		
222	PB	3.37		
223	LS	0	92.7	
224	UD	0.062		
	*			
225	KK	X		
226	BA	0.0257		
227	PB	3.37		
228	LS	0	90.0	
229	UD	0.080		
	*			
230	KK	B		
231	BA	0.1361		
232	PB	3.36		
233	LS	0	93.5	
234	UD	0.077		
	*			
235	KK	DC-1		
236	BA	0.0169		
237	PB	3.35		
238	LS	0	98.0	
239	UD	0.050		
	*			
240	KK	COS-3		
241	BA	0.0027		
242	PB	3.36		
243	LS	0	84.7	
244	UD	0.140		
	*			
245	KK	DUMMY1		
246	KM	REGIONAL FACILITY - BELTWAY CHANNEL NORTH		
247	KM	COMBINE CP1, CP4, II, X, B, DC1, AND COS-3		
248	HC	7		
	*			
249	KK	3-0*		
250	KM	REFERENCED FROM THE OVERALL SWPA MPU		
251	BA	0.0805		
252	PB	3.48		
253	LS	0	94.5	
254	UD	0.103		
	*			

1 HEC-1 INPUT PAGE 8

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

255	KKOFF-COS2			
256	KM	OFFSITE BASIN		
257	BA	.0299		
258	PB	3.45		
259	LS	0	86.0	
260	UD	0.110		
	*			
261	KKCOFFCOS2			
262	KM	COMBINE 3-0 AND OFF-COS2		
263	HC	2		
	*			
264	KK	E		
265	BA	0.0218		

V22.OUT

266	PB	3.43	
267	LS	0	95.0
268	UD	0.062	
	*		
269	KK	STJ1	
270	KM	STREET J1	
271	BA	0.0059	
272	PB	3.43	
273	LS	0	98.0
274	UD	0.050	
	*		
275	KK	CSTJ1	
276	KM	COMBINE OFF-COS2, E, AND STJ1	
277	HC	3	
	*		
278	KK	NP-2	
279	BA	0.0024	
280	PB	3.43	
281	LS	0	89.0
282	UD	0.059	
	*		
283	KK	ES-1	
284	BA	0.0220	
285	PB	3.43	
286	LS	0	95.0
287	UD	0.063	
	*		
288	KK	CES-1	
289	KM	COMBINE CSTJ, NP-2, AND ES-1	
290	HC	3	
	*		

1

HEC-1 INPUT

PAGE 9

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
------	---

291	KK	OFF4	
292	BA	0.0823	
293	PB	3.44	
294	LS	0	94.8
295	UD	0.077	
	*		
296	KK	L	
297	BA	0.0126	
298	PB	3.42	
299	LS	0	94.6
300	UD	0.050	
	*		
301	KK	STL1	
302	BA	0.0028	
303	PB	3.42	
304	LS	0	98.0
305	UD	0.050	
	*		
306	KK	CSTL1	
307	KM	COMBINE L AND STL1	
308	HC	2	
	*		
309	KK	STG1	
310	BA	0.0028	
311	PB	3.42	
312	LS	0	98.0
313	UD	0.050	
	*		
314	KK	CSTG1	
315	KM	COMBINE OFF4, CSTL, AND STG1	
316	HC	3	
	*		
317	KK	M	
318	BA	0.0176	
319	PB	3.42	
320	LS	0	94.3
321	UD	0.053	
	*		
322	KK	STJ2	
323	BA	0.0048	
324	PB	3.42	

325 LS 0 98.0
 326 UD 0.072
 *

1

HEC-1 INPUT

PAGE 10

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

327 KK DUMMY2
 328 KM REGIONAL FACILITY
 329 HC 4
 *

330 KK S
 331 BA 0.0047
 332 PB 3.40
 333 LS 0 88.3
 334 UD 0.064
 *

335 KK STF
 336 BA 0.0029
 337 PB 3.40
 338 LS 0 98.0
 339 UD 0.050
 *

340 KK NP-3
 341 BA 0.0056
 342 PB 3.4
 343 LS 0 80.3
 344 UD 0.079
 *

345 KK U
 346 BA 0.0055
 347 PB 3.40
 348 LS 0 86.3
 349 UD 0.069
 *

350 KK DES4
 351 BA 0.0027
 352 PB 3.40
 353 LS 0 98.0
 354 UD 0.050
 *

355 KK CDES4
 356 KM COMBINE U AND DES4
 357 HC 2
 *

358 KK DUMMY3
 359 KM COMBINE S, STF, NP-3, CDES4
 360 HC 5
 *

1

HEC-1 INPUT

PAGE 11

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

361 KK V
 362 BA 0.0060
 363 PB 3.37
 364 LS 0 90.0
 365 UD 0.060
 *

366 KK W
 367 BA 0.0062
 368 PB 3.40
 369 LS 0 90.0
 370 UD 0.065
 *

371 KK CVW
 372 KM COMBINE W AND V
 373 HC 2
 *

374 KK CARR3
 375 BA 0.0046
 376 PB 3.37
 377 LS 0 98.0
 378 UD 0.050
 *

379 KK DUMMY4

V22.OUT

380	KM	REGIONAL FACILITY	
381	HC	3	
	*		
382	KK	STE3	
383	BA	0.0017	
384	PB	3.40	
385	LS	0	98.0
386	UD	0.050	
	*		
387	KK	EE	
388	BA	0.0104	
389	PB	3.39	
390	LS	0	90.5
391	UD	0.075	
	*		
392	KK	DUMMY5	
393	KM	REGIONAL FACILITY	
394	HC	3	
	*		

1 HEC-1 INPUT PAGE 12

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

395	KK	STEE3	
396	BA	0.0023	
397	PB	3.39	
398	LS	0	98.0
399	UD	0.050	
	*		
400	KK	HH	
401	BA	0.0072	
402	PB	3.39	
403	LS	0	94.2
404	UD	0.055	
	*		
405	KK	CARR4	
406	BA	0.0048	
407	PB	3.37	
408	LS	0	98.0
409	UD	0.056	
	*		
410	KK	DUMMY6	
411	KM	REGIONAL FACILITY - BELTWAY CHANNEL SOUTH	
412	HC	4	
	*		
413	KK	OFF5	
414	BA	0.0199	
415	PB	3.44	
416	LS	0	92.2
417	UD	0.050	
	*		
418	KK	STE1	
419	BA	0.0027	
420	PB	3.42	
421	LS	0	98.0
422	UD	0.050	
	*		
423	KK	Y	
424	BA	0.0126	
425	PB	3.44	
426	LS	0	92.4
427	UD	0.071	
	*		
428	KK	CY	
429	KM	COMBINES OFF5, Y, AND STE1	
430	HC	3	
	*		

1 HEC-1 INPUT PAGE 13

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

431	KK	STL2	
432	BA	0.0028	
433	PB	3.44	
434	LS	0	98.0
435	UD	0.050	
	*		

436 KK CSTL2
 437 KM COMBINES CY AND STL2
 438 HC 2
 *

 439 KK Z
 440 BA 0.0110
 441 PB 3.42
 442 LS 0 87.6
 443 UD 0.086
 *

 444 KK STJ3
 445 BA 0.0038
 446 PB 3.42
 447 LS 0 98.0
 448 UD 0.058
 *

 449 KK CSTJ3
 450 KM COMBINE Z AND STJ3
 451 HC 2
 *

 452 KK DUMMY7
 453 KM REGIONAL FACILITY
 454 HC 2
 *

 455 KK STE2
 456 BA 0.0028
 457 PB 3.40
 458 LS 0 98.0
 459 UD 0.050
 *

 460 KK BB
 461 BA 0.0097
 462 PB 3.42
 463 LS 0 91.0
 464 UD 0.074
 *

1

HEC-1 INPUT

PAGE 14

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

465 KK T
 466 BA 0.0063
 467 PB 3.42
 468 LS 0 92.0
 469 UD 0.055
 *

 470 KK CC
 471 BA 0.0086
 472 PB 3.42
 473 LS 0 90.7
 474 UD 0.079
 *

 475 KK DD
 476 BA 0.0071
 477 PB 3.40
 478 LS 0 90.6
 479 UD 0.079
 *

 480 KK DUMMY8
 481 KM REGIONAL FACILITY
 482 HC 6
 *

 483 KK DESS
 484 BA 0.0028
 485 PB 3.40
 486 LS 0 98.0
 487 UD 0.050
 *

 488 KK NP-4
 489 BA 0.0011
 490 PB 3.39
 491 LS 0 84.1
 492 UD 0.071
 *

 493 KK DUMMY9

494 KM REGIONAL FACILITY V22.OUT
 495 HC 3
 *
 496 KK AA
 497 BA 0.0073
 498 PB 3.43
 499 LS 0 93.0
 500 UD 0.065
 *

1 HEC-1 INPUT PAGE 15

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

501 KK STJ4
 502 BA 0.0016
 503 PB 3.41
 504 LS 0 98.0
 505 UD 0.059
 *
 506 KK CSTJ4
 507 KM COMBINE AA AND STJ4
 508 HC 2
 *

509 KK STEE1
 510 BA 0.0023
 511 PB 3.44
 512 LS 0 98.0
 513 UD 0.050
 *

514 KK CSTEE2
 515 KM COMBINES CSTJ4 AND STEE1
 516 HC 2
 *

517 KK STEE2
 518 BA 0.0038
 519 PB 3.41
 520 LS 0 98.0
 521 UD 0.050
 *

522 KK FF
 523 BA 0.0048
 524 PB 3.41
 525 LS 0 94.2
 526 UD 0.059
 *

527 KK CFF
 528 KM COMBINES CSTEE2,STEE2, AND FF
 529 HC 3
 *

530 KK DUMMY10
 531 KM REGIONAL FACILITY
 532 HC 2
 *

533 KK GG
 534 BA 0.0058
 535 PB 3.41
 536 LS 0 94.2
 537 UD 0.050
 *

1 HEC-1 INPUT PAGE 16

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

538 KK DES6
 539 BA 0.0017
 540 PB 3.39
 541 LS 0 98.0
 542 UD 0.053
 *

543 KK DUMMY11
 544 KM REGIONAL FACILITY - DESERT FOOTHILLS
 545 HC 3
 *
 546 ZZ

1 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT

LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
22	LM	
	.	
35	.	D
	.	
40	.	DES1
	.	
45	CDES1.....	
	.	
48	.	COS-2
	.	
53	CCOS-2.....	
	.	
56	.	A
	.	
61	CA.....	
	.	
64	CP1.....	
	.	
67	STI	
	.	
73	.	C
	.	
78	CSTI.....	
	.	
81	.	G
	.	
86	CG.....	
	.	
89	.	H
	.	
94	CH.....	
	.	
97	.	STH
	.	
103	.	J
	.	
108	CJ.....	
	.	
111	.	K
	.	
116	CK.....	
	.	
119	.	NP-1
	.	
124	CNP-1.....	
	.	
127	.	DES2
	.	
132	CDES2.....	
	.	
135	CP2.....	
	.	
138	.	CARR1
	.	
143	.	I
	.	
148	CCARR1.....	

151	.	.	N				
156	.	.		STFF			
161	.	.	CSTFF.....				
164	.	.		STG2			
169	.	.	CSTG2.....				
172	.	.		O			
177	.	.			P		
182	.	.		COP.....			
185	.	.			DES3		
190	.	.		CDES3.....			
193	.	.	CP3.....				
196	.	.		Q			
201	.	.			R		
206	.	.		CQR.....			
209	.	.			CARR2		
214	.	.		CCARR2.....			
217	.	.	CP4.....				
220	.	.	II				
225	.	.		X			
230	.	.			B		
235	.	.				DC-1	
240	.	.					COS-3
245	DUMMY1.....						
249		3-O*					
255			OFF-COS2				
261		COFFCOS2.....					
264			E				
269				STJ1			
275		CSTJ1.....					

278	.	.	NP-2						
	.	.	.						
283	.	.	.	ES-1					
	.	.	.						
288	.	CES-1	.....						
	.	.							
291	.	.	OFF4						
	.	.	.						
296	.	.	.	L					
	.	.	.	.					
301	.	.	.	.	STL1				
	.	.	.	.	.				
306	.	.	.	CSTL1	.....				
	.	.	.	.					
309	.	.	.	.	STG1				
	.	.	.	.	.				
314	.	.	CSTG1	.....					
	.	.	.						
317	.	.	.	M					
	.	.	.	.					
322	.	.	.	.	STJ2				
	.	.	.	.	.				
327	.	DUMMY2	.....						
	.	.							
330	.	.	S						
	.	.	.						
335	.	.	.	STF					
	.	.	.	.					
340	.	.	.	.	NP-3				
	.	.	.	.	.				
345	.	.	.	.	.	U			
	.	.	.	.	.	.			
350	.	.	.	.	.	.	DES4		
	.	.	.	.	.	.	.		
355	.	.	.	.	.	.	.	CDES4	.....
	.	.	.	.	.	.	.	.	
358	.	DUMMY3	.....						
	.	.							
361	.	.	V						
	.	.	.						
366	.	.	.	W					
	.	.	.	.					
371	.	.	CVW	.....					
	.	.	.						
374	.	.	.	CARR3					
	.	.	.	.					
379	.	DUMMY4	.....						
	.	.							
382	.	.	STE3						
	.	.	.						
387	.	.	.	EE					
	.	.	.	.					
392	.	DUMMYS	.....						
	.	.							
395	.	.	STEE3						
	.	.	.						
400	.	.	.	HH					
	.	.	.	.					
405	.	.	.	.	CARR4				
	.	.	.	.	.				

410	.	DUMMY6.....	.	.	.	.	.
413	.	.	OFF5	.	.	.	.
418	.	.	.	STE1	.	.	.
423	.	.	.	.	.	Y	.
428	.	.	CY.....	.	.	.	.
431	.	.	.	STL2	.	.	.
436	.	.	CSTL2.....	.	.	.	.
439	.	.	.	Z	.	.	.
444	.	.	.	.	STJ3	.	.
449	.	.	CSTJ3.....	.	.	.	.
452	.	.	DUMMY7.....	.	.	.	.
455	.	.	.	STE2	.	.	.
460	.	.	.	.	BB	.	.
465	.	.	.	.	.	T	.
470	.	.	.	.	.	.	CC
475	.	.	.	.	.	.	.
480	.	.	DUMMY8.....	.	.	.	DD
483	.	.	.	DESS	.	.	.
488	.	.	.	.	NP-4	.	.
493	.	.	DUMMY9.....	.	.	.	.
496	.	.	.	AA	.	.	.
501	.	.	.	.	STJ4	.	.
506	.	.	CSTJ4.....	.	.	.	.
509	.	.	.	.	STEE1	.	.
514	.	.	CSTEE2.....	.	.	.	.
517	.	.	.	.	STEE2	.	.
522	.	.	.	.	.	FF	.
527	.	.	CFF.....	.	.	.	.
530	.	.	DUMMY10.....	.	.	.	.
533	.	.	.	GG	.	.	.

V22.OUT

```

      .      .      .      .
538    .      .      .      .      DES6
      .      .      .      .
543    .      .      DUMMY11.....

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*   JUN 1998                     *
*   VERSION 4.1                   *
* RUN DATE 19MAR19 TIME 11:17:59 *
*
*****
```

```
*****
*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
*   609 SECOND STREET          *
*   DAVIS, CALIFORNIA 95616     *
*   (916) 756-1104              *
*
*****
```

ULTIMATE CONDITION HYDROLOGIC MODEL
INPUT FILE DATE = NOVEMBER 1, 2018
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY VTN (JYA)

```
*****
* UPDATE #1 - SUMMERLIN WEST VILLAGE 22 *
*****
```

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

100-YEAR, 6-HOUR STORM, SDN3

19 IO OUTPUT CONTROL VARIABLES

```
IPRNT      5 PRINT CONTROL
IPLOT      0 PLOT CONTROL
QSCAL      0. HYDROGRAPH PLOT SCALE
```

IT HYDROGRAPH TIME DATA

```
NMIN      5 MINUTES IN COMPUTATION INTERVAL
IDATE      1 0 STARTING DATE
ITIME      0000 STARTING TIME
NQ         100 NUMBER OF HYDROGRAPH ORDINATES
NDDATE      1 0 ENDING DATE
NDTIME      0815 ENDING TIME
ICENT      19 CENTURY MARK
```

```
COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE      8.25 HOURS
```

ENGLISH UNITS

```
DRAINAGE AREA      SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION  FEET
FLOW               CUBIC FEET PER SECOND
STORAGE VOLUME     ACRE-FEET
SURFACE AREA       ACRES
TEMPERATURE        DEGREES FAHRENHEIT
```

JP MULTI-PLAN OPTION

```
NPLAN      1 NUMBER OF PLANS
```

JR MULTI-RATIO OPTION

```
RATIOS OF PRECIPITATION
1.00
```

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1	
				1.00	
HYDROGRAPH AT					
+	LM	.01	1 FLOW	41.	3.50
			TIME		
HYDROGRAPH AT					
+	D	.02	1 FLOW	47.	

				TIME	3.50
HYDROGRAPH AT					
+	DES1	.01	1	FLOW	14.
				TIME	3.50
2 COMBINED AT					
+	CDES1	.02	1	FLOW	62.
				TIME	3.50
HYDROGRAPH AT					
+	COS-2	.02	1	FLOW	32.
				TIME	3.50
2 COMBINED AT					
+	CCOS-2	.04	1	FLOW	93.
				TIME	3.50
HYDROGRAPH AT					
+	A	.03	1	FLOW	66.
				TIME	3.50
2 COMBINED AT					
+	CA	.07	1	FLOW	160.
				TIME	3.50
2 COMBINED AT					
+	CP1	.08	1	FLOW	201.
				TIME	3.50
HYDROGRAPH AT					
+	STI	.00	1	FLOW	11.
				TIME	3.50
HYDROGRAPH AT					
+	C	.02	1	FLOW	50.
				TIME	3.50
2 COMBINED AT					
+	CSTI	.02	1	FLOW	61.
				TIME	3.50
HYDROGRAPH AT					
+	G	.01	1	FLOW	30.
				TIME	3.50
2 COMBINED AT					
+	CG	.03	1	FLOW	91.
				TIME	3.50
HYDROGRAPH AT					
+	H	.01	1	FLOW	33.
				TIME	3.50
2 COMBINED AT					
+	CH	.05	1	FLOW	124.
				TIME	3.50
HYDROGRAPH AT					
+	STH	.00	1	FLOW	10.
				TIME	3.50
HYDROGRAPH AT					
+	J	.01	1	FLOW	25.
				TIME	3.50
2 COMBINED AT					
+	CJ	.01	1	FLOW	35.
				TIME	3.50
HYDROGRAPH AT					
+	K	.01	1	FLOW	22.
				TIME	3.50
2 COMBINED AT					
+	CK	.02	1	FLOW	58.
				TIME	3.50
HYDROGRAPH AT					
+	NP-1	.00	1	FLOW	2.
				TIME	3.50
2 COMBINED AT					
+	CNP-1	.02	1	FLOW	59.
				TIME	3.50
HYDROGRAPH AT					
+	DES2	.01	1	FLOW	15.
				TIME	3.50

2 COMBINED AT +	CDES2	.03	1	FLOW TIME	74. 3.50
2 COMBINED AT +	CP2	.07	1	FLOW TIME	198. 3.50
HYDROGRAPH AT +	CARR1	.01	1	FLOW TIME	29. 3.50
HYDROGRAPH AT +	I	.02	1	FLOW TIME	38. 3.50
3 COMBINED AT +	CCARR1	.10	1	FLOW TIME	265. 3.50
HYDROGRAPH AT +	N	.01	1	FLOW TIME	28. 3.50
HYDROGRAPH AT +	STFF	.00	1	FLOW TIME	5. 3.50
2 COMBINED AT +	CSTFF	.01	1	FLOW TIME	33. 3.50
HYDROGRAPH AT +	STG2	.00	1	FLOW TIME	13. 3.50
2 COMBINED AT +	CSTG2	.02	1	FLOW TIME	46. 3.50
HYDROGRAPH AT +	O	.01	1	FLOW TIME	13. 3.50
HYDROGRAPH AT +	P	.01	1	FLOW TIME	13. 3.50
2 COMBINED AT +	COP	.01	1	FLOW TIME	26. 3.50
HYDROGRAPH AT +	DES3	.00	1	FLOW TIME	8. 3.50
2 COMBINED AT +	CDES3	.01	1	FLOW TIME	34. 3.50
2 COMBINED AT +	CP3	.03	1	FLOW TIME	80. 3.50
HYDROGRAPH AT +	Q	.01	1	FLOW TIME	14. 3.50
HYDROGRAPH AT +	R	.01	1	FLOW TIME	15. 3.50
2 COMBINED AT +	CQR	.01	1	FLOW TIME	29. 3.50
HYDROGRAPH AT +	CARR2	.01	1	FLOW TIME	15. 3.50
2 COMBINED AT +	CCARR2	.02	1	FLOW TIME	44. 3.50
3 COMBINED AT +	CP4	.15	1	FLOW TIME	389. 3.50

HYDROGRAPH AT +	II	.03	1	FLOW TIME	77. 3.50
HYDROGRAPH AT +	X	.03	1	FLOW TIME	56. 3.50
HYDROGRAPH AT +	B	.14	1	FLOW TIME	328. 3.50
HYDROGRAPH AT +	DC-1	.02	1	FLOW TIME	48. 3.50
HYDROGRAPH AT +	COS-3	.00	1	FLOW TIME	4. 3.58
7 COMBINED AT +	DUMMY1	.44	1	FLOW TIME	1103. 3.50
HYDROGRAPH AT +	3-0*	.08	1	FLOW TIME	189. 3.50
HYDROGRAPH AT +	OFF-COS2	.03	1	FLOW TIME	53. 3.50
2 COMBINED AT +	COFFCOS2	.11	1	FLOW TIME	242. 3.50
HYDROGRAPH AT +	E	.02	1	FLOW TIME	58. 3.50
HYDROGRAPH AT +	STJ1	.01	1	FLOW TIME	17. 3.50
3 COMBINED AT +	CSTJ1	.14	1	FLOW TIME	317. 3.50
HYDROGRAPH AT +	NP-2	.00	1	FLOW TIME	6. 3.50
HYDROGRAPH AT +	ES-1	.02	1	FLOW TIME	59. 3.50
3 COMBINED AT +	CES-1	.16	1	FLOW TIME	382. 3.50
HYDROGRAPH AT +	OFF4	.08	1	FLOW TIME	209. 3.50
HYDROGRAPH AT +	L	.01	1	FLOW TIME	35. 3.50
HYDROGRAPH AT +	STL1	.00	1	FLOW TIME	8. 3.50
2 COMBINED AT +	CSTL1	.02	1	FLOW TIME	43. 3.50
HYDROGRAPH AT +	STG1	.00	1	FLOW TIME	8. 3.50
3 COMBINED AT +	CSTG1	.10	1	FLOW TIME	260. 3.50
HYDROGRAPH AT +	M	.02	1	FLOW TIME	48. 3.50
HYDROGRAPH AT					

V22.OUT

+	STJ2	.00	1	FLOW TIME	13. 3.50
4 COMBINED AT +	DUMMY2	.29	1	FLOW TIME	702. 3.50
HYDROGRAPH AT +	S	.00	1	FLOW TIME	11. 3.50
HYDROGRAPH AT +	STF	.00	1	FLOW TIME	8. 3.50
HYDROGRAPH AT +	NP-3	.01	1	FLOW TIME	9. 3.50
HYDROGRAPH AT +	U	.01	1	FLOW TIME	11. 3.50
HYDROGRAPH AT +	DES4	.00	1	FLOW TIME	8. 3.50
2 COMBINED AT +	CDES4	.01	1	FLOW TIME	19. 3.50
5 COMBINED AT +	DUMMY3	.31	1	FLOW TIME	749. 3.50
HYDROGRAPH AT +	V	.01	1	FLOW TIME	14. 3.50
HYDROGRAPH AT +	W	.01	1	FLOW TIME	15. 3.50
2 COMBINED AT +	CVW	.01	1	FLOW TIME	29. 3.50
HYDROGRAPH AT +	CARR3	.00	1	FLOW TIME	13. 3.50
3 COMBINED AT +	DUMMY4	.32	1	FLOW TIME	791. 3.50
HYDROGRAPH AT +	STE3	.00	1	FLOW TIME	5. 3.50
HYDROGRAPH AT +	EE	.01	1	FLOW TIME	24. 3.50
3 COMBINED AT +	DUMMY5	.34	1	FLOW TIME	820. 3.50
HYDROGRAPH AT +	STEE3	.00	1	FLOW TIME	7. 3.50
HYDROGRAPH AT +	HH	.01	1	FLOW TIME	19. 3.50
HYDROGRAPH AT +	CARR4	.00	1	FLOW TIME	13. 3.50
4 COMBINED AT +	DUMMY6	.35	1	FLOW TIME	859. 3.50
HYDROGRAPH AT +	OFF5	.02	1	FLOW TIME	53. 3.50
HYDROGRAPH AT +	STE1	.00	1	FLOW	8.

				TIME	3.50
HYDROGRAPH AT					
+	Y	.01	1	FLOW TIME	31. 3.50
3 COMBINED AT					
+	CY	.04	1	FLOW TIME	92. 3.50
HYDROGRAPH AT					
+	STL2	.00	1	FLOW TIME	8. 3.50
2 COMBINED AT					
+	CSTL2	.04	1	FLOW TIME	100. 3.50
HYDROGRAPH AT					
+	Z	.01	1	FLOW TIME	22. 3.50
HYDROGRAPH AT					
+	STJ3	.00	1	FLOW TIME	11. 3.50
2 COMBINED AT					
+	CSTJ3	.01	1	FLOW TIME	33. 3.50
2 COMBINED AT					
+	DUMMY7	.05	1	FLOW TIME	133. 3.50
HYDROGRAPH AT					
+	STE2	.00	1	FLOW TIME	8. 3.50
HYDROGRAPH AT					
+	BB	.01	1	FLOW TIME	23. 3.50
HYDROGRAPH AT					
+	T	.01	1	FLOW TIME	16. 3.50
HYDROGRAPH AT					
+	CC	.01	1	FLOW TIME	20. 3.50
HYDROGRAPH AT					
+	DD	.01	1	FLOW TIME	16. 3.50
6 COMBINED AT					
+	DUMMY8	.09	1	FLOW TIME	215. 3.50
HYDROGRAPH AT					
+	DES5	.00	1	FLOW TIME	8. 3.50
HYDROGRAPH AT					
+	NP-4	.00	1	FLOW TIME	2. 3.50
3 COMBINED AT					
+	DUMMY9	.09	1	FLOW TIME	225. 3.50
HYDROGRAPH AT					
+	AA	.01	1	FLOW TIME	19. 3.50
HYDROGRAPH AT					
+	STJ4	.00	1	FLOW TIME	4. 3.50
2 COMBINED AT					
+	CSTJ4	.01	1	FLOW TIME	23. 3.50
HYDROGRAPH AT					
+	STEE1	.00	1	FLOW TIME	7. 3.50
2 COMBINED AT					
+	CSTEE2	.01	1	FLOW TIME	30. 3.50

V22.OUT

HYDROGRAPH AT					
+	STEE2	.00	1	FLOW	11.
				TIME	3.50
HYDROGRAPH AT					
+	FF	.00	1	FLOW	13.
				TIME	3.50
3 COMBINED AT					
+	CFF	.02	1	FLOW	53.
				TIME	3.50
2 COMBINED AT					
+	DUMMY10	.11	1	FLOW	279.
				TIME	3.50
HYDROGRAPH AT					
+	GG	.01	1	FLOW	16.
				TIME	3.50
HYDROGRAPH AT					
+	DES6	.00	1	FLOW	5.
				TIME	3.50
3 COMBINED AT					
+	DUMMY11	.12	1	FLOW	299.
				TIME	3.50

*** NORMAL END OF HEC-1 ***

APPENDIX C

HYDRAULIC CALCULATIONS

**LOCAL FACILITY
NORMAL DEPTH CALCULATIONS**

Worksheet for 4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	5.4	%
Diameter	30.0	in
Discharge	41.00	ft ³ /s

Results

Normal Depth	13.75	in
Flow Area	2.19	ft ²
Wetted Perimeter	3.72	ft
Hydraulic Radius	7.08	in
Top Width	2.49	ft
Critical Depth	2.15	ft
Percent Full	45.8	%
Critical Slope	0.00925	ft/ft
Velocity	18.69	ft/s
Velocity Head	5.43	ft
Specific Energy	6.57	ft
Froude Number	3.51	
Maximum Discharge	102.53	ft ³ /s
Discharge Full	95.31	ft ³ /s
Slope Full	0.00999	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	45.83	%
Downstream Velocity	Infinity	ft/s

Worksheet for 4

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	13.75	in
Critical Depth	2.15	ft
Channel Slope	5.4	%
Critical Slope	0.00925	ft/ft

Cross Section for 4

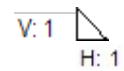
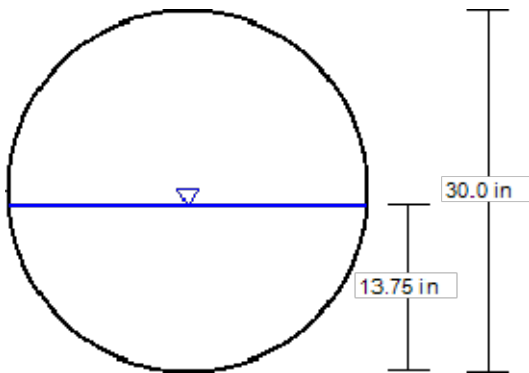
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	5.4 %
Normal Depth	13.75 in
Diameter	30.0 in
Discharge	41.00 ft ³ /s

Cross Section Image



Worksheet for 5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.0	%
Diameter	30.0	in
Discharge	47.00	ft ³ /s

Results

Normal Depth	20.49	in
Flow Area	3.57	ft ²
Wetted Perimeter	4.86	ft
Hydraulic Radius	8.81	in
Top Width	2.33	ft
Critical Depth	2.26	ft
Percent Full	68.3	%
Critical Slope	0.01153	ft/ft
Velocity	13.16	ft/s
Velocity Head	2.69	ft
Specific Energy	4.40	ft
Froude Number	1.87	
Maximum Discharge	62.40	ft ³ /s
Discharge Full	58.00	ft ³ /s
Slope Full	0.01313	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	68.30	%
Downstream Velocity	Infinity	ft/s

Worksheet for 5

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	20.49	in
Critical Depth	2.26	ft
Channel Slope	2.0	%
Critical Slope	0.01153	ft/ft

Cross Section for 5

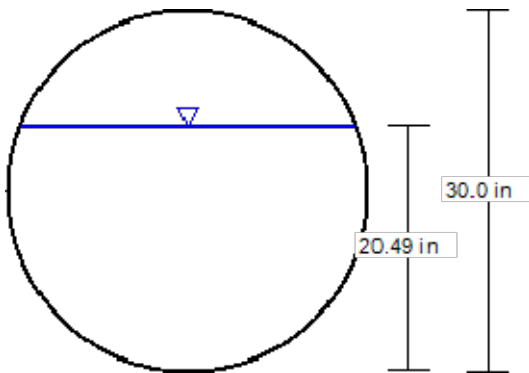
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.0 %
Normal Depth	20.49 in
Diameter	30.0 in
Discharge	47.00 ft ³ /s

Cross Section Image



V: 1
H: 1

A small right-angled triangle diagram illustrating the channel slope. The vertical side is labeled 'V: 1' and the horizontal side is labeled 'H: 1'.

Worksheet for 7

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.0	%
Diameter	30.0	in
Discharge	32.00	ft ³ /s

Results

Normal Depth	15.91	in
Flow Area	2.64	ft ²
Wetted Perimeter	4.08	ft
Hydraulic Radius	7.78	in
Top Width	2.50	ft
Critical Depth	1.93	ft
Percent Full	53.0	%
Critical Slope	0.00688	ft/ft
Velocity	12.11	ft/s
Velocity Head	2.28	ft
Specific Energy	3.60	ft
Froude Number	2.07	
Maximum Discharge	62.40	ft ³ /s
Discharge Full	58.00	ft ³ /s
Slope Full	0.00609	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	53.02	%
Downstream Velocity	Infinity	ft/s

Worksheet for 7

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	15.91	in
Critical Depth	1.93	ft
Channel Slope	2.0	%
Critical Slope	0.00688	ft/ft

Cross Section for 7

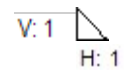
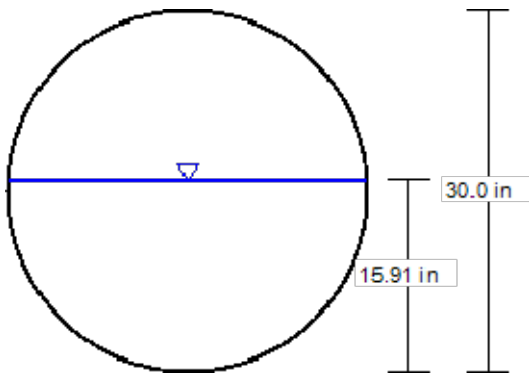
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.0 %
Normal Depth	15.91 in
Diameter	30.0 in
Discharge	32.00 ft ³ /s

Cross Section Image



Worksheet for 8

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.9	%
Diameter	36.0	in
Discharge	93.00	ft ³ /s

Results

Normal Depth	24.78	in
Flow Area	5.19	ft ²
Wetted Perimeter	5.87	ft
Hydraulic Radius	10.60	in
Top Width	2.78	ft
Critical Depth	2.86	ft
Percent Full	68.8	%
Critical Slope	0.01688	ft/ft
Velocity	17.93	ft/s
Velocity Head	4.99	ft
Specific Energy	7.06	ft
Froude Number	2.31	
Maximum Discharge	122.18	ft ³ /s
Discharge Full	113.58	ft ³ /s
Slope Full	0.01944	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	68.83	%
Downstream Velocity	Infinity	ft/s

Worksheet for 8

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	24.78	in
Critical Depth	2.86	ft
Channel Slope	2.9	%
Critical Slope	0.01688	ft/ft

Cross Section for 8

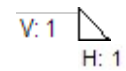
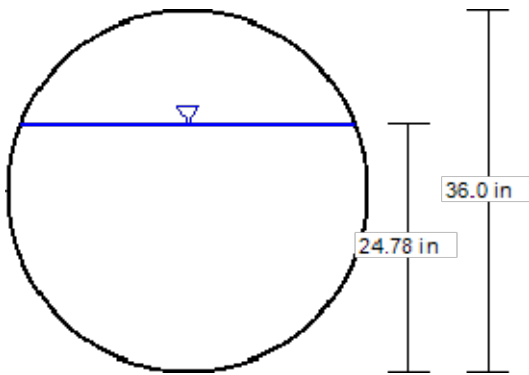
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.9 %
Normal Depth	24.78 in
Diameter	36.0 in
Discharge	93.00 ft ³ /s

Cross Section Image



Worksheet for 9

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.0	%
Diameter	36.0	in
Discharge	66.00	ft ³ /s

Results

Normal Depth	22.19	in
Flow Area	4.57	ft ²
Wetted Perimeter	5.42	ft
Hydraulic Radius	10.13	in
Top Width	2.92	ft
Critical Depth	2.60	ft
Percent Full	61.6	%
Critical Slope	0.00897	ft/ft
Velocity	14.44	ft/s
Velocity Head	3.24	ft
Specific Energy	5.09	ft
Froude Number	2.03	
Maximum Discharge	101.46	ft ³ /s
Discharge Full	94.32	ft ³ /s
Slope Full	0.00979	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	61.63	%
Downstream Velocity	Infinity	ft/s

Worksheet for 9

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	22.19	in
Critical Depth	2.60	ft
Channel Slope	2.0	%
Critical Slope	0.00897	ft/ft

Cross Section for 9

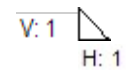
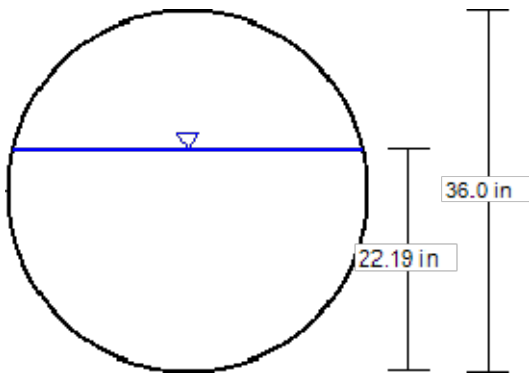
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.0 %
Normal Depth	22.19 in
Diameter	36.0 in
Discharge	66.00 ft ³ /s

Cross Section Image



Worksheet for 12A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	36.0	in
Discharge	53.00	ft ³ /s

Results

Normal Depth	13.05	in
Flow Area	2.31	ft ²
Wetted Perimeter	3.88	ft
Hydraulic Radius	7.16	in
Top Width	2.88	ft
Critical Depth	2.37	ft
Percent Full	36.3	%
Critical Slope	0.00680	ft/ft
Velocity	22.91	ft/s
Velocity Head	8.16	ft
Specific Energy	9.25	ft
Froude Number	4.51	
Maximum Discharge	202.92	ft ³ /s
Discharge Full	188.64	ft ³ /s
Slope Full	0.00631	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	36.26	%
Downstream Velocity	Infinity	ft/s

Worksheet for 12A

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	13.05	in
Critical Depth	2.37	ft
Channel Slope	8.0	%
Critical Slope	0.00680	ft/ft

Cross Section for 12A

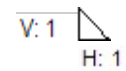
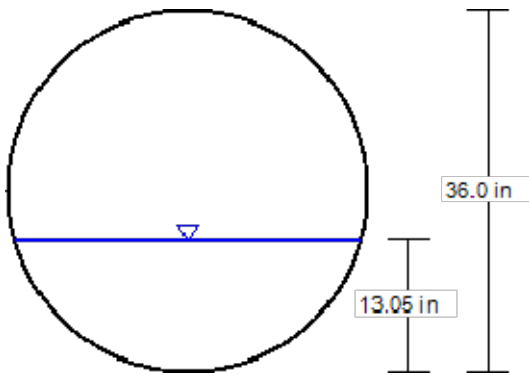
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	13.05 in
Diameter	36.0 in
Discharge	53.00 ft ³ /s

Cross Section Image



Worksheet for 13

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.0	%
Diameter	36.0	in
Discharge	58.00	ft ³ /s

Results

Normal Depth	25.96	in
Flow Area	5.46	ft ²
Wetted Perimeter	6.09	ft
Hydraulic Radius	10.76	in
Top Width	2.69	ft
Critical Depth	2.47	ft
Percent Full	72.1	%
Critical Slope	0.00753	ft/ft
Velocity	10.63	ft/s
Velocity Head	1.76	ft
Specific Energy	3.92	ft
Froude Number	1.32	
Maximum Discharge	71.74	ft ³ /s
Discharge Full	66.69	ft ³ /s
Slope Full	0.00756	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	72.11	%
Downstream Velocity	Infinity	ft/s

Worksheet for 13

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	25.96	in
Critical Depth	2.47	ft
Channel Slope	1.0	%
Critical Slope	0.00753	ft/ft

Cross Section for 13

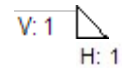
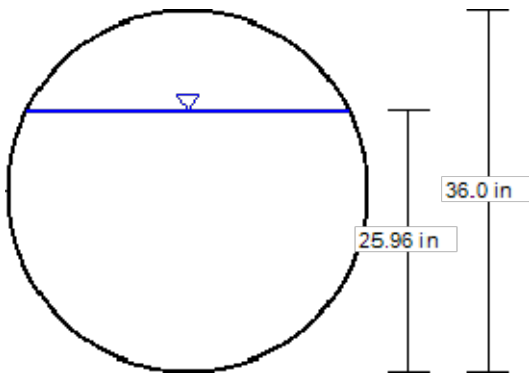
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.0 %
Normal Depth	25.96 in
Diameter	36.0 in
Discharge	58.00 ft ³ /s

Cross Section Image



Worksheet for 25

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.5 %
Diameter	30.0 in
Discharge	6.00 ft ³ /s

Results

Normal Depth	7.00 in
Flow Area	0.87 ft ²
Wetted Perimeter	2.52 ft
Hydraulic Radius	4.15 in
Top Width	2.12 ft
Critical Depth	0.81 ft
Percent Full	23.3 %
Critical Slope	0.00414 ft/ft
Velocity	6.89 ft/s
Velocity Head	0.74 ft
Specific Energy	1.32 ft
Froude Number	1.89
Maximum Discharge	54.04 ft ³ /s
Discharge Full	50.23 ft ³ /s
Slope Full	0.00021 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	23.35 %
Downstream Velocity	Infinity ft/s

Worksheet for 25

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	7.00	in
Critical Depth	0.81	ft
Channel Slope	1.5	%
Critical Slope	0.00414	ft/ft

Cross Section for 25

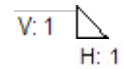
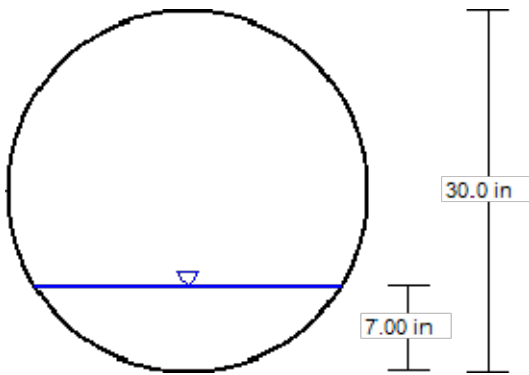
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.5 %
Normal Depth	7.00 in
Diameter	30.0 in
Discharge	6.00 ft ³ /s

Cross Section Image



Worksheet for 27

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.3	%
Diameter	36.0	in
Discharge	59.00	ft ³ /s

Results

Normal Depth	19.75	in
Flow Area	3.97	ft ²
Wetted Perimeter	5.00	ft
Hydraulic Radius	9.52	in
Top Width	2.99	ft
Critical Depth	2.48	ft
Percent Full	54.9	%
Critical Slope	0.00769	ft/ft
Velocity	14.86	ft/s
Velocity Head	3.43	ft
Specific Energy	5.08	ft
Froude Number	2.27	
Maximum Discharge	108.81	ft ³ /s
Discharge Full	101.15	ft ³ /s
Slope Full	0.00783	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	54.86	%
Downstream Velocity	Infinity	ft/s

Worksheet for 27

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	19.75	in
Critical Depth	2.48	ft
Channel Slope	2.3	%
Critical Slope	0.00769	ft/ft

Cross Section for 27

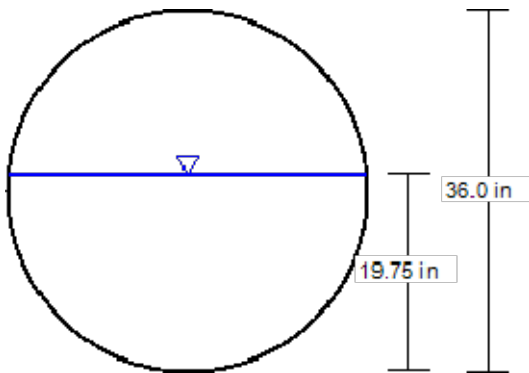
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.3 %
Normal Depth	19.75 in
Diameter	36.0 in
Discharge	59.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 34

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	5.0	%
Diameter	36.0	in
Discharge	58.00	ft ³ /s

Results

Normal Depth	15.59	in
Flow Area	2.93	ft ²
Wetted Perimeter	4.31	ft
Hydraulic Radius	8.17	in
Top Width	2.97	ft
Critical Depth	2.47	ft
Percent Full	43.3	%
Critical Slope	0.00753	ft/ft
Velocity	19.78	ft/s
Velocity Head	6.08	ft
Specific Energy	7.38	ft
Froude Number	3.51	
Maximum Discharge	160.42	ft ³ /s
Discharge Full	149.13	ft ³ /s
Slope Full	0.00756	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	43.30	%
Downstream Velocity	Infinity	ft/s

Worksheet for 34

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	15.59	in
Critical Depth	2.47	ft
Channel Slope	5.0	%
Critical Slope	0.00753	ft/ft

Cross Section for 34

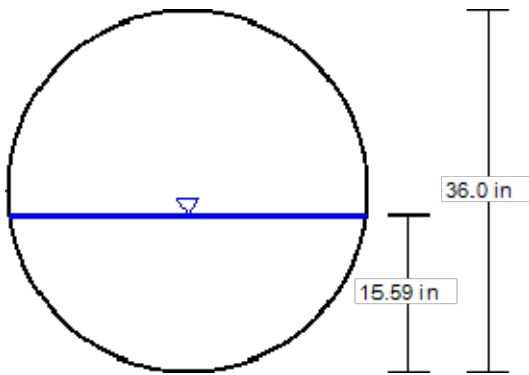
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	5.0 %
Normal Depth	15.59 in
Diameter	36.0 in
Discharge	58.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 35

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.0	%
Diameter	30.0	in
Discharge	2.00	ft ³ /s

Results

Normal Depth	4.51	in
Flow Area	0.46	ft ²
Wetted Perimeter	1.99	ft
Hydraulic Radius	2.79	in
Top Width	1.79	ft
Critical Depth	0.46	ft
Percent Full	15.0	%
Critical Slope	0.00430	ft/ft
Velocity	4.32	ft/s
Velocity Head	0.29	ft
Specific Energy	0.67	ft
Froude Number	1.50	
Maximum Discharge	44.12	ft ³ /s
Discharge Full	41.01	ft ³ /s
Slope Full	0.00002	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	15.02	%
Downstream Velocity	Infinity	ft/s

Worksheet for 35

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	4.51	in
Critical Depth	0.46	ft
Channel Slope	1.0	%
Critical Slope	0.00430	ft/ft

Cross Section for 35

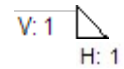
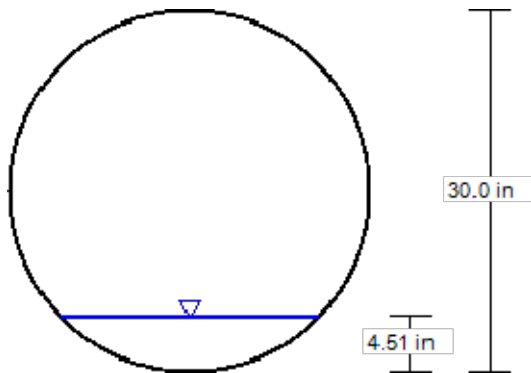
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.0 %
Normal Depth	4.51 in
Diameter	30.0 in
Discharge	2.00 ft ³ /s

Cross Section Image



Worksheet for 36

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.0	%
Diameter	42.0	in
Discharge	74.00	ft ³ /s

Results

Normal Depth	26.78	in
Flow Area	6.47	ft ²
Wetted Perimeter	6.47	ft
Hydraulic Radius	12.00	in
Top Width	3.37	ft
Critical Depth	2.69	ft
Percent Full	63.8	%
Critical Slope	0.00614	ft/ft
Velocity	11.43	ft/s
Velocity Head	2.03	ft
Specific Energy	4.26	ft
Froude Number	1.45	
Maximum Discharge	108.22	ft ³ /s
Discharge Full	100.60	ft ³ /s
Slope Full	0.00541	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	63.75	%
Downstream Velocity	Infinity	ft/s

Worksheet for 36

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	26.78	in
Critical Depth	2.69	ft
Channel Slope	1.0	%
Critical Slope	0.00614	ft/ft

Cross Section for 36

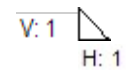
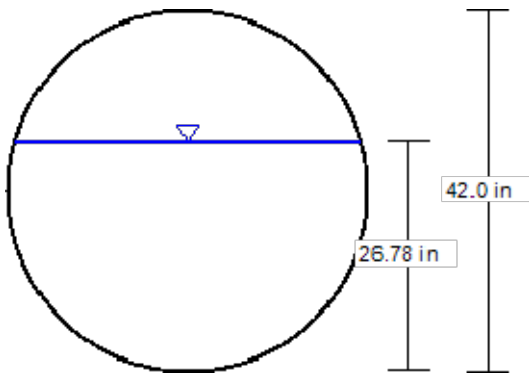
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.0 %
Normal Depth	26.78 in
Diameter	42.0 in
Discharge	74.00 ft ³ /s

Cross Section Image



Worksheet for 37

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.9	%
Diameter	60.0	in
Discharge	198.00	ft ³ /s

Results

Normal Depth	40.65	in
Flow Area	14.16	ft ²
Wetted Perimeter	9.67	ft
Hydraulic Radius	17.57	in
Top Width	4.67	ft
Critical Depth	4.02	ft
Percent Full	67.7	%
Critical Slope	0.00599	ft/ft
Velocity	13.98	ft/s
Velocity Head	3.04	ft
Specific Energy	6.43	ft
Froude Number	1.42	
Maximum Discharge	265.77	ft ³ /s
Discharge Full	247.06	ft ³ /s
Slope Full	0.00578	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	67.75	%
Downstream Velocity	Infinity	ft/s

Worksheet for 37

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	40.65	in
Critical Depth	4.02	ft
Channel Slope	0.9	%
Critical Slope	0.00599	ft/ft

Cross Section for 37

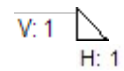
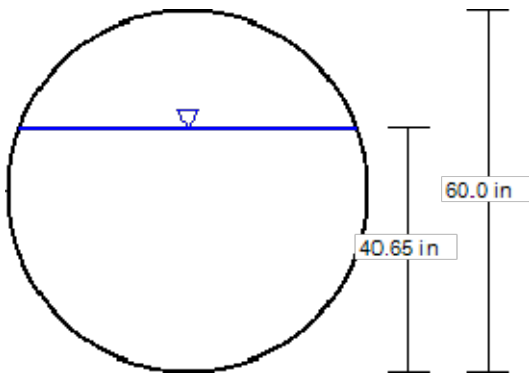
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.9 %
Normal Depth	40.65 in
Diameter	60.0 in
Discharge	198.00 ft ³ /s

Cross Section Image



Worksheet for 40

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.6	%
Diameter	30.0	in
Discharge	38.00	ft ³ /s

Results

Normal Depth	11.98	in
Flow Area	1.83	ft ²
Wetted Perimeter	3.42	ft
Hydraulic Radius	6.42	in
Top Width	2.45	ft
Critical Depth	2.08	ft
Percent Full	39.9	%
Critical Slope	0.00834	ft/ft
Velocity	20.77	ft/s
Velocity Head	6.70	ft
Specific Energy	7.70	ft
Froude Number	4.24	
Maximum Discharge	121.63	ft ³ /s
Discharge Full	113.07	ft ³ /s
Slope Full	0.00858	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	39.94	%
Downstream Velocity	Infinity	ft/s

Worksheet for 40

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	11.98	in
Critical Depth	2.08	ft
Channel Slope	7.6	%
Critical Slope	0.00834	ft/ft

Cross Section for 40

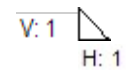
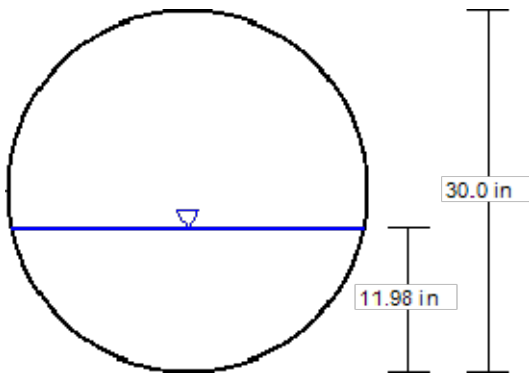
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.6 %
Normal Depth	11.98 in
Diameter	30.0 in
Discharge	38.00 ft ³ /s

Cross Section Image



Worksheet for 41

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.9	%
Height	5.00	ft
Bottom Width	6.00	ft
Discharge	265.00	ft ³ /s

Results

Normal Depth	41.21	in
Flow Area	20.60	ft ²
Wetted Perimeter	12.87	ft
Hydraulic Radius	19.21	in
Top Width	6.00	ft
Critical Depth	3.93	ft
Percent Full	68.7	%
Critical Slope	0.00634	ft/ft
Velocity	12.86	ft/s
Velocity Head	2.57	ft
Specific Energy	6.00	ft
Froude Number	1.22	
Discharge Full	346.69	ft ³ /s
Slope Full	0.01540	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	68.68	%
Downstream Velocity	Infinity	ft/s

Worksheet for 41

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	41.21	in
Critical Depth	3.93	ft
Channel Slope	0.9	%
Critical Slope	0.00634	ft/ft

Cross Section for 41

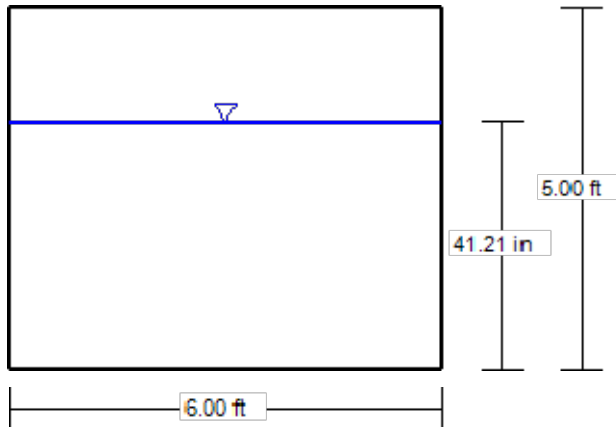
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015
Channel Slope	0.9 %
Normal Depth	41.21 in
Height	5.00 ft
Bottom Width	6.00 ft
Discharge	265.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 50

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.9	%
Diameter	30.0	in
Discharge	26.00	ft ³ /s

Results

Normal Depth	9.69	in
Flow Area	1.37	ft ²
Wetted Perimeter	3.02	ft
Hydraulic Radius	5.44	in
Top Width	2.34	ft
Critical Depth	1.74	ft
Percent Full	32.3	%
Critical Slope	0.00584	ft/ft
Velocity	18.97	ft/s
Velocity Head	5.59	ft
Specific Energy	6.40	ft
Froude Number	4.37	
Maximum Discharge	124.01	ft ³ /s
Discharge Full	115.28	ft ³ /s
Slope Full	0.00402	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	32.28	%
Downstream Velocity	Infinity	ft/s

Worksheet for 50

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	9.69	in
Critical Depth	1.74	ft
Channel Slope	7.9	%
Critical Slope	0.00584	ft/ft

Cross Section for 50

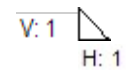
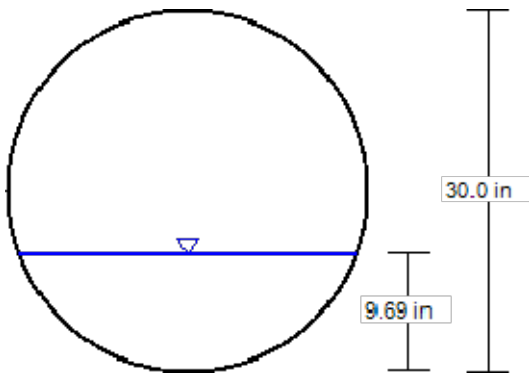
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.9 %
Normal Depth	9.69 in
Diameter	30.0 in
Discharge	26.00 ft ³ /s

Cross Section Image



Worksheet for 52

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.1	%
Diameter	36.0	in
Discharge	80.00	ft ³ /s

Results

Normal Depth	16.93	in
Flow Area	3.27	ft ²
Wetted Perimeter	4.53	ft
Hydraulic Radius	8.65	in
Top Width	2.99	ft
Critical Depth	2.77	ft
Percent Full	47.0	%
Critical Slope	0.01247	ft/ft
Velocity	24.48	ft/s
Velocity Head	9.31	ft
Specific Energy	10.73	ft
Froude Number	4.13	
Maximum Discharge	191.17	ft ³ /s
Discharge Full	177.71	ft ³ /s
Slope Full	0.01439	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	47.04	%
Downstream Velocity	Infinity	ft/s

Worksheet for 52

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	16.93	in
Critical Depth	2.77	ft
Channel Slope	7.1	%
Critical Slope	0.01247	ft/ft

Cross Section for 52

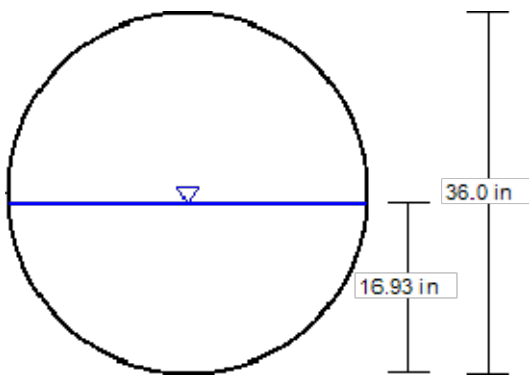
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.1 %
Normal Depth	16.93 in
Diameter	36.0 in
Discharge	80.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 55

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.3	%
Diameter	30.0	in
Discharge	29.00	ft ³ /s

Results

Normal Depth	10.47	in
Flow Area	1.53	ft ²
Wetted Perimeter	3.16	ft
Hydraulic Radius	5.79	in
Top Width	2.38	ft
Critical Depth	1.84	ft
Percent Full	34.9	%
Critical Slope	0.00632	ft/ft
Velocity	19.01	ft/s
Velocity Head	5.61	ft
Specific Energy	6.49	ft
Froude Number	4.19	
Maximum Discharge	119.21	ft ³ /s
Discharge Full	110.82	ft ³ /s
Slope Full	0.00500	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	34.91	%
Downstream Velocity	Infinity	ft/s

Worksheet for 55

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	10.47	in
Critical Depth	1.84	ft
Channel Slope	7.3	%
Critical Slope	0.00632	ft/ft

Cross Section for 55

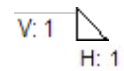
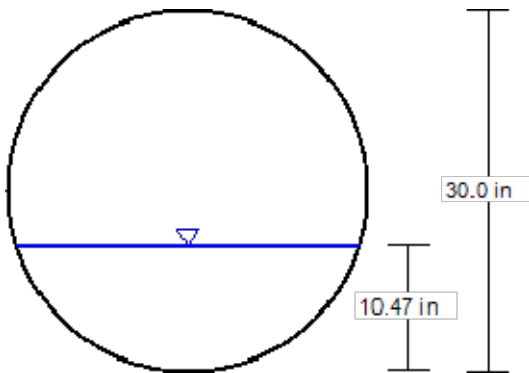
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.3 %
Normal Depth	10.47 in
Diameter	30.0 in
Discharge	29.00 ft ³ /s

Cross Section Image



Worksheet for 61

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.1	%
Diameter	60.0	in
Discharge	389.00	ft ³ /s

Results

Normal Depth	42.43	in
Flow Area	14.84	ft ²
Wetted Perimeter	9.99	ft
Hydraulic Radius	17.83	in
Top Width	4.55	ft
Critical Depth	4.87	ft
Percent Full	70.7	%
Critical Slope	0.01978	ft/ft
Velocity	26.21	ft/s
Velocity Head	10.67	ft
Specific Energy	14.21	ft
Froude Number	2.56	
Maximum Discharge	493.25	ft ³ /s
Discharge Full	458.53	ft ³ /s
Slope Full	0.02231	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	70.72	%
Downstream Velocity	Infinity	ft/s

Worksheet for 61

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	42.43	in
Critical Depth	4.87	ft
Channel Slope	3.1	%
Critical Slope	0.01978	ft/ft

Cross Section for 61

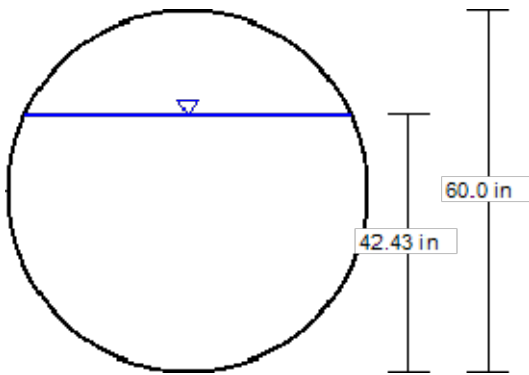
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	3.1 %
Normal Depth	42.43 in
Diameter	60.0 in
Discharge	389.00 ft ³ /s

Cross Section Image



V: 1
H: 1

A small right-angled triangle diagram illustrating the slope. The vertical side is labeled 'V: 1' and the horizontal side is labeled 'H: 1'.

Worksheet for 62

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	30.0	in
Discharge	35.00	ft ³ /s

Results

Normal Depth	11.30	in
Flow Area	1.69	ft ²
Wetted Perimeter	3.30	ft
Hydraulic Radius	6.14	in
Top Width	2.42	ft
Critical Depth	2.01	ft
Percent Full	37.7	%
Critical Slope	0.00755	ft/ft
Velocity	20.69	ft/s
Velocity Head	6.66	ft
Specific Energy	7.60	ft
Froude Number	4.37	
Maximum Discharge	124.79	ft ³ /s
Discharge Full	116.01	ft ³ /s
Slope Full	0.00728	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	37.66	%
Downstream Velocity	Infinity	ft/s

Worksheet for 62

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	11.30	in
Critical Depth	2.01	ft
Channel Slope	8.0	%
Critical Slope	0.00755	ft/ft

Cross Section for 62

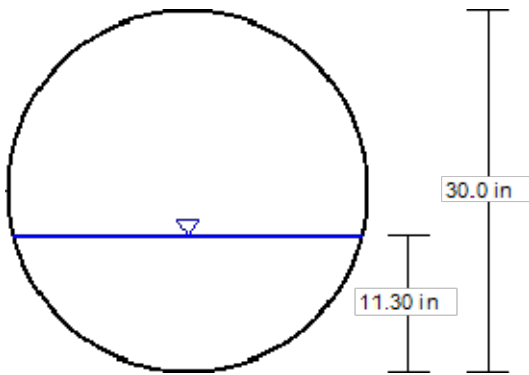
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	11.30 in
Diameter	30.0 in
Discharge	35.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 63

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.5	%
Diameter	30.0	in
Discharge	43.00	ft ³ /s

Results

Normal Depth	21.36	in
Flow Area	3.74	ft ²
Wetted Perimeter	5.02	ft
Hydraulic Radius	8.93	in
Top Width	2.26	ft
Critical Depth	2.19	ft
Percent Full	71.2	%
Critical Slope	0.00994	ft/ft
Velocity	11.50	ft/s
Velocity Head	2.06	ft
Specific Energy	3.84	ft
Froude Number	1.58	
Maximum Discharge	54.04	ft ³ /s
Discharge Full	50.23	ft ³ /s
Slope Full	0.01099	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	71.21	%
Downstream Velocity	Infinity	ft/s

Worksheet for 63

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	21.36	in
Critical Depth	2.19	ft
Channel Slope	1.5	%
Critical Slope	0.00994	ft/ft

Cross Section for 63

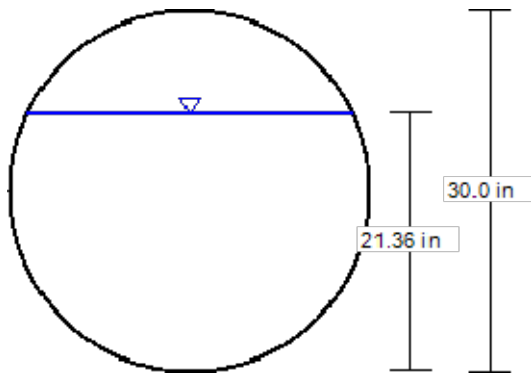
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.5 %
Normal Depth	21.36 in
Diameter	30.0 in
Discharge	43.00 ft ³ /s

Cross Section Image



V: 1
H: 1

A small right-angled triangle diagram illustrating the slope. The vertical side is labeled 'V: 1' and the horizontal side is labeled 'H: 1'.

Worksheet for 64

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	36.0	in
Discharge	48.00	ft ³ /s

Results

Normal Depth	12.38	in
Flow Area	2.15	ft ²
Wetted Perimeter	3.76	ft
Hydraulic Radius	6.87	in
Top Width	2.85	ft
Critical Depth	2.26	ft
Percent Full	34.4	%
Critical Slope	0.00619	ft/ft
Velocity	22.29	ft/s
Velocity Head	7.72	ft
Specific Energy	8.76	ft
Froude Number	4.52	
Maximum Discharge	202.92	ft ³ /s
Discharge Full	188.64	ft ³ /s
Slope Full	0.00518	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	34.40	%
Downstream Velocity	Infinity	ft/s

Worksheet for 64

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	12.38	in
Critical Depth	2.26	ft
Channel Slope	8.0	%
Critical Slope	0.00619	ft/ft

Cross Section for 64

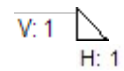
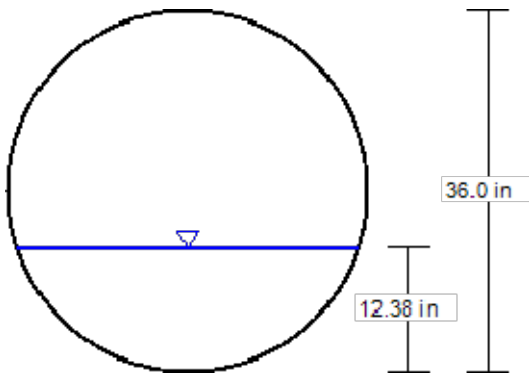
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	12.38 in
Diameter	36.0 in
Discharge	48.00 ft ³ /s

Cross Section Image



Worksheet for 66

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.1	%
Diameter	30.0	in
Discharge	11.00	ft ³ /s

Results

Normal Depth	7.91	in
Flow Area	1.03	ft ²
Wetted Perimeter	2.70	ft
Hydraulic Radius	4.60	in
Top Width	2.20	ft
Critical Depth	1.11	ft
Percent Full	26.4	%
Critical Slope	0.00434	ft/ft
Velocity	10.63	ft/s
Velocity Head	1.76	ft
Specific Energy	2.42	ft
Froude Number	2.73	
Maximum Discharge	77.68	ft ³ /s
Discharge Full	72.21	ft ³ /s
Slope Full	0.00072	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	26.38	%
Downstream Velocity	Infinity	ft/s

Worksheet for 66

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	7.91	in
Critical Depth	1.11	ft
Channel Slope	3.1	%
Critical Slope	0.00434	ft/ft

Cross Section for 66

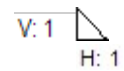
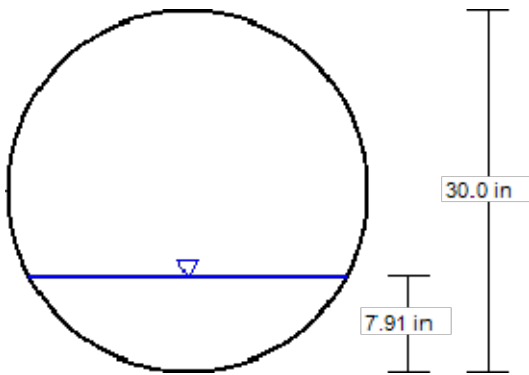
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	3.1 %
Normal Depth	7.91 in
Diameter	30.0 in
Discharge	11.00 ft ³ /s

Cross Section Image



Worksheet for 68

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.3 %
Diameter	30.0 in
Discharge	9.00 ft ³ /s

Results

Normal Depth	8.92 in
Flow Area	1.22 ft ²
Wetted Perimeter	2.88 ft
Hydraulic Radius	5.09 in
Top Width	2.29 ft
Critical Depth	1.00 ft
Percent Full	29.7 %
Critical Slope	0.00424 ft/ft
Velocity	7.36 ft/s
Velocity Head	0.84 ft
Specific Energy	1.58 ft
Froude Number	1.77
Maximum Discharge	50.30 ft ³ /s
Discharge Full	46.76 ft ³ /s
Slope Full	0.00048 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	29.73 %
Downstream Velocity	Infinity ft/s

Worksheet for 68

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	8.92	in
Critical Depth	1.00	ft
Channel Slope	1.3	%
Critical Slope	0.00424	ft/ft

Cross Section for 68

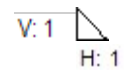
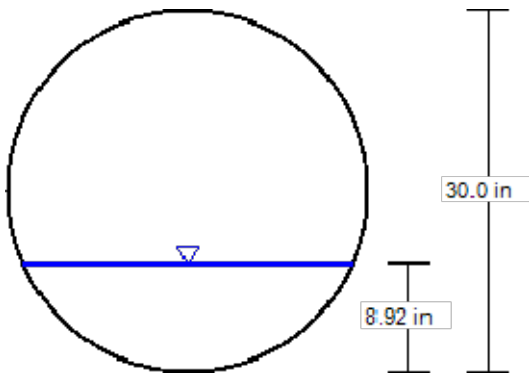
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.3 %
Normal Depth	8.92 in
Diameter	30.0 in
Discharge	9.00 ft ³ /s

Cross Section Image



Worksheet for 69

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	30.0	in
Discharge	11.00	ft ³ /s

Results

Normal Depth	6.24	in
Flow Area	0.74	ft ²
Wetted Perimeter	2.37	ft
Hydraulic Radius	3.75	in
Top Width	2.03	ft
Critical Depth	1.11	ft
Percent Full	20.8	%
Critical Slope	0.00434	ft/ft
Velocity	14.88	ft/s
Velocity Head	3.44	ft
Specific Energy	3.96	ft
Froude Number	4.35	
Maximum Discharge	124.79	ft ³ /s
Discharge Full	116.01	ft ³ /s
Slope Full	0.00072	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	20.80	%
Downstream Velocity	Infinity	ft/s

Worksheet for 69

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.24	in
Critical Depth	1.11	ft
Channel Slope	8.0	%
Critical Slope	0.00434	ft/ft

Cross Section for 69

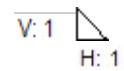
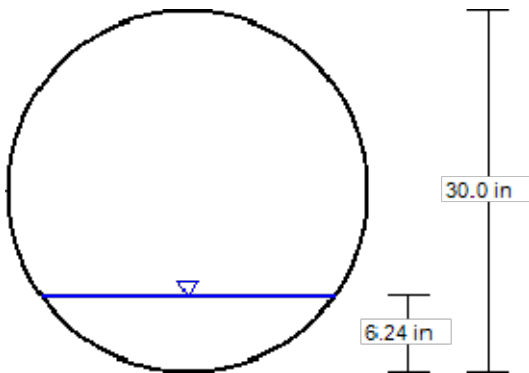
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	6.24 in
Diameter	30.0 in
Discharge	11.00 ft ³ /s

Cross Section Image



Worksheet for 72

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.0	%
Diameter	30.0	in
Discharge	29.00	ft ³ /s

Results

Normal Depth	10.59	in
Flow Area	1.55	ft ²
Wetted Perimeter	3.18	ft
Hydraulic Radius	5.84	in
Top Width	2.39	ft
Critical Depth	1.84	ft
Percent Full	35.3	%
Critical Slope	0.00632	ft/ft
Velocity	18.72	ft/s
Velocity Head	5.45	ft
Specific Energy	6.33	ft
Froude Number	4.10	
Maximum Discharge	116.73	ft ³ /s
Discharge Full	108.52	ft ³ /s
Slope Full	0.00500	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	35.30	%
Downstream Velocity	Infinity	ft/s

Worksheet for 72

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	10.59	in
Critical Depth	1.84	ft
Channel Slope	7.0	%
Critical Slope	0.00632	ft/ft

Cross Section for 72

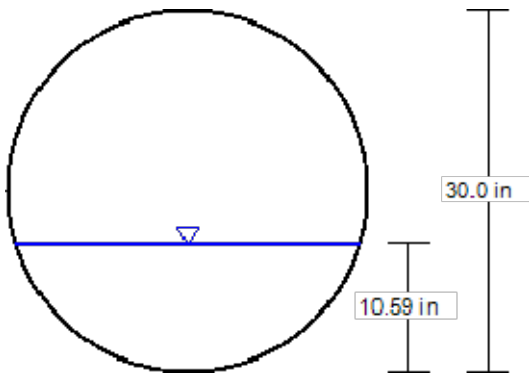
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.0 %
Normal Depth	10.59 in
Diameter	30.0 in
Discharge	29.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 74

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	6.3	%
Diameter	30.0	in
Discharge	5.00	ft ³ /s

Results

Normal Depth	4.50	in
Flow Area	0.46	ft ²
Wetted Perimeter	1.99	ft
Hydraulic Radius	2.79	in
Top Width	1.79	ft
Critical Depth	0.74	ft
Percent Full	15.0	%
Critical Slope	0.00414	ft/ft
Velocity	10.83	ft/s
Velocity Head	1.82	ft
Specific Energy	2.20	ft
Froude Number	3.76	
Maximum Discharge	110.74	ft ³ /s
Discharge Full	102.95	ft ³ /s
Slope Full	0.00015	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	14.99	%
Downstream Velocity	Infinity	ft/s

Worksheet for 74

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	4.50	in
Critical Depth	0.74	ft
Channel Slope	6.3	%
Critical Slope	0.00414	ft/ft

Cross Section for 74

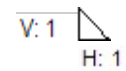
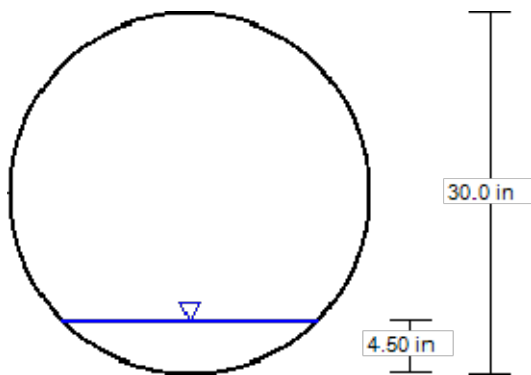
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	6.3 %
Normal Depth	4.50 in
Diameter	30.0 in
Discharge	5.00 ft ³ /s

Cross Section Image



Worksheet for 77A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	36.0	in
Discharge	53.00	ft ³ /s

Results

Normal Depth	13.05	in
Flow Area	2.31	ft ²
Wetted Perimeter	3.88	ft
Hydraulic Radius	7.16	in
Top Width	2.88	ft
Critical Depth	2.37	ft
Percent Full	36.3	%
Critical Slope	0.00680	ft/ft
Velocity	22.91	ft/s
Velocity Head	8.16	ft
Specific Energy	9.25	ft
Froude Number	4.51	
Maximum Discharge	202.92	ft ³ /s
Discharge Full	188.64	ft ³ /s
Slope Full	0.00631	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	36.26	%
Downstream Velocity	Infinity	ft/s

Worksheet for 77A

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	13.05	in
Critical Depth	2.37	ft
Channel Slope	8.0	%
Critical Slope	0.00680	ft/ft

Cross Section for 77A

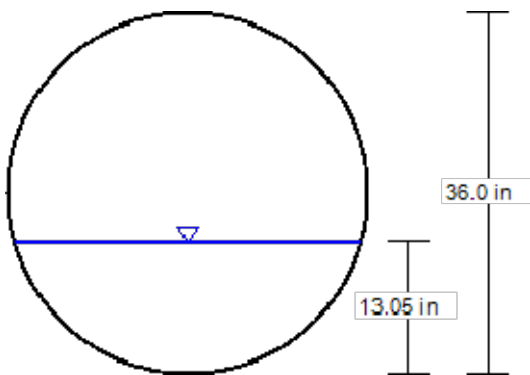
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	13.05 in
Diameter	36.0 in
Discharge	53.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 79

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	36.0	in
Discharge	92.00	ft ³ /s

Results

Normal Depth	17.74	in
Flow Area	3.47	ft ²
Wetted Perimeter	4.67	ft
Hydraulic Radius	8.92	in
Top Width	3.00	ft
Critical Depth	2.86	ft
Percent Full	49.3	%
Critical Slope	0.01650	ft/ft
Velocity	26.52	ft/s
Velocity Head	10.93	ft
Specific Energy	12.41	ft
Froude Number	4.35	
Maximum Discharge	202.92	ft ³ /s
Discharge Full	188.64	ft ³ /s
Slope Full	0.01903	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	49.27	%
Downstream Velocity	Infinity	ft/s

Worksheet for 79

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	17.74	in
Critical Depth	2.86	ft
Channel Slope	8.0	%
Critical Slope	0.01650	ft/ft

Cross Section for 78

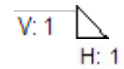
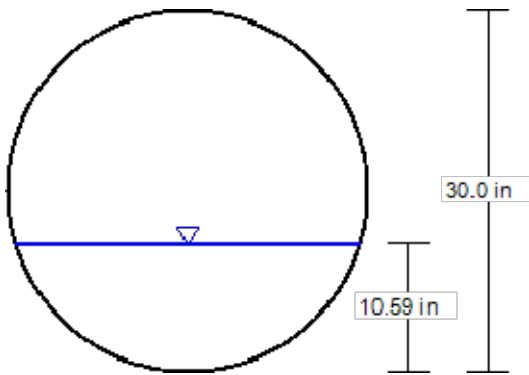
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	10.59 in
Diameter	30.0 in
Discharge	31.00 ft ³ /s

Cross Section Image



Worksheet for 79

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	36.0	in
Discharge	92.00	ft ³ /s

Results

Normal Depth	17.74	in
Flow Area	3.47	ft ²
Wetted Perimeter	4.67	ft
Hydraulic Radius	8.92	in
Top Width	3.00	ft
Critical Depth	2.86	ft
Percent Full	49.3	%
Critical Slope	0.01650	ft/ft
Velocity	26.52	ft/s
Velocity Head	10.93	ft
Specific Energy	12.41	ft
Froude Number	4.35	
Maximum Discharge	202.92	ft ³ /s
Discharge Full	188.64	ft ³ /s
Slope Full	0.01903	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	49.27	%
Downstream Velocity	Infinity	ft/s

Worksheet for 79

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	17.74	in
Critical Depth	2.86	ft
Channel Slope	8.0	%
Critical Slope	0.01650	ft/ft

Cross Section for 79

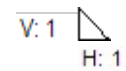
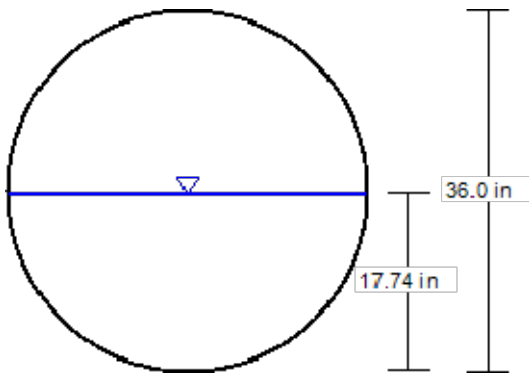
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	17.74 in
Diameter	36.0 in
Discharge	92.00 ft ³ /s

Cross Section Image



Worksheet for 80

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.1	%
Diameter	30.0	in
Discharge	8.00	ft ³ /s

Results

Normal Depth	6.74	in
Flow Area	0.83	ft ²
Wetted Perimeter	2.47	ft
Hydraulic Radius	4.01	in
Top Width	2.09	ft
Critical Depth	0.94	ft
Percent Full	22.5	%
Critical Slope	0.00419	ft/ft
Velocity	9.69	ft/s
Velocity Head	1.46	ft
Specific Energy	2.02	ft
Froude Number	2.72	
Maximum Discharge	77.68	ft ³ /s
Discharge Full	72.21	ft ³ /s
Slope Full	0.00038	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	22.47	%
Downstream Velocity	Infinity	ft/s

Worksheet for 80

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.74	in
Critical Depth	0.94	ft
Channel Slope	3.1	%
Critical Slope	0.00419	ft/ft

Cross Section for 80

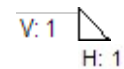
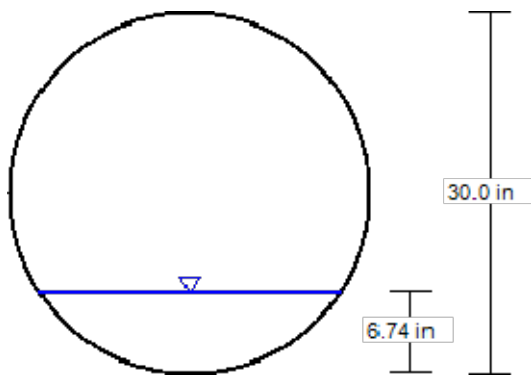
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	3.1 %
Normal Depth	6.74 in
Diameter	30.0 in
Discharge	8.00 ft ³ /s

Cross Section Image



Worksheet for 81

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	36.0	in
Discharge	100.00	ft ³ /s

Results

Normal Depth	18.64	in
Flow Area	3.69	ft ²
Wetted Perimeter	4.82	ft
Hydraulic Radius	9.20	in
Top Width	3.00	ft
Critical Depth	2.90	ft
Percent Full	51.8	%
Critical Slope	0.01968	ft/ft
Velocity	27.08	ft/s
Velocity Head	11.39	ft
Specific Energy	12.95	ft
Froude Number	4.30	
Maximum Discharge	202.92	ft ³ /s
Discharge Full	188.64	ft ³ /s
Slope Full	0.02248	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	51.76	%
Downstream Velocity	Infinity	ft/s

Worksheet for 81

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	18.64	in
Critical Depth	2.90	ft
Channel Slope	8.0	%
Critical Slope	0.01968	ft/ft

Cross Section for 81

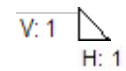
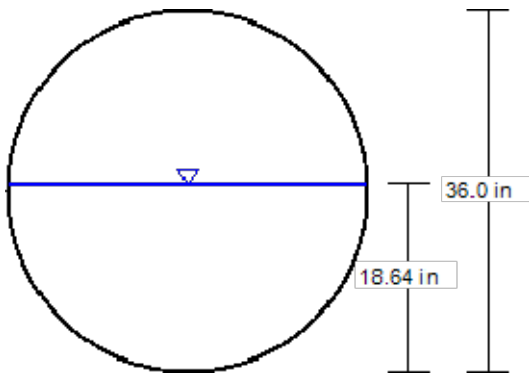
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	18.64 in
Diameter	36.0 in
Discharge	100.00 ft ³ /s

Cross Section Image



Worksheet for 82

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.9	%
Diameter	30.0	in
Discharge	22.00	ft ³ /s

Results

Normal Depth	11.57	in
Flow Area	1.75	ft ²
Wetted Perimeter	3.35	ft
Hydraulic Radius	6.25	in
Top Width	2.43	ft
Critical Depth	1.60	ft
Percent Full	38.6	%
Critical Slope	0.00530	ft/ft
Velocity	12.60	ft/s
Velocity Head	2.47	ft
Specific Energy	3.43	ft
Froude Number	2.62	
Maximum Discharge	75.13	ft ³ /s
Discharge Full	69.85	ft ³ /s
Slope Full	0.00288	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	38.56	%
Downstream Velocity	Infinity	ft/s

Worksheet for 82

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	11.57	in
Critical Depth	1.60	ft
Channel Slope	2.9	%
Critical Slope	0.00530	ft/ft

Cross Section for 82

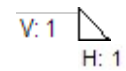
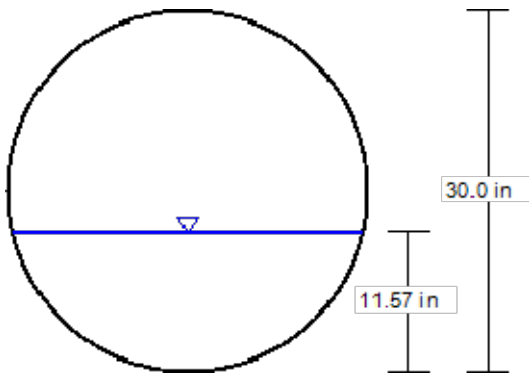
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.9 %
Normal Depth	11.57 in
Diameter	30.0 in
Discharge	22.00 ft ³ /s

Cross Section Image



Worksheet for 83

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.2	%
Diameter	30.0	in
Discharge	23.00	ft ³ /s

Results

Normal Depth	11.54	in
Flow Area	1.74	ft ²
Wetted Perimeter	3.34	ft
Hydraulic Radius	6.24	in
Top Width	2.43	ft
Critical Depth	1.63	ft
Percent Full	38.5	%
Critical Slope	0.00543	ft/ft
Velocity	13.22	ft/s
Velocity Head	2.72	ft
Specific Energy	3.68	ft
Froude Number	2.76	
Maximum Discharge	78.92	ft ³ /s
Discharge Full	73.37	ft ³ /s
Slope Full	0.00314	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	38.46	%
Downstream Velocity	Infinity	ft/s

Worksheet for 83

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	11.54	in
Critical Depth	1.63	ft
Channel Slope	3.2	%
Critical Slope	0.00543	ft/ft

Cross Section for 83

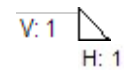
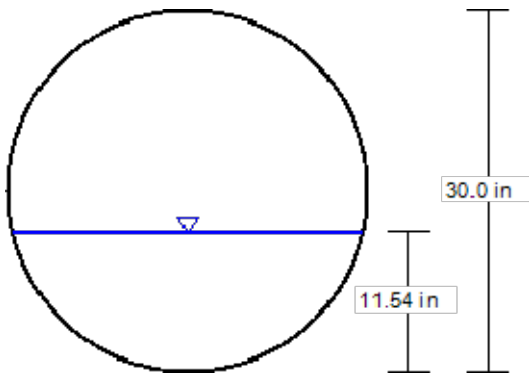
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	3.2 %
Normal Depth	11.54 in
Diameter	30.0 in
Discharge	23.00 ft ³ /s

Cross Section Image



Worksheet for 85

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.3	%
Diameter	30.0	in
Discharge	20.00	ft ³ /s

Results

Normal Depth	11.70	in
Flow Area	1.77	ft ²
Wetted Perimeter	3.37	ft
Hydraulic Radius	6.31	in
Top Width	2.44	ft
Critical Depth	1.52	ft
Percent Full	39.0	%
Critical Slope	0.00508	ft/ft
Velocity	11.29	ft/s
Velocity Head	1.98	ft
Specific Energy	2.95	ft
Froude Number	2.33	
Maximum Discharge	66.91	ft ³ /s
Discharge Full	62.20	ft ³ /s
Slope Full	0.00238	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	38.99	%
Downstream Velocity	Infinity	ft/s

Worksheet for 85

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	11.70	in
Critical Depth	1.52	ft
Channel Slope	2.3	%
Critical Slope	0.00508	ft/ft

Cross Section for 85

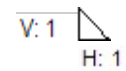
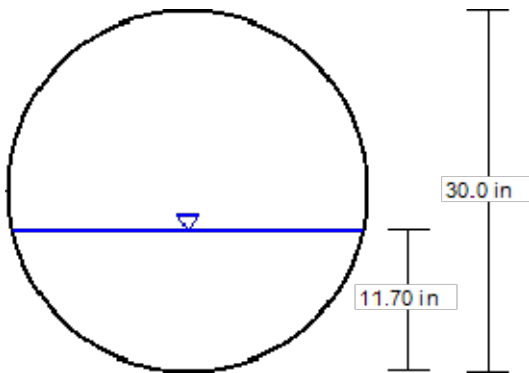
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.3 %
Normal Depth	11.70 in
Diameter	30.0 in
Discharge	20.00 ft ³ /s

Cross Section Image



Worksheet for 86

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	30.0	in
Discharge	16.00	ft ³ /s

Results

Normal Depth	7.53	in
Flow Area	0.96	ft ²
Wetted Perimeter	2.62	ft
Hydraulic Radius	4.41	in
Top Width	2.17	ft
Critical Depth	1.35	ft
Percent Full	25.1	%
Critical Slope	0.00470	ft/ft
Velocity	16.59	ft/s
Velocity Head	4.28	ft
Specific Energy	4.91	ft
Froude Number	4.39	
Maximum Discharge	124.79	ft ³ /s
Discharge Full	116.01	ft ³ /s
Slope Full	0.00152	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	25.09	%
Downstream Velocity	Infinity	ft/s

Worksheet for 86

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	7.53	in
Critical Depth	1.35	ft
Channel Slope	8.0	%
Critical Slope	0.00470	ft/ft

Cross Section for 86

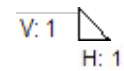
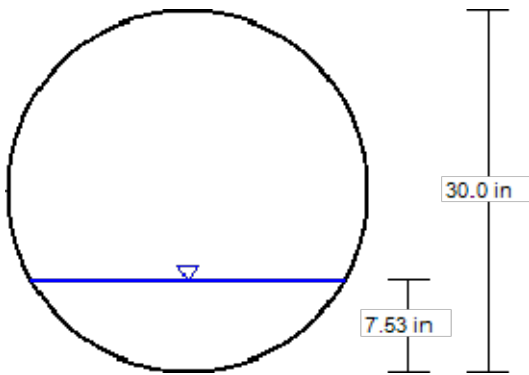
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	7.53 in
Diameter	30.0 in
Discharge	16.00 ft ³ /s

Cross Section Image



Worksheet for 87

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	30.0	in
Discharge	19.00	ft ³ /s

Results

Normal Depth	8.21	in
Flow Area	1.09	ft ²
Wetted Perimeter	2.75	ft
Hydraulic Radius	4.75	in
Top Width	2.23	ft
Critical Depth	1.48	ft
Percent Full	27.4	%
Critical Slope	0.00497	ft/ft
Velocity	17.43	ft/s
Velocity Head	4.72	ft
Specific Energy	5.41	ft
Froude Number	4.40	
Maximum Discharge	124.79	ft ³ /s
Discharge Full	116.01	ft ³ /s
Slope Full	0.00215	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	27.37	%
Downstream Velocity	Infinity	ft/s

Worksheet for 87

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	8.21	in
Critical Depth	1.48	ft
Channel Slope	8.0	%
Critical Slope	0.00497	ft/ft

Cross Section for 87

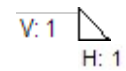
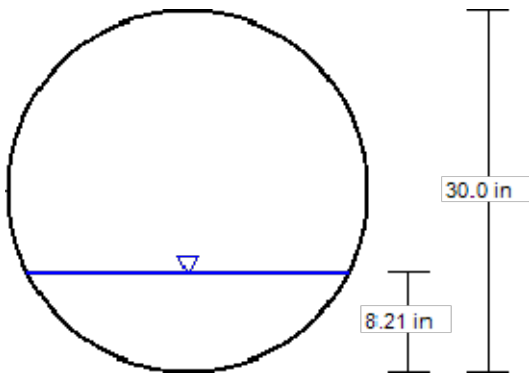
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	8.21 in
Diameter	30.0 in
Discharge	19.00 ft ³ /s

Cross Section Image



Worksheet for 88

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	30.0	in
Discharge	30.00	ft ³ /s

Results

Normal Depth	10.41	in
Flow Area	1.51	ft ²
Wetted Perimeter	3.15	ft
Hydraulic Radius	5.76	in
Top Width	2.38	ft
Critical Depth	1.87	ft
Percent Full	34.7	%
Critical Slope	0.00650	ft/ft
Velocity	19.83	ft/s
Velocity Head	6.11	ft
Specific Energy	6.98	ft
Froude Number	4.38	
Maximum Discharge	124.79	ft ³ /s
Discharge Full	116.01	ft ³ /s
Slope Full	0.00535	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	34.69	%
Downstream Velocity	Infinity	ft/s

Worksheet for 88

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	10.41	in
Critical Depth	1.87	ft
Channel Slope	8.0	%
Critical Slope	0.00650	ft/ft

Cross Section for 88

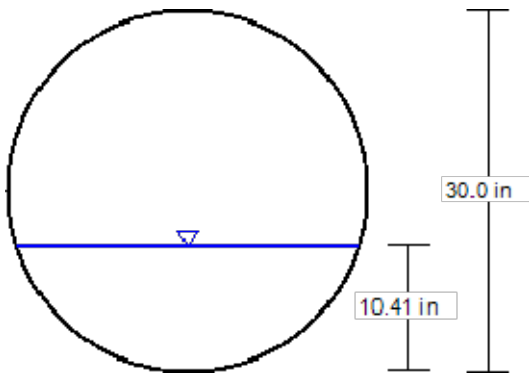
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	10.41 in
Diameter	30.0 in
Discharge	30.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 89

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	30.0	in
Discharge	13.00	ft ³ /s

Results

Normal Depth	6.78	in
Flow Area	0.83	ft ²
Wetted Perimeter	2.48	ft
Hydraulic Radius	4.03	in
Top Width	2.09	ft
Critical Depth	1.21	ft
Percent Full	22.6	%
Critical Slope	0.00447	ft/ft
Velocity	15.62	ft/s
Velocity Head	3.79	ft
Specific Energy	4.36	ft
Froude Number	4.37	
Maximum Discharge	124.79	ft ³ /s
Discharge Full	116.01	ft ³ /s
Slope Full	0.00100	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	22.60	%
Downstream Velocity	Infinity	ft/s

Worksheet for 89

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.78	in
Critical Depth	1.21	ft
Channel Slope	8.0	%
Critical Slope	0.00447	ft/ft

Cross Section for 89

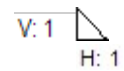
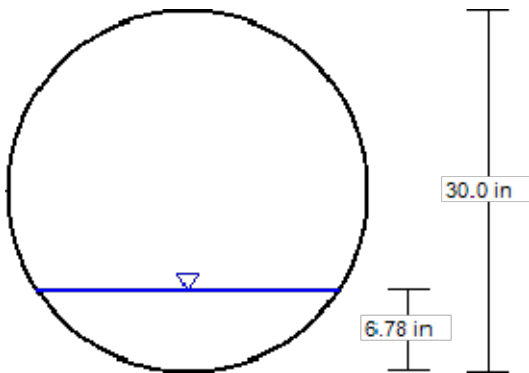
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	6.78 in
Diameter	30.0 in
Discharge	13.00 ft ³ /s

Cross Section Image



Worksheet for 90

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.8	%
Diameter	36.0	in
Discharge	53.00	ft ³ /s

Results

Normal Depth	13.14	in
Flow Area	2.33	ft ²
Wetted Perimeter	3.89	ft
Hydraulic Radius	7.20	in
Top Width	2.89	ft
Critical Depth	2.37	ft
Percent Full	36.5	%
Critical Slope	0.00680	ft/ft
Velocity	22.70	ft/s
Velocity Head	8.01	ft
Specific Energy	9.11	ft
Froude Number	4.45	
Maximum Discharge	200.37	ft ³ /s
Discharge Full	186.27	ft ³ /s
Slope Full	0.00631	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	36.50	%
Downstream Velocity	Infinity	ft/s

Worksheet for 90

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	13.14	in
Critical Depth	2.37	ft
Channel Slope	7.8	%
Critical Slope	0.00680	ft/ft

Cross Section for 90

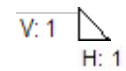
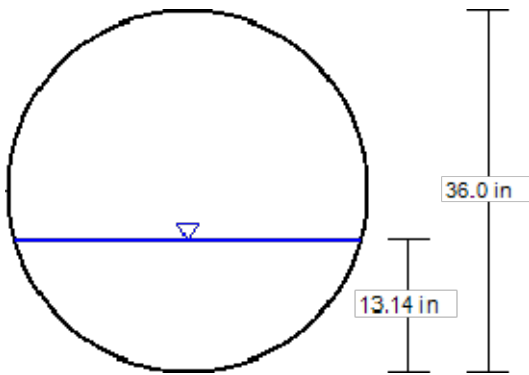
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.8 %
Normal Depth	13.14 in
Diameter	36.0 in
Discharge	53.00 ft ³ /s

Cross Section Image



Worksheet for 91

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.5	%
Diameter	30.0	in
Discharge	2.00	ft ³ /s

Results

Normal Depth	5.33	in
Flow Area	0.59	ft ²
Wetted Perimeter	2.18	ft
Hydraulic Radius	3.25	in
Top Width	1.91	ft
Critical Depth	0.46	ft
Percent Full	17.8	%
Critical Slope	0.00431	ft/ft
Velocity	3.39	ft/s
Velocity Head	0.18	ft
Specific Energy	0.62	ft
Froude Number	1.07	
Maximum Discharge	31.20	ft ³ /s
Discharge Full	29.00	ft ³ /s
Slope Full	0.00002	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	17.78	%
Downstream Velocity	Infinity	ft/s

Worksheet for 91

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	5.33	in
Critical Depth	0.46	ft
Channel Slope	0.5	%
Critical Slope	0.00431	ft/ft

Cross Section for 91

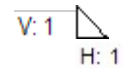
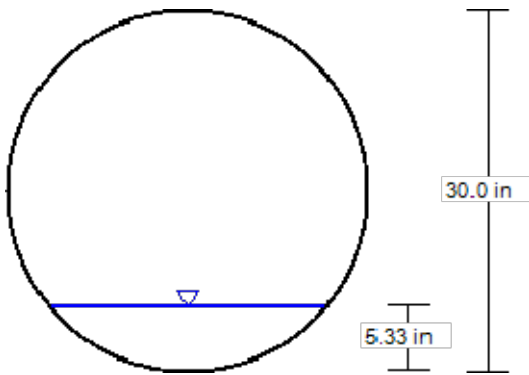
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.5 %
Normal Depth	5.33 in
Diameter	30.0 in
Discharge	2.00 ft ³ /s

Cross Section Image



Worksheet for 92

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.7	%
Diameter	30.0	in
Discharge	16.00	ft ³ /s

Results

Normal Depth	9.95	in
Flow Area	1.42	ft ²
Wetted Perimeter	3.07	ft
Hydraulic Radius	5.56	in
Top Width	2.35	ft
Critical Depth	1.35	ft
Percent Full	33.2	%
Critical Slope	0.00470	ft/ft
Velocity	11.25	ft/s
Velocity Head	1.97	ft
Specific Energy	2.79	ft
Froude Number	2.55	
Maximum Discharge	72.50	ft ³ /s
Discharge Full	67.39	ft ³ /s
Slope Full	0.00152	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	33.17	%
Downstream Velocity	Infinity	ft/s

Worksheet for 92

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	9.95	in
Critical Depth	1.35	ft
Channel Slope	2.7	%
Critical Slope	0.00470	ft/ft

Cross Section for 92

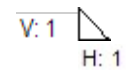
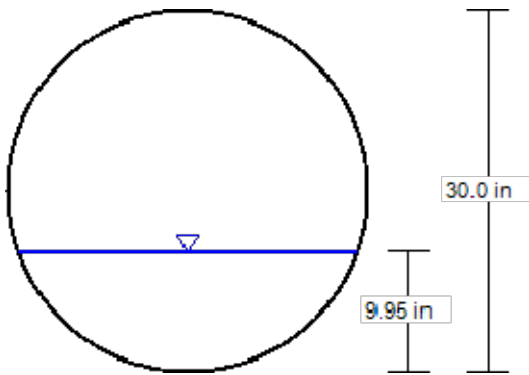
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.7 %
Normal Depth	9.95 in
Diameter	30.0 in
Discharge	16.00 ft ³ /s

Cross Section Image



Worksheet for 93

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.4	%
Diameter	30.0	in
Discharge	24.00	ft ³ /s

Results

Normal Depth	9.45	in
Flow Area	1.32	ft ²
Wetted Perimeter	2.98	ft
Hydraulic Radius	5.34	in
Top Width	2.32	ft
Critical Depth	1.67	ft
Percent Full	31.5	%
Critical Slope	0.00556	ft/ft
Velocity	18.12	ft/s
Velocity Head	5.10	ft
Specific Energy	5.89	ft
Froude Number	4.23	
Maximum Discharge	120.02	ft ³ /s
Discharge Full	111.57	ft ³ /s
Slope Full	0.00342	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	31.50	%
Downstream Velocity	Infinity	ft/s

Worksheet for 93

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	9.45	in
Critical Depth	1.67	ft
Channel Slope	7.4	%
Critical Slope	0.00556	ft/ft

Cross Section for 93

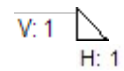
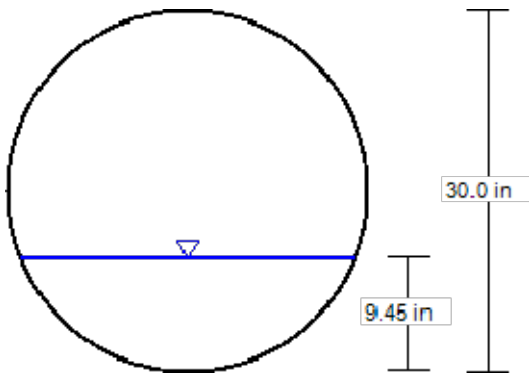
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.4 %
Normal Depth	9.45 in
Diameter	30.0 in
Discharge	24.00 ft ³ /s

Cross Section Image



Worksheet for 94

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	6.2	%
Diameter	30.0	in
Discharge	19.00	ft ³ /s

Results

Normal Depth	8.77	in
Flow Area	1.19	ft ²
Wetted Perimeter	2.86	ft
Hydraulic Radius	5.02	in
Top Width	2.27	ft
Critical Depth	1.48	ft
Percent Full	29.2	%
Critical Slope	0.00497	ft/ft
Velocity	15.91	ft/s
Velocity Head	3.94	ft
Specific Energy	4.67	ft
Froude Number	3.87	
Maximum Discharge	109.86	ft ³ /s
Discharge Full	102.13	ft ³ /s
Slope Full	0.00215	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	29.22	%
Downstream Velocity	Infinity	ft/s

Worksheet for 94

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	8.77	in
Critical Depth	1.48	ft
Channel Slope	6.2	%
Critical Slope	0.00497	ft/ft

Cross Section for 94

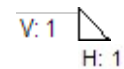
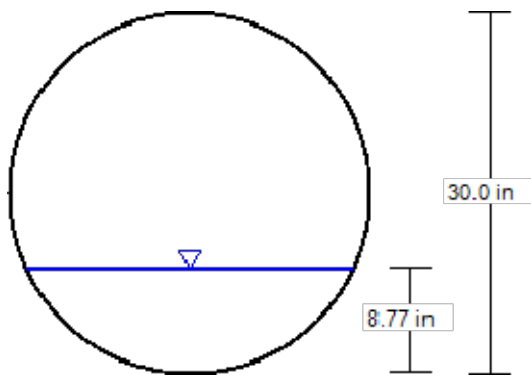
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	6.2 %
Normal Depth	8.77 in
Diameter	30.0 in
Discharge	19.00 ft ³ /s

Cross Section Image



Worksheet for 95

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.0	%
Diameter	42.0	in
Discharge	77.00	ft ³ /s

Results

Normal Depth	18.02	in
Flow Area	3.94	ft ²
Wetted Perimeter	5.00	ft
Hydraulic Radius	9.47	in
Top Width	3.46	ft
Critical Depth	2.75	ft
Percent Full	42.9	%
Critical Slope	0.00638	ft/ft
Velocity	19.52	ft/s
Velocity Head	5.92	ft
Specific Energy	7.42	ft
Froude Number	3.23	
Maximum Discharge	216.44	ft ³ /s
Discharge Full	201.21	ft ³ /s
Slope Full	0.00586	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	42.91	%
Downstream Velocity	Infinity	ft/s

Worksheet for 95

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	18.02	in
Critical Depth	2.75	ft
Channel Slope	4.0	%
Critical Slope	0.00638	ft/ft

Cross Section for 95

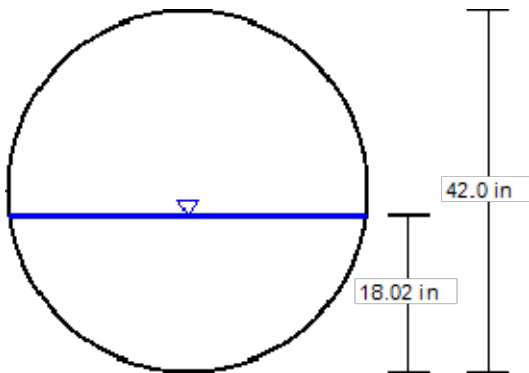
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	4.0 %
Normal Depth	18.02 in
Diameter	42.0 in
Discharge	77.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 96

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.8	%
Diameter	36.0	in
Discharge	56.00	ft ³ /s

Results

Normal Depth	13.53	in
Flow Area	2.43	ft ²
Wetted Perimeter	3.96	ft
Hydraulic Radius	7.36	in
Top Width	2.91	ft
Critical Depth	2.43	ft
Percent Full	37.6	%
Critical Slope	0.00722	ft/ft
Velocity	23.05	ft/s
Velocity Head	8.26	ft
Specific Energy	9.38	ft
Froude Number	4.44	
Maximum Discharge	200.37	ft ³ /s
Discharge Full	186.27	ft ³ /s
Slope Full	0.00705	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	37.60	%
Downstream Velocity	Infinity	ft/s

Worksheet for 96

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	13.53	in
Critical Depth	2.43	ft
Channel Slope	7.8	%
Critical Slope	0.00722	ft/ft

Cross Section for 96

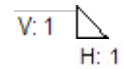
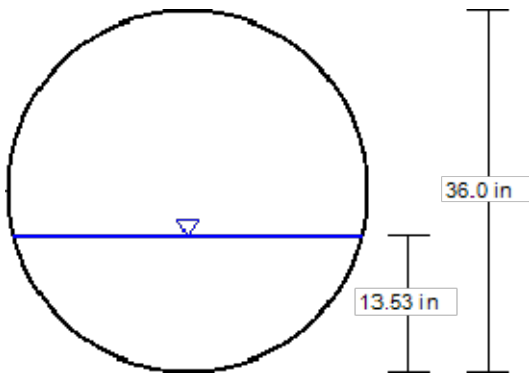
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.8 %
Normal Depth	13.53 in
Diameter	36.0 in
Discharge	56.00 ft ³ /s

Cross Section Image



Addendum #1 Update #1 to the Master Conceptual Drainage Study for

Summerlin West Village 22

Las Vegas, Nevada

W.O. # 7861-3A

Prepared for:

Howard Hughes Company, LLC

Submitted to:

City of Las Vegas
Public Works



HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Summerlin West Village 22 Date: March 20, 2019

Location of Development: a) Descriptive (Cross Streets) North/South: I-215 Western Beltway

East/West: Summerlin Parkway

b) Section: 23 and 14 Township: 20S Range: 59E

c) APN : 137-14-401-006, 137-23-101-002

Name of Owner: The Howard Hughes Company, LLC

Telephone No.: (702) 791-4336 Fax No.: (702) 791-4453 E-Mail Address: chris.anderson@howardhughes.com

Address: 10801 W. Charleston Blvd. LV, NV, 89135

Contact Person-Name: Joanna Ayson Telephone No.: (702)-873-7550

* E-Mail Address: jayson@vtnnv.com Fax No.: (702)-362-2597

Firm: VTN Nevada

Address: 2727 S. Rainbow Blvd, LV, NV, 89146

Type of Land Development/Land Disturbance Process:

☐	Rezoning	☐	Subdivision Map	☐	Clearing and Grading Only
☐	Parcel Map	☒	Planned Unit Development	☐	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit		

1. Total Owned Land Area: At Site: +/-446 Acres Being Developed/Disturbed: +/-446 Acres

2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No

3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ Yes** ☐ No

4. Proposed type of development (Residential, Commercial, Etc.): Mixed-use master plan

5. Approximate upstream land area which drains to the subject site: +/- 61 acres

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: SWPA MPU (DS4926), Western Segment Las Vegas Beltway from Summerlin to Cheyenne (DS2610), Summerlin Lake Mead Blvd Improvements (DS4146)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing 66" RCP in Lake Mead Pkwy, Existing I-215 Western Beltway Channel, future SWPA CCRFCD storm drain facilities

8. Briefly describe your proposed schedule for the subject project: As soon as possible



Engineer's Seal

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

***New Required Field**

****Review and concurrence of the Clark County Regional Flood Control District is required.**

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

**ADDENDUM #1 TO UPDATE #1
TO THE MASTER CONCEPTUAL DRAINAGE STUDY
FOR
SUMMERLIN WEST VILLAGE 22
CLARK COUNTY, NEVADA
W.O. # 7861**

Prepared for:
HOWARD HUGHES COMPANY LLC

Submitted to:
**CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS**



March 20, 2019
W.O. #7861

City of Las Vegas
Department of Public Works
333 N. Rancho Blvd., 7th Floor
Las Vegas, NV 89106

Attention: Albert Sung, P.E.
Flood Control Project Engineer

SUBJECT: ADDENDUM #1 TO UPDATE #1 TO THE MASTER CONCEPTUAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22

Mr. Sung:

This *Addendum #1 to Update #1 to the Master Conceptual Drainage Study for Summerlin West Village 22* is being submitted to the City of Las Vegas to address your review comments dated March 6, 2019.

Comment #1

The subject Update #1 to Summerlin Village 22 will not be approved prior to the final approval of the Update to Summerlin West Planning Area Master Drainage Study,

RESPONSE: The Update to the Drainage Study for Summerlin West Planning Area Master Plan Update (referred to as the Overall MCDS) was conditionally approved by the City of Las Vegas on March 13, 2019 subject to Clark County Regional Flood Control District (CCRFCD) and Clark County Public Works (CCPW) concurrence. The Overall MCDS is currently under review by CCRFCD and CCPW.

Comment #2

The site is adjacent to or crosses an existing or proposed Clark County Regional Flood Control District (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

Please note that effective March 15, 2019, the CCRFCD adopts new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

<http://gustfront.ccrfcd.org/LandDev/LandDev.aspx>

RESPONSE: A copy of the drainage study and all associated addenda will be submitted to CCRFCD for concurrence after approval by CLV.

Comment #3

The site is also adjacent to the Clark County Western Beltway project. The engineer must coordinate with Clark County Department of Public Works (CCPW) and incorporate any concerns for mutual boundary conditions. CCPW concurrence is required prior to the final approval of the master conceptual study

RESPONSE: VTN agrees to coordinate with CCPW to address any concerns for the mutual boundary conditions. A copy of the conceptual drainage study and all associated addenda will be submitted to CCPW for concurrence.

Comment #4

Atkins is working on the 2018 MPU. Coordinate and verify the proposed regional flood control facilities as shown on Figure 7 with Atkins for inclusion of the Summerlin West Village 22 regional facilities into the ongoing 2018 MPU.

RESPONSE: VTN agrees to coordinate with Atkins for inclusion of the proposed facilities in the ongoing 2018 MPU.

Comment #5

The Master Drainage Study Update for Summerlin West Planning Area proposes a modification to internal flow patterns that alters the flow patterns to the Beltway Channel system downstream of the Summerlin Parkway interchange. The modification proposes a storm drain system within Summerlin Village 22 area (Storm Drain F) that will collect flows from the Gowan channel tributary area and route them into the Beltway Channel (MPU Facility APBE 0122). This resulted in increased flows in the Beltway Channel segment between Summerlin Parkway and Far Hills Boulevard, ie, mitigation measures are required for the impacted Beltway Channel segment.

A technical drainage study for the analysis, design and construction plans for the Beltway Channel modifications must be submitted and approved by the City prior to the individual onsite parcel developments.

RESPONSE: Acknowledged. This comment was also included as a condition on the conditional approval letter of the original study.

Comment #6

The Grand Park Detention Basin is proposed to regulate and meter outflow to match the previously approved downstream flow conditions at the junction of Far Hills storm drain and the Beltway Channel. Without the Grand Park Detention Basin, there will be a net increase in flows at the Beltway Channel downstream of Far Hills intersection exceeding the previously approved flow.

A technical drainage study for the analysis, design and construction plans for the Grand Park Detention Basin must be submitted and approved by the City prior to the individual onsite parcel developments.

RESPONSE: Acknowledged. This comment was also included as a condition on the conditional approval letter of the original study.

Comment #7

Page 2 of the Update #1, in the Table of “Re-Evaluation of SWPA MPU CCRFCD Facilities”, Facility SD-F1C and SD-F1D are shown as 6’X5’ RCB, however, they are 7’X5’ RCB per Figure 7. Same for Facility SD-F3 has a discrepancy of 8X7’ vs. 8’X8’. Review and revise accordingly in the next submittal.

RESPONSE: The following table was submitted on Page 2 of the text. Please note that the name of concentration point CE has been revised to CES-1 since the previous submittal. No other values have changed.

RE-EVALUATION OF SWPA MPU CCRFCD FACILITIES						
Facility Per Overall SWPA MCDS	Design Slope	Q100	Tributary Basin/CP	Velocity ft/s	New Facility Size	Facility Size Per Overall SWPA MCDS
	%	cfs				
SD-F	7.0	189	3-0*	30.02	42" RCP	42" RCP
SD-F1A	7.0	242	COFFCOS2	26.98	5'X5' RCB	5'X5' RCB
SD-F1B	1.0	317	CSTJ1	13.69	5'X5' RCB	6'X5' RCB
SD-F1C	1.0	382	CES-1	14.68	7'X5' RCB	6'X5' RCB
SD-F1D	0.5	642	CES-1 + CSTG1	12.72	8'X7' RCB	6'X5' RCB
SD-F2	4.5	749	DUMMY3	30.40	8'X8' RCB	8'X7' RCB
SD-F3	0.5	779	CP3-Q*	13.22	8'X8' RCB	8'X7' RCB

Please refer to the column “New Facility Size” for the sizes that are proposed with this study. The last column, “Facility Size per Overall SWPA MCDS” refers to the sizes established in the SWPA MCDS and are superseded by the sizes shown in this study. The table above indicates that facility SD-F1C and SDF-1D are a 7’X5’ RCB and a 8’X7’ RCB, respectively. The label for SD-F1C on Figure 7 was correct and therefore has not been revised. The label for SD-F1D on Figure 7 was revised to callout 8’X7’ RCB to match the table and calculations. SD-F3 was shown as an 8’x8’ RCB on both the table and Figure 7 in the previous submittal, therefore the label for SD-F3 has not been revised.

Comment #8

Facility 11, a 66”-RCP in Lake Mead Boulevard is proposed to accept 583cfs, an increase of 210 cfs from 373 cfs in the original study. Provide an update study to the Lake Mead Boulevard Street Improvements Project concurrently with the next submittal.

RESPONSE: The offsite basins OFF1, OFF2, OFF3, and OFF-ST have been removed from the analysis and are no longer shown to drain to the existing Lake Mead Boulevard storm drain. The offsite basins will drain north towards Village 26, which is consistent with the drainage patterns shown in the Overall MCDS. In addition, basin COS-1 has been removed because it is assumed that the area will be

preserved and will continue to drain north to Village 26. The basins have been removed from Figure 6, and the revised Figure 6 been included in Appendix A. The revised hydrologic calculations have been included in Appendix B.

Facilities 1 and 2 in Lake Mead Boulevard are no longer required and have been removed from Figure 7. Facility 4 is now only intended for the street flow generated by basin LM. The flow rate in the existing Lake Mead Boulevard storm drain has reduced to 201 cfs (CP1) as a result of the revisions. Therefore, the flow rate within the existing 66-inch RCP is now within the referenced design flow of 383 cfs, and an update to the Lake Mead Boulevard Street Improvements project is no longer required. Revised hydrologic calculations have been included in Appendix B.

Comment #9

Figure 8 (Interim Condition Ditch Locations): Channel facility Legend Yellow dotted line is wrongly identified as Carriage Hill Drive (Desert Foothills to Street F). The correct section of Carriage Hill Drive is form Street F to Street I.

RESPONSE: The legend has been revised to call out the correct street names. Since the submittal of this drainage study, several street names for Summerlin West Planning Area have been established and are summarized in the following table. The drainage maps have been revised to show the correct street names and have been included in Appendix A.

Old Name	New Name
Street A	Redpoint Drive
Street B	Kindle Corner Ave
Street C	Red Pass Drive
Street D	Clowder Spring Way
Street E	Flight Range Ave
Street F	Kindle Rise Way
Street G	Fleet Wing Avenue
Street H	Clowder Pass Way
Street I	Kestrel Creek Avenue
Street J	Kettle Ridge Drive
Street K	Park Drift Trail
Street L	Bask Ridge Drive
Street M	N/A
Street N	Scurry Bend Drive
Street O	Calico Bend Drive
Street P	Highland Pride Lane
Street Q	Sunset Run Drive
Street AA	N/A
Street EE	Flight Edge Way
Street FF	Hive Bluff Lane
Street KK	N/A
Street LL	Grand Park Boulevard

FGH Connector	Meadow Run Street
V22 Carriage Hill	Kettle Bend Road
Summerlin Pkwy WB	Sunset Run Drive
Summerlin Pkwy EB	Sky Vista Drive

Additional Revisions:

The basin boundary for CARR1 has been revised as a result of a land plan revision. The revised alignment of CARR1 also affected the areas of the surrounding basins DES1, DES2, B, and I. The area and flow changes for the affected basins and concentration points are summarized in the following table.

Basin	Previous Submittal		Addendum #1		Difference	
	Area (Acres)	Q100 (cfs)	Area (Acres)	Q100 (cfs)	Area (Acres)	Q100 (cfs)
DES1	3.83	15	3.76	14	-0.07	-1
C-COS2	-	94	-	93	-	-1
DES2	3.58	16	3.40	15	-0.18	-1
CDES2	-	75	-	74	-	-1
CP2	-	199	-	198	-	-1
CARR1	4.93	22	6.68	29	1.75	7
I	9.22	33	10.56	38	1.34	5
CCARR1	-	253	-	265	-	12
CP4	-	377	-	389	-	12
B	90.03	339	87.82	328	-2.21	-11

The normal depth calculations for the proposed facilities have been revised according to the new flow rates summarized in the above table. In addition, proposed parcel stubs been updated to be a minimum size of 30-inches for flexibility. Figure 7 has been updated accordingly and included in Appendix A. Hydraulic calculations have been included in Appendix C.

Parcels ES-1 and E have exchanged locations. Basins ES-1 and E utilize the same land use assumption (Commercial/Urban District) in the curve number calculations, therefore curve numbers for the basins are not affected by the revision. Other hydrologic parameters including rainfall depths, travel times, and areas are also not affected by the location exchange. The label for ES-1 and E have been swapped on all calculations and figures. The label changes do not affect hydraulic calculations.

I hope this addresses your concerns regarding this project. If there are any questions or any additional information is required, please contact this office.

Respectfully Submitted,

VTN Consulting

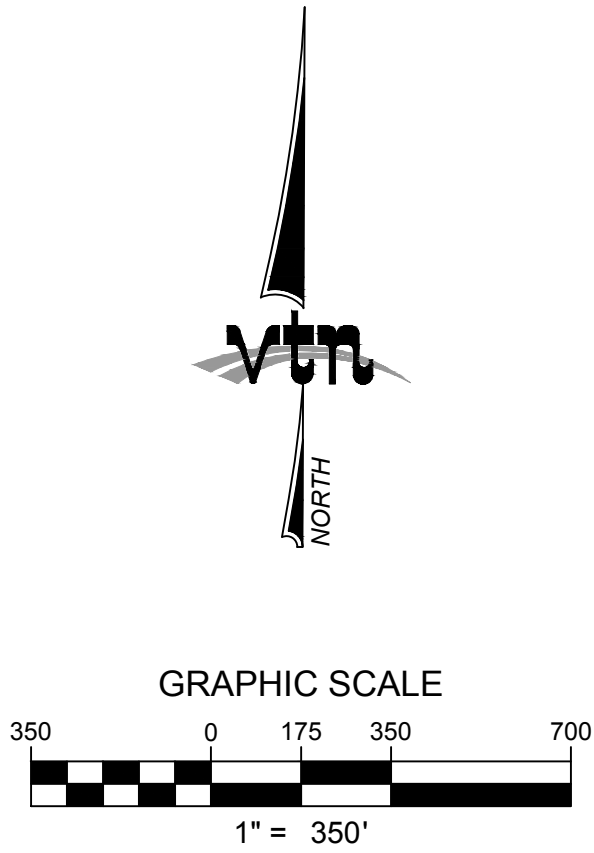


Joanna Ayson, E.I.

APPENDIX

APPENDIX A

FIGURES



LEGEND

- BASIN BOUNDARY
- BASIN DESIGNATION
- CONCENTRATION POINT
- FLOW ARROW

ULTIMATE CONDITION HEC-1 SUMMARY TABLE					
BASIN ID	AREA (ac)	Q100 (CFS)	BASIN ID	AREA (ac)	Q100 (CFS)
LM	9.16	41	STJ1	3.76	17
D	11.27	47	CSTJ1	-	317
DES1	3.76	14	NP-2	1.53	6
CDES1	-	62	ES-1	14.05	59
COS-2	10.17	32	CES-1	-	382
CCOS-2	-	93	OFF4	52.68	209
A	16.92	66	L	8.09	35
CA	-	160	STL1	1.78	8
CP1	-	201	CSTL1	-	43
STI	2.46	11	STG1	1.77	8
C	11.68	50	CSTG1	-	260
CSTI	-	61	M	11.24	48
G	7.08	30	STJ2	3.10	13
CG	-	91	S	3.01	11
H	7.65	33	STF	1.83	8
CH	-	124	NP-3	3.61	9
STH	2.29	10	U	3.49	11
J	5.8	25	DES4	1.72	8
CJ	-	35	CDES4	-	19
K	5.17	22	V	3.85	14
CK	-	58	W	3.97	15
NP-1	0.49	2	CVW	-	29
CNP-1	-	59	CARR3	2.95	13
DES2	3.40	15	STE3	1.11	5
CDES2	-	74	EE	6.65	24
CP2	-	198	STEE3	1.49	7
CARR1	6.68	29	HH	4.60	19
I	10.56	38	CARR4	3.10	13
CCARR1	-	265	OFF5	12.73	53
N	6.67	28	STE1	1.72	8
STFF	1.08	5	Y	8.07	31
CSTFF	-	33	CY	-	92
STG2	2.83	13	STL2	1.79	8
CSTG2	-	46	CSTL2	-	100
O	3.25	13	Z	7.04	22
P	3.37	13	STJ3	2.44	11
COP	-	26	CSTJ3	-	33
DES3	1.84	8	STE2	1.78	8
CDES3	-	34	BB	6.18	23
CP3	-	80	T	4.02	16
Q	3.62	14	CC	5.50	20
R	3.49	15	DD	4.57	16
CQR	-	29	DES5	1.80	8
CARR2	3.58	15	NP-4	0.71	2
CCARR2	-	44	AA	4.64	19
CP4	-	389	STJ4	1.05	4
II	19.56	77	CSTJ4	-	23
X	16.47	56	STEE1	1.45	7
B	87.12	328	CSTEE2	-	30
DC-1	10.84	48	STEE2	2.40	11
COS-3	1.75	4	FF	3.08	13
3-O*	-	189	CFF	-	53
OFF-COS2	19.16	53	GG	3.74	16
COFFCOS2	-	242	DES6	1.11	5
E	13.96	58			

THE HOWARD HUGHES CORPORATION

10801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

FIGURE 6
ULTIMATE CONDITION BASIN MAP

DRAWN BY: AH
DESIGNED BY: J/A
CHECKED BY: J/A
PROJECT NO: 7801

SHEET
OF SHEETS
DRAWING NO.

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 813-7500 FAX: (702) 362-2897
WEB: WWW.VTNV.COM

CONSULTING ENGINEERS & LAND SURVEYORS

SUMMERLIN WEST VILLAGE 22

SCALE: 1" = 300' HORIZ.
NA VERT.

REVISION

BY

DATE

REV

PLANNERS & LAND SURVEYORS

PLANNERS & LAND SURVEYORS

PLANNERS & LAND SURVEYORS

PLANNERS & LAND SURVEYORS

PLANNERS & LAND SURVEYORS

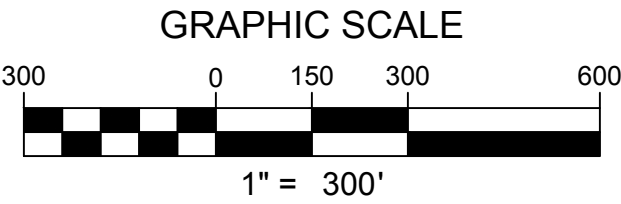
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PLANNERS & LAND SURVEYORS

PLANNERS & LAND SURVEYORS

PLANNERS & LAND SURVEYORS

PLANNERS & LAND SURVEYORS



LEGEND

- CCRFGD STORM DRAIN ALIGNMENT
- EXISTING FACILITY
- VILLAGE 22 LOCAL STORM DRAIN
- W51 BASIN DESIGNATION
- CONCENTRATION POINT
- LOCAL FACILITY DESIGNATION
- DEVELOPED CONDITION FLOW ARROW

VILLAGE 22 LOCAL FLOOD PROTECTION FACILITIES									
Facility #	Design Slope %	Q100 cfs	Velocity ft/s	Facility	Facility #	Design Slope %	Q100 cfs	Velocity ft/s	Facility
4	5.4	41	18.69	30" RCP	56	1.5	44	11.54	30" RCP
5	2.0	47	13.16	30" RCP	58	1.5	15	8.93	30" RCP
6	2.7	62	15.58	30" RCP	61	3.1	389	26.21	60" RCP
7	2.0	32	12.11	30" RCP	62	8.0	35	20.39	30" RCP
8	2.9	93	17.93	36" RCP	63	1.5	43	11.50	30" RCP
9	8.0	66	14.44	36" RCP	64	8.0	48	22.29	36" RCP
10	3.0	160	20.54	42" RCP	65	8.2	260	33.90	42" RCP
11	N/A	201	N/A	EX 66" RCP**	66	3.1	11	10.63	30" RCP
12A	8.0	53	22.91	36" RCP	68	1.3	9	7.36	30" RCP
12B	2.6	53	15.05	36" RCP	69	8.0	11	14.88	30" RCP
13	8.0	58	10.63	36" RCP	72	7.0	29	18.72	30" RCP
19	0.5	50	8.01	42" RCP	74	6.3	5	10.83	30" RCP
20	5.8	61	20.97	42" RCP	77A	8.0	53	22.91	36" RCP
21	0.5	30	7.07	36" RCP	77B	7.4	209	31.33	42" RCP
22	9.7	91	28.22	42" RCP	78	8.0	31	20.01	30" RCP
23	0.8	33	8.46	30" RCP	79	8.1	92	26.52	36" RCP
24	10.1	124	31.13	42" RCP	80	3.1	8	9.69	30" RCP
25	1.5	6	6.89	30" RCP	81	8.0	100	27.08	36" RCP
27	2.3	59	14.86	36" RCP	82	2.9	22	12.60	30" RCP
29	0.5	25	6.65	30" RCP	83	3.2	23	13.22	30" RCP
30	7.0	35	19.71	30" RCP	84	0.5	16	6.05	30" RCP
33	0.6	22	6.99	30" RCP	85	2.3	20	11.29	30" RCP
34	5.0	58	19.78	36" RCP	86	8.0	16	16.59	30" RCP
35	1.0	2	4.32	30" RCP	87	8.0	19	17.43	30" RCP
36	1.0	74	11.43	42" RCP	88	7.8	30	19.83	30" RCP
37	0.9	198	13.98	60" RCP	89	8.0	13	15.62	30" RCP
40	7.6	38	20.77	30" RCP	90	7.8	53	22.70	36" RCP
41	0.9	265	13.39	6"X6" RCB	91	0.5	2	3.39	30" RCP
43	0.5	28	6.73	30" RCP	92	2.7	16	11.25	30" RCP
44	3.3	33	14.72	30" RCP	93	7.4	24	18.12	30" RCP
45	6.8	46	20.97	30" RCP	94	6.2	19	15.91	30" RCP
50	7.9	26	18.97	30" RCP	95	4.0	77	19.52	42" RCP
51	2.5	34	13.37	30" RCP	96	5.0	56	23.05	36" RCP
52	7.1	80	24.48	36" RCP	97	5.0	339	30.51	54" RCP
55	7.3	29	19.01	30" RCP	98	N/A	138	N/A	EX 48" RCP***

*Replaces existing 30" RCP stub provided in Lake Mead Study
**Existing 66" RCP per Lake Mead Blvd Study
***Existing Facility (Per Lake Mead Blvd Study) can accept 138 cfs and may be used for flexibility

THE HOWARD HUGHES CORPORATION

10801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

FIGURE 7
LOCAL STORM DRAIN
FACILITIES MAP

SUMMERLIN WEST VILLAGE 22

DRAWN BY: ATM MAY 2018

DESIGNED BY: STS/TA MAY 2018

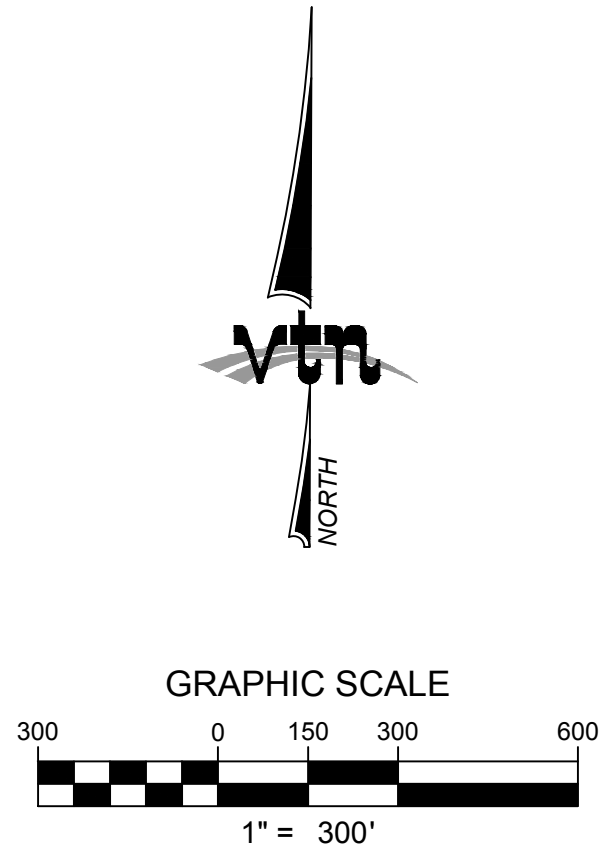
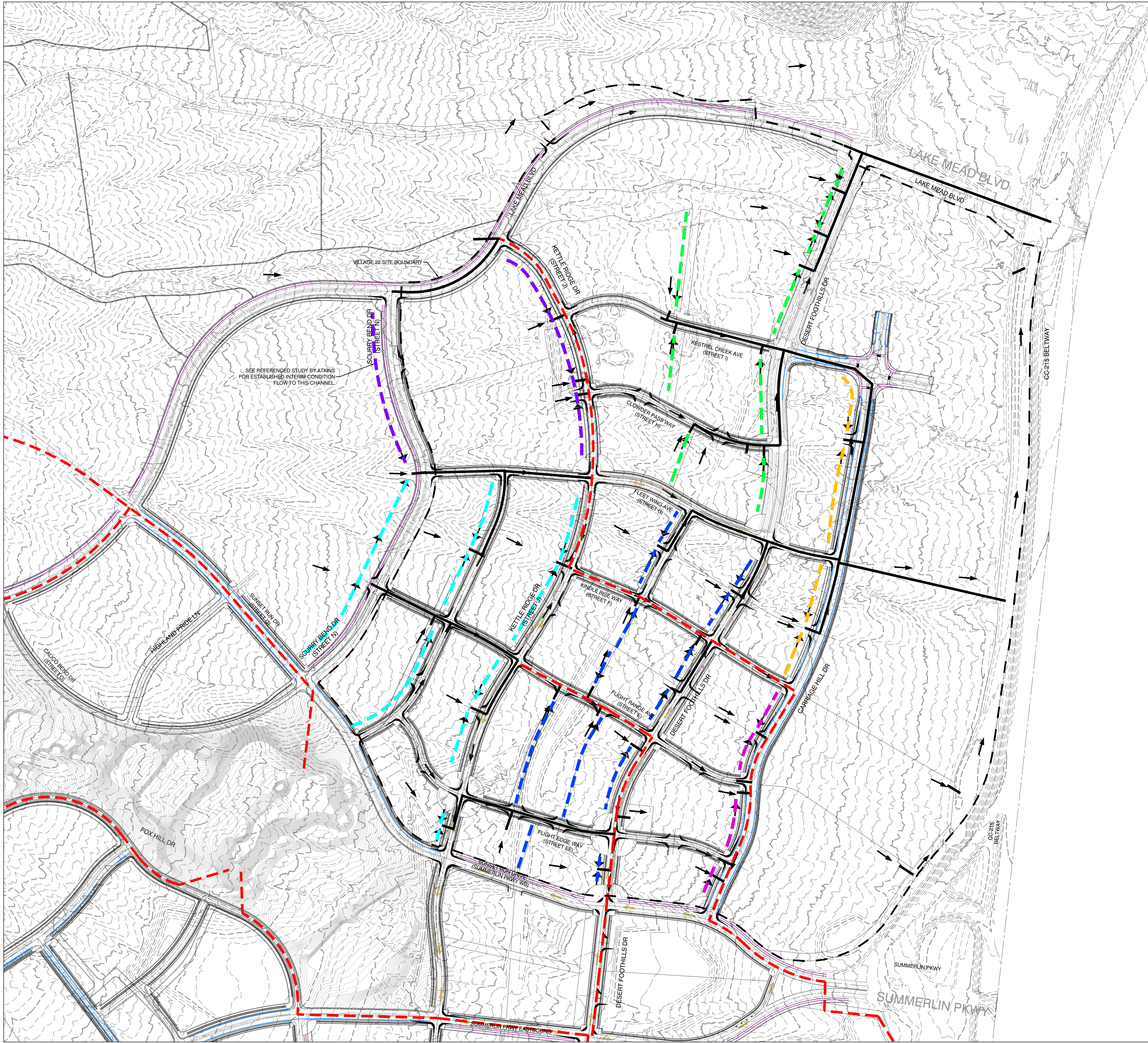
CHECKED BY: J/A MAY 2018

PROJECT NO: 7801 SCALE: 1"=300' HORIZ. VERT. NA

SHEET

OF SHEETS
DRAWING NO.

H:\7801 Village 22 Master\Drawings\4_ADD1 TO UP\A_Figures\Figure 7 - Local Flood Control Facilities Map.dwg



CHANNEL FACILITY LEGEND

- TO BE CONSTRUCTED WITH CARRIAGE HILL DR (KESTREL CREEK AVE TO KINDLE RISE WAY)
- TO BE CONSTRUCTED WITH CARRIAGE HILL DR (SUNSET RUN DR TO KINDLE RISE WAY)
- TO BE CONSTRUCTED WITH DESERT FOOTHILLS DR (LAKE MEAD BLVD TO FLEET WING AVE)
- TO BE CONSTRUCTED WITH DESERT FOOTHILLS DR (SUNSET RUN DR TO FLEET WING AVE)
- TO BE CONSTRUCTED WITH KETTLE RIDGE DR (LAKE MEAD BLVD TO FLEET WING AVE)
- TO BE CONSTRUCTED WITH KETTLE RIDGE DR (SUNSET RUN DR TO FLEET WING AVE)

STORM DRAIN LEGEND

- CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT STORM DRAIN
- VILLAGE 22 LOCAL STORM DRAIN

DRAWN BY: AH		AUGUST 2018	
DESIGNED BY: Z/A			
CHECKED BY: J/A			
PROJECT NO: 7801		SCALE: 1" = 300' HORIZ. N/A VERT.	
SHEET			
OF SHEETS			
DRAWING NO.			
FIGURE 8 INTERIM CONDITION DITCH LOCATIONS		SUMMERLIN WEST VILLAGE 22	
THE HOWARD HUGHES CORPORATION 10801 WEST CHARLESTON BLVD, 3RD FLOOR LAS VEGAS, NEVADA 89135		2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH: (702) 893-7500 FAX: (702) 362-2887 WEB: WWW.VTNV.COM CONSULTING ENGINEERS & LAND SURVEYORS	
REV		DATE	
BY		REVISION	

APPENDIX B

HYDROLOGIC

CALCULATIONS

CURVE NUMBERS FOR SOILS - W.O. #7861

Soil # 152 Cave gravelly fine sandy loam, 0 to 4 percent slopes							
Soil	Percent	Group	Apartment/Condo ₁	Townhouses ₂	Open Space ₃	Urban Districts ₄	Impervious ₅
Cave	100%	D	93	92	89	95	98
Total	100%		93	92	89	95	98

Soil # 155 Cave gravelly fine sandy loam, 4 to 15 percent slopes							
Soil	Percent	Group	Apartment/Condo ₁	Townhouses ₂	Open Space ₃	Urban Districts ₄	Impervious ₅
Cave	100%	D	93	92	89	95	98
Total	100%		93	92	89	95	98

Soil # 156 Vace - Wechech association							
Soil	Percent	Group	Apartment/Condo ₁	Townhouses ₂	Open Space ₃	Urban Districts ₄	Impervious ₅
Vace and Similar	45%	D	93	92	89	95	98
Wechech and Similar	25%	D	93	92	89	95	98
Wechech, steep, and similar	15%	D	93	92	89	95	98
Weiser	8%	B	88	87	79	92	98
Irongold	4%	D	93	92	89	95	98
Commski	2%	B	88	87	79	92	98
Threelakes	1%	A	81	80	68	89	98
Total	100%		93	92	88	95	98

Soil # 502 Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes							
Soil	Percent	Group	Apartment/Condo ₁	Townhouses ₂	Open Space ₃	Urban Districts ₄	Impervious ₅
Canutio	55%	A	81	80	68	89	98
Cave	40%	D	93	92	89	95	98
Arizo	5%	D	93	92	89	95	98
Total	100%		87	86	78	92	98

1-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A

* Residential (Apartments / Condos)

2-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A

* Residential (Townhouses)

3-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4

* Open spaces in poor condition (grass cover < 50%)

4-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4

* Urban Districts (Commercial / Business & Residential with average lot size <6000 sqft)

5-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4

*Impervious (Paved Streets)

Curve Number calculations for ONSITE Basins

Basin	Type	Soil Percentage	Apartment/Condo ₁	Townhouses ₂	Open Space ₃	Urban Districts ₄	Impervious ₅	CN Value
A	155	100%				100%		95.0
B	152	7%	40%			60%		93.5
	155	76%	40%			60%		
	502	17%	40%			60%		
C	155	100%				100%		95.0
D	155	100%				100%		95.0
E	155	100%				100%		95.0
ES-1	155	100%				100%		95.0
G	155	100%				100%		95.0
H	155	100%				100%		95.0
I	152	15%		100%				92.0
	155	85%		100%				
J	152	2%				100%		95.0
	155	98%				100%		
K	152	38%				100%		95.0
	155	62%				100%		
L	155	87%				100%		94.6
	502	13%				100%		
M	155	76%				100%		94.3
	502	24%				100%		
N	152	3%				100%		95.0
	155	97%				100%		
O	155	100%		95%		5%		92.2
P	155	100%		95%		5%		92.2
Q	155	100%		95%		5%		92.2
R	155	77%		95%		5%		94.3
	502	23%		95%		5%		
S	155	35%		95%		5%		88.3
	502	65%		95%		5%		
T	502	100%				100%		92.0
U	502	100%		95%		5%		86.3
V	155	0%	40%			60%		90.0
	502	100%	40%			60%		
W	502	100%	40%			60%		90.0
X	502	100%	40%			60%		90.0
Y	156	14%				100%		92.4
	502	86%				100%		
Z	156	27%		100%				87.6
	502	73%		100%				
AA	156	100%	100%					93.0
BB	156	24%	40%			60%		91.0
	502	76%	40%			60%		
CC	156	16%	40%			60%		90.7
	502	84%	40%			60%		

DD	156	15%	40%			60%		90.6
	502	85%	40%			60%		
EE	156	11%	40%			60%		90.5
	502	89%	40%			60%		
FF	156	100%	40%			60%		94.2
GG	156	100%	40%			60%		94.2
HH	156	100%	40%			60%		94.2
II	156	64%	40%			60%		92.7
	502	36%	40%			60%		
COS-1	155	16%			100%			79.8
	502	84%			100%			
COS-2	155	100%			100%			89.0
COS-3	156	67%			100%			84.7
	502	33%			100%			
NP-1	155	100%			100%			89.0
NP-2	155	100%			100%			89.0
NP-3	155	21%			100%			80.3
	502	79%			100%			
NP-4	156	61%			100%			84.1
	502	39%			100%			
DC-1	152	16%					100%	98.0
	155	53%					100%	
	502	31%					100%	
LM	155	95%					100%	98.0
	502	5%					100%	
DES1	155	100%					100%	98.0
DES2	152	24%					100%	98.0
	155	76%					100%	
DES3	155	100%					100%	98.0
DES4	155	18%					100%	98.0
	502	82%					100%	
DES5	156	16%					100%	98.0
	502	84%					100%	
DES6	156	100%					100%	98.0
CARR1	152	6%					100%	98.0
	155	94%					100%	
CARR2	155	77%					100%	98.0
	502	23%					100%	
CARR3	155	6%					100%	98.0
	502	94%					100%	
CARR4	156	57%					100%	98.0
	502	43%					100%	
STI	155	100%					100%	98.0
STJ1	155	100%					100%	98.0
STJ2	155	70%					100%	98.0
	502	30%					100%	

STJ3	156	33%					100%	98.0
	502	67%					100%	
STJ4	156	100%					100%	98.0
STH	155	100%					100%	98.0
STG1	155	100%					100%	98.0
STG2	152	42%					100%	98.0
	155	58%					100%	
STF	155	100%					100%	98.0
STE1	502	100%					100%	98.0
STE2	502	100%					100%	98.0
STE3	502	100%					100%	98.0
STEE1	156	99%					100%	98.0
STEE2	156	99%					100%	98.0
STEE3	156	100%					100%	98.0
STFF	155	100%					100%	98.0
STL1	155	82%					100%	98.0
	502	18%					100%	
STL2	156	32%					100%	98.0
	502	68%					100%	

TRAVEL TIME CALCULATIONS

DEVELOPMENT: **Summerlin West Village 22**

W.O. # **7861**

CALCULATED BY: **AH**

$$Velocity = CS^{\frac{1}{2}}$$

C1 applies to the first 500 feet of travel distance
C2 applies to the remaining travel distance

Existing:	Developed
C1=14.8 C2=29.4	C1=20.2 C2=30.6

					First 500 feet		Remaining Travel Distance	
Basin	Length (ft)	High Elev (ft)	Low Elev (ft)	Slope (ft/ft)	C1	V1 (fps)	C2	V2 (fps)
DEVELOPED CONDITION ONSITE								
A	1651	3448	3310	0.084	20.2	5.8	30.6	8.8
B	1355	3336	3230	0.078	20.2	5.6	30.6	8.6
C	538	3454	3371	0.154	20.2	7.9	30.6	12.0
D	541	3368	3327	0.076	20.2	5.6	30.6	8.4
E	849	3526	3447	0.093	20.2	6.2	30.6	9.3
ES-1	941	3514	3422	0.098	20.2	6.3	30.6	9.6
G	419	3435	3408	0.064	20.2	5.1	30.6	7.8
H	494	3408	3336	0.146	20.2	7.7	30.6	11.7
I	1044	3347	3299	0.046	20.2	4.3	30.6	6.6
J	403	3433	3371	0.154	20.2	7.9	30.6	12.0
K	326	3389	3346	0.132	20.2	7.3	30.6	11.1
L	341	3524	3462	0.182	20.2	8.6	30.6	13.0
M	406	3486	3423	0.155	20.2	8.0	30.6	12.1
N	468	3436	3382	0.115	20.2	6.9	30.6	10.4
O	267	3386	3352	0.127	20.2	7.2	30.6	10.9
P	392	3399	3361	0.097	20.2	6.3	30.6	9.5
Q	311	3353	3315	0.122	20.2	7.1	30.6	10.7
R	361	3365	3328	0.102	20.2	6.5	30.6	9.8
S	256	3440	3398	0.164	20.2	8.2	30.6	12.4
T	284	3451	3403	0.169	20.2	8.3	30.6	12.6
U	276	3421	3384	0.134	20.2	7.4	30.6	11.2
V	253	3376	3337	0.154	20.2	7.9	30.6	12.0
W	413	3383	3344	0.094	20.2	6.2	30.6	9.4
X	1072	3338	3254	0.078	20.2	5.7	30.6	8.6
Y	774	3543	3496	0.061	20.2	5.0	30.6	7.5
Z	800	3500	3460	0.050	20.2	4.5	30.6	6.8
AA	674	3513	3456	0.085	20.2	5.9	30.6	8.9
BB	703	3468	3428	0.057	20.2	4.8	30.6	7.3
CC	652	3431	3408	0.035	20.2	3.8	30.6	5.7
DD	621	3421	3391	0.048	20.2	4.4	30.6	6.7
EE	555	3393	3341	0.094	20.2	6.2	30.6	9.4
FF	269	3469	3416	0.197	20.2	9.0	30.6	13.6
GG	392	3426	3392	0.087	20.2	5.9	30.6	9.0
HH	505	3387	3343	0.087	20.2	6.0	30.6	9.0
II	962	3337	3268	0.072	20.2	5.4	30.6	8.2
COS-1	1373	3450	3350	0.073	20.2	5.5	30.6	8.3
COS-2	1676	3452	3417	0.021	20.2	2.9	30.6	4.4
COS-3	1333	3309	3248	0.046	20.2	4.3	30.6	6.5
NP-1	98	3359	3343	0.163	20.2	8.2	30.6	12.4

TRAVEL TIME CALCULATIONS

DEVELOPMENT: **Summerlin West Village 22**

W.O. # **7861**

CALCULATED BY: **AH**

$$Velocity = CS^{\frac{1}{2}}$$

C1 applies to the first 500 feet of travel distance
C2 applies to the remaining travel distance

Existing:	Developed
C1=14.8 C2=29.4	C1=20.2 C2=30.6

Basin	Length (ft)	High Elev (ft)	Low Elev (ft)	Slope (ft/ft)	First 500 feet		Remaining Travel Distance	
					C1	V1 (fps)	C2	V2 (fps)
NP-2	95	3460	3420	0.421	20.2	13.1	30.6	19.9
NP-3	237	3408	3373	0.148	20.2	7.8	30.6	11.8
NP-4	123	3391	3376	0.122	20.2	7.1	30.6	10.7
DC-1	3630	3252	3219	0.009	20.2	1.9	30.6	2.9
LM	3472	3515	3305	0.060	20.2	5.0	30.6	7.5
DES1	1148	3344	3303	0.036	20.2	3.8	30.6	5.8
DES2	1035	3354	3336	0.017	20.2	2.7	30.6	4.0
DES3	552	3369	3337	0.058	20.2	4.9	30.6	7.4
DES4	652	3385	3366	0.029	20.2	3.4	30.6	5.2
DES5	696	3393	3380	0.019	20.2	2.8	30.6	4.2
DES6	318	3400	3391	0.028	20.2	3.4	30.6	5.1
CARR1	1512	3340	3296	0.029	20.2	3.4	30.6	5.2
CARR2	795	3355	3305	0.063	20.2	5.1	30.6	7.7
CARR3	1079	3365	3326	0.036	20.2	3.8	30.6	5.8
CARR4	842	3345	3324	0.025	20.2	3.2	30.6	4.8
STI	1262	3442	3345	0.077	20.2	5.6	30.6	8.5
STJ1	1498	3457	3415	0.028	20.2	3.4	30.6	5.1
STJ2	1025	3440	3413	0.026	20.2	3.3	30.6	5.0
STJ3	926	3473	3453	0.022	20.2	3.0	30.6	4.5
STJ4	268	3473	3454	0.071	20.2	5.4	30.6	8.1
STH	1102	3421	3343	0.071	20.2	5.4	30.6	8.1
STG1	890	3513	3421	0.103	20.2	6.5	30.6	9.8
STG2	1025	3424	3348	0.074	20.2	5.5	30.6	8.3
STF	887	3436	3370	0.074	20.2	5.5	30.6	8.3
STE1	831	3522	3458	0.077	20.2	5.6	30.6	8.5
STE2	867	3455	3384	0.082	20.2	5.8	30.6	8.8
STE3	505	3384	3341	0.085	20.2	5.9	30.6	8.9
STEE1	532	3503	3461	0.079	20.2	5.7	30.6	8.6
STEE2	791	3470	3393	0.097	20.2	6.3	30.6	9.5
STEE3	575	3386	3342	0.077	20.2	5.6	30.6	8.5
STFF	509	3401	3374	0.053	20.2	4.7	30.6	7.0
STL1	895	3489	3456	0.037	20.2	3.9	30.6	5.9
STL2	865	3526	3488	0.044	20.2	4.2	30.6	6.4

STANDARD FORM 4

DEVELOPMENT: Summerlin West Village 22

W.O. # 7861

CALCULATED BY: AH

V1 applies to the first 500 feet of travel distance V2 applies to the remaining travel distance			
Existing:		Developed	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1 - k)L^{1/2}}{S^{1/3}}$$

$$T_i = \frac{L}{60V}$$

$$k = 0.0132C_n - 0.39$$

$$T_c = T_i + T_t$$

SUB-BASIN DATA					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG.	Cn	K	AREA Ac.	AREA Mi^2	LENGTH Ft	SLOPE %	Ti Min.	LENGTH Ft.	SLOPE %	V1 fps (9a)	V2 fps (9b)	Tt Min.	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
(1)		(2)	(3)		(4)	(5)	(6)	(7)	(8)			(10)		(11)	(12)		
DEVELOPED CONDITION ONSITE																	
A	95.0	0.864	16.92	0.0264	100	1.0	4.25	1651	8.4	5.8	8.8	3.60	1751	19.73	7.84	0.078	
B	93.5	0.844	87.12	0.1361	100	1.0	4.61	1355	7.8	5.6	8.6	3.14	1455	18.08	7.75	0.077	
C	95.0	0.864	11.68	0.0183	100	1.0	4.25	538	15.4	7.9	12.0	1.10	638	13.54	5.35	0.054	
D	95.0	0.864	11.27	0.0176	100	1.0	4.25	541	7.6	5.6	8.4	1.58	641	13.56	5.83	0.058	
E	95.0	0.864	13.96	0.0218	100	1.0	4.25	849	9.3	6.2	9.3	1.98	949	15.27	6.22	0.062	
ES-1	95.0	0.864	14.05	0.0220	100	1.0	4.25	941	9.8	6.3	9.6	2.09	1041	15.78	6.34	0.063	
G	95.0	0.864	7.08	0.0111	100	1.0	4.25	419	6.4	5.1	7.8	1.36	519	12.88	5.61	0.056	
H	95.0	0.864	7.65	0.0120	100	1.0	4.25	494	14.6	7.7	11.7	1.07	594	13.30	5.32	0.053	
I	92.0	0.824	10.56	0.0165	100	1.0	4.96	1044	4.6	4.3	6.6	3.31	1144	16.36	8.27	0.083	
J	95.0	0.864	5.80	0.0091	100	1.0	4.25	403	15.4	7.9	12.0	0.85	503	12.79	5.10	0.051	
K	95.0	0.864	5.17	0.0081	100	1.0	4.25	326	13.2	7.3	11.1	0.74	426	12.37	4.99	0.050	
L	94.6	0.859	8.09	0.0126	100	1.0	4.34	341	18.2	8.6	13.0	0.66	441	12.45	5.00	0.050	
M	94.3	0.854	11.24	0.0176	100	1.0	4.42	406	15.5	8.0	12.1	0.85	506	12.81	5.27	0.053	
N	95.0	0.864	6.67	0.0104	100	1.0	4.25	468	11.5	6.9	10.4	1.14	568	13.16	5.38	0.054	
O	92.2	0.826	3.25	0.0051	100	1.0	4.93	267	12.7	7.2	10.9	0.62	367	12.04	5.54	0.055	
P	92.2	0.826	3.37	0.0053	100	1.0	4.93	392	9.7	6.3	9.5	1.04	492	12.73	5.96	0.060	
Q	92.2	0.826	3.62	0.0057	100	1.0	4.93	311	12.2	7.1	10.7	0.73	411	12.28	5.66	0.057	
R	94.3	0.855	3.49	0.0055	100	1.0	4.40	361	10.2	6.5	9.8	0.93	461	12.56	5.33	0.053	
S	88.3	0.776	3.01	0.0047	100	1.0	5.83	256	16.4	8.2	12.4	0.52	356	11.98	6.35	0.064	
T	92.0	0.824	4.02	0.0063	100	1.0	4.96	284	16.9	8.3	12.6	0.57	384	12.13	5.53	0.055	
U	86.3	0.749	3.49	0.0055	100	1.0	6.32	276	13.4	7.4	11.2	0.62	376	12.09	6.94	0.069	
V	90.0	0.798	3.85	0.0060	100	1.0	5.44	253	15.4	7.9	12.0	0.53	353	11.96	5.97	0.060	
W	90.0	0.798	3.97	0.0062	100	1.0	5.44	413	9.4	6.2	9.4	1.11	513	12.85	6.54	0.065	
X	90.0	0.798	16.47	0.0257	100	1.0	5.44	1072	7.8	5.7	8.6	2.59	1172	16.51	8.02	0.080	
Y	92.4	0.830	8.07	0.0126	100	1.0	4.86	774	6.1	5.0	7.5	2.28	874	14.86	7.14	0.071	
Z	87.6	0.767	7.04	0.0110	100	1.0	6.00	800	5.0	4.5	6.8	2.58	900	15.00	8.58	0.086	
AA	93.0	0.838	4.64	0.0073	100	1.0	4.72	674	8.5	5.9	8.9	1.74	774	14.30	6.47	0.065	
BB	91.0	0.811	6.18	0.0097	100	1.0	5.20	703	5.7	4.8	7.3	2.19	803	14.46	7.39	0.074	
CC	90.7	0.807	5.53	0.0086	100	1.0	5.28	652	3.5	3.8	5.7	2.64	752	14.18	7.91	0.079	
DD	90.6	0.806	4.57	0.0071	100	1.0	5.29	652	3.5	3.8	5.7	2.64	752	14.18	7.92	0.079	
EE	90.5	0.804	6.65	0.0104	100	1.0	5.33	621	4.8	4.4	6.7	2.18	721	14.01	7.50	0.075	
FF	94.2	0.853	3.08	0.0048	100	1.0	4.44	555	9.4	6.2	9.4	1.45	655	13.64	5.88	0.059	
GG	94.2	0.853	3.74	0.0058	100	1.0	4.44	269	19.7	9.0	13.6	0.50	369	12.05	4.94	0.049	Use Min TLAG = 0.050 per HCDDM
HH	94.2	0.853	4.60	0.0072	100	1.0	4.44	392	8.7	5.9	9.0	1.10	492	12.73	5.54	0.055	
II	92.7	0.833	19.56	0.0306	100	1.0	4.80	505	8.7	6.0	9.0	1.41	605	13.36	6.20	0.062	
COS-1	79.8	0.663	2.86	0.0045	100	1.0	7.87	962	7.2	5.4	8.2	2.48	1062	15.90	10.35	0.103	
COS-2	89.0	0.785	10.17	0.0159	100	1.0	5.67	1373	7.3	5.5	8.3	3.29	1473	18.18	8.96	0.090	Use Min TLAG = 0.100 per HCDDM
COS-3	84.7	0.728	1.75	0.0027	100	1.0	6.70	1676	2.1	2.9	4.4	7.29	1776	19.87	13.98	0.140	
NP-1	89.0	0.785	0.49	0.0008	100	1.0	5.67	1333	4.6	4.3	6.5	4.05	1433	17.96	9.72	0.097	
NP-2	89.0	0.785	1.53	0.0024	100	1.0	5.67	98	16.3	8.2	12.4	0.20	198	11.10	5.87	0.059	
NP-3	80.3	0.670	3.61	0.0056	100	1.0	7.74	95	42.1	13.1	19.9	0.12	195	11.08	7.86	0.079	
NP-4	84.1	0.720	0.71	0.0011	100	1.0	6.84	237	14.8	7.8	11.8	0.51	337	11.87	7.35	0.073	

STANDARD FORM 4

DEVELOPMENT: Summerlin West Village 22

W.O. # 7861

CALCULATED BY: AH

V1 applies to the first 500 feet of travel distance V2 applies to the remaining travel distance			
Existing:		Developed	
V1=148*S ^{1/2}	V2=294*S ^{1/2}	V1=202*S ^{1/2}	V2=306*S ^{1/2}

$$T_i = \frac{1.8(1.1 - k)L^{1/2}}{S^{1/3}}$$

$$T_i = \frac{L}{60V}$$

$$k = 0.0132C_n - 0.39$$

$$T_c = T_i + T_t$$

SUB-BASIN DATA					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG. (1)	Cn (2)	K (3)	AREA Ac. (4)	AREA MI^2 (5)	LENGTH Ft (6)	SLOPE % (7)	Ti Min. (8)	LENGTH Ft. (9)	SLOPE % (10)	V1 fps (11a)	V2 fps (11b)	Tt Min. (12)	TOTAL LENGTH (13)	Tc Min. (14)	Min. (15)	TLAG Hr. (16)	
DC-1	98.0	0.904	10.84	0.0169	100	1.0	3.54	123	12.2	7.1	10.7	0.29	223	11.24	3.83	0.038	Use Min TLAG = 0.050 per HCDDM
LM	98.0	0.904	9.16	0.0143	100	1.0	3.54	237	14.8	7.8	11.8	0.51	337	11.87	4.04	0.040	Use Min TLAG = 0.050 per HCDDM
DES1	98.0	0.904	3.76	0.0059	38	2.0	1.73	3472	6.0	5.0	7.5	8.26	3510	29.50	9.99	0.100	
DES2	98.0	0.904	3.40	0.0053	38	2.0	1.73	1148	3.6	3.8	5.8	4.05	1186	16.59	5.78	0.058	
DES3	98.0	0.904	1.84	0.0029	30	2.0	1.54	1035	1.7	2.7	4.0	5.34	1065	15.92	6.87	0.069	
DES4	98.0	0.904	1.72	0.0027	30	2.0	1.54	552	5.8	4.9	7.4	1.83	582	13.23	3.37	0.034	Use Min TLAG = 0.050 per HCDDM
DES5	98.0	0.904	1.80	0.0028	30	2.0	1.54	652	2.9	3.4	5.2	2.90	682	13.79	4.44	0.044	Use Min TLAG = 0.050 per HCDDM
DES6	98.0	0.904	1.11	0.0017	30	2.0	1.54	696	1.9	2.8	4.2	3.80	726	14.03	5.34	0.053	
CARR1	98.0	0.904	6.68	0.0104	42	2.0	1.82	696	1.9	2.8	4.2	3.80	738	14.10	5.62	0.056	
CARR2	98.0	0.904	3.58	0.0056	42	2.0	1.82	1512	2.9	3.4	5.2	5.65	1554	18.63	7.47	0.075	
CARR3	98.0	0.904	2.95	0.0046	42	2.0	1.82	795	6.3	5.1	7.7	2.29	837	14.65	4.10	0.041	Use Min TLAG = 0.050 per HCDDM
CARR4	98.0	0.904	3.10	0.0048	42	2.0	1.82	1079	3.6	3.8	5.8	3.83	1121	16.23	5.65	0.056	
ST1	98.0	0.904	2.46	0.0038	19	2.0	1.22	842	2.5	3.2	4.8	3.79	861	14.78	5.01	0.050	
STJ1	98.0	0.904	3.76	0.0059	19	2.0	1.22	1262	7.7	5.6	8.5	2.99	1281	17.12	4.21	0.042	Use Min TLAG = 0.050 per HCDDM
STJ2	98.0	0.904	3.10	0.0048	30	2.0	1.54	1498	2.8	3.4	5.1	5.71	1528	18.49	7.25	0.072	
STJ3	98.0	0.904	2.44	0.0038	30	2.0	1.54	1025	2.6	3.3	5.0	4.30	1055	15.86	5.84	0.058	
STJ4	98.0	0.904	1.05	0.0016	30	2.0	1.54	926	2.2	3.0	4.5	4.39	956	15.31	5.92	0.059	
STH	98.0	0.904	2.29	0.0036	21	2.0	1.29	926	2.2	3.0	4.5	4.39	947	15.26	5.67	0.057	
STG1	98.0	0.904	1.77	0.0028	19	2.0	1.22	1102	7.1	5.4	8.1	2.78	1121	16.23	4.01	0.040	Use Min TLAG = 0.050 per HCDDM
STG2	98.0	0.904	2.83	0.0044	30	2.0	1.54	890	10.3	6.5	9.8	1.94	920	15.11	3.48	0.035	Use Min TLAG = 0.050 per HCDDM
STF	98.0	0.904	1.83	0.0029	21	2.0	1.29	1025	7.4	5.5	8.3	2.57	1046	15.81	3.85	0.039	Use Min TLAG = 0.050 per HCDDM
STE1	98.0	0.904	1.72	0.0027	21	2.0	1.29	887	7.4	5.5	8.3	2.29	908	15.04	3.57	0.036	Use Min TLAG = 0.050 per HCDDM
STE2	98.0	0.904	1.78	0.0028	21	2.0	1.29	831	7.7	5.6	8.5	2.14	852	14.73	3.42	0.034	Use Min TLAG = 0.050 per HCDDM
STE3	98.0	0.904	1.11	0.0017	21	2.0	1.29	867	8.2	5.8	8.8	2.14	888	14.93	3.43	0.034	Use Min TLAG = 0.050 per HCDDM
STEE1	98.0	0.904	1.49	0.0023	21	2.0	1.29	505	8.5	5.9	8.9	1.42	526	12.92	2.71	0.027	Use Min TLAG = 0.050 per HCDDM
STEE2	98.0	0.904	2.41	0.0038	21	2.0	1.29	532	7.9	5.7	8.6	1.53	553	13.07	2.82	0.028	Use Min TLAG = 0.050 per HCDDM
STEE3	98.0	0.904	1.49	0.0023	21	2.0	1.29	791	9.7	6.3	9.5	1.83	812	14.51	3.12	0.031	Use Min TLAG = 0.050 per HCDDM
STFF	98.0	0.904	1.08	0.0017	19	2.0	1.22	575	7.7	5.6	8.5	1.64	594	13.30	2.86	0.029	Use Min TLAG = 0.050 per HCDDM
STL1	98.0	0.904	1.78	0.0028	19	2.0	1.22	509	5.3	4.7	7.0	1.81	528	12.93	3.04	0.030	Use Min TLAG = 0.050 per HCDDM
STL2	98.0	0.904	1.79	0.0028	21	2.0	1.29	895	3.7	3.9	5.9	3.27	916	15.09	4.55	0.046	Use Min TLAG = 0.050 per HCDDM
																Tc Min (Urban)= 5 min	
																Tc Min (Non Urb)= 10 min	

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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 19MAR19 TIME 11:17:59
*
*****

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V22.OUT

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*****
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
*****

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X X XXXXXX XXXX X
X X X X X XX
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XXXXXX XXXX X XXXX X
X X X X X
X X X X X
X X XXXXXX XXXX XXX

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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

*DIAGRAM

*** FREE ***

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1 ID ULTIMATE CONDITION HYDROLOGIC MODEL
2 ID INPUT FILE DATE = NOVEMBER 1, 2018
3 ID DESIGN STORM = 100-YEAR 6-HR STORM
4 ID STORM DISTRIBUTION = SDN #3
5 ID MODELED BY VTN (JYA)
6 ID
7 ID
8 ID *****
9 ID * UPDATE #1 - SUMMERLIN WEST VILLAGE 22 *
10 ID *****
11 ID
12 ID
13 ID
14 ID JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
15 ID
16 ID 100-YEAR, 6-HOUR STORM, SDN3
17 ID
18 IT 5 0 0 100
19 IO 5 0 0
20 IN 5 0 0
21 JR PREC 1.00
*

22 KK LM
23 BA 0.0143
24 PB 3.41
25 PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
26 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
27 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
28 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
29 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
30 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
31 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
32 PC 0.998 0.999 1
33 LS 0 98.0
34 UD 0.050
*

35 KK D
36 BA 0.0176
37 PB 3.39
38 LS 0 95.0
39 UD 0.058
*

40 KK DES1
41 BA .0059
42 PB 3.39
43 LS 0 98.0

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1

44 UD 0.100
*
HEC-1 INPUT PAGE 2

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

45 KK CDES1
46 KM COMBINE D AND DES1
47 HC 2
*
48 KK COS-2
49 BA 0.0159
50 PB 3.41
51 LS 0 89.0
52 UD 0.100
*
53 KK CCOS-2
54 KM COMBINE CDES1 AND COS-2
55 HC 2
*
56 KK A
57 BA 0.0264
58 PB 3.41
59 LS 0 95.0
60 UD 0.078
*
61 KK CA
62 KM COMBINE CCOS-2 AND A
63 HC 2
*
64 KK CP1
65 KM COMBINE LM AND CA
66 HC 2
*
67 KK STI
68 KM STREET I
69 BA 0.0038
70 PB 3.41
71 LS 0 98.0
72 UD 0.050
*
73 KK C
74 BA 0.0183
75 PB 3.41
76 LS 0 95.0
77 UD 0.054
*

1

HEC-1 INPUT PAGE 3

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

78 KK CSTI
79 KM COMBINE C AND STI
80 HC 2
*
81 KK G
82 BA 0.0111
83 PB 3.41
84 LS 0 95.0
85 UD 0.056
*
86 KK CG
87 KM COMBINE CSTI AND CG
88 HC 2
*
89 KK H
90 BA 0.0120
91 PB 3.41
92 LS 0 95.0
93 UD 0.053
*
94 KK CH
95 KM COMBINE CG AND CH
96 HC 2
*

V22.OUT

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97      KK      STH
98      KM      STREET H
99      BA      0.0036
100     PB      3.41
101     LS      0      98.0
102     UD      0.057
      *

103     KK      J
104     BA      0.0091
105     PB      3.41
106     LS      0      95.0
107     UD      0.051
      *

108     KK      CJ
109     KM      COMBINE J AND STH
110     HC      2
      *

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1 HEC-1 INPUT PAGE 4

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

```

111     KK      K
112     BA      0.0081
113     PB      3.40
114     LS      0      95.0
115     UD      0.050
      *

116     KK      CK
117     KM      COMBINE CJ AND K
118     HC      2
      *

119     KK      NP-1
120     BA      0.0008
121     PB      3.38
122     LS      0      89.0
123     UD      0.097
      *

124     KK      CNP-1
125     KM      COMBINE CK AND NP-1
126     HC      2
      *

127     KK      DES2
128     BA      .0053
129     PB      3.38
130     LS      0      98.0
131     UD      0.058
      *

132     KK      CDES2
133     KM      COMBINE DES2 & CNP-1
134     HC      2
      *

135     KK      CP2
136     KM      COMBINE CDES2 & CH
137     HC      2
      *

138     KK      CARR1
139     BA      0.0104
140     PB      3.38
141     LS      0      98.0
142     UD      0.056
      *

143     KK      I
144     BA      0.0165
145     PB      3.38
146     LS      0      92.0
147     UD      0.083
      *

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1 HEC-1 INPUT PAGE 5

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

```

148     KK      CCARR1
149     KM      COMBINE CP2, I, CARR1
150     HC      3
      *

151     KK      N

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V22.OUT

152	BA	0.0104	
153	PB	3.40	
154	LS	0	95.0
155	UD	0.054	
	*		
156	KK	STFF	
157	BA	0.0017	
158	PB	3.40	
159	LS	0	98.0
160	UD	0.050	
	*		
161	KK	CSTFF	
162	KM	COMBINE N AND STFF	
163	HC	2	
	*		
164	KK	STG2	
165	BA	0.0044	
166	PB	3.40	
167	LS	0	98.0
168	UD	0.050	
	*		
169	KK	CSTG2	
170	KM	COMBINE	CSTFF AND STG2
171	HC	2	
	*		
172	KK	0	
173	BA	0.0051	
174	PB	3.40	
175	LS	0	92.2
176	UD	0.055	
	*		
177	KK	P	
178	BA	0.0053	
179	PB	3.40	
180	LS	0	92.2
181	UD	0.060	
	*		

1

HEC-1 INPUT

PAGE 6

LINE	ID	1	2	3	4	5	6	7	8	9	10
182	KK	COP									
183	KM	COMBINE P AND O									
184	HC	2									
	*										
185	KK	DES3									
186	BA	0.0029									
187	PB	3.38									
188	LS	0									
189	UD	0.069									
	*										
190	KK	CDES3									
191	KM	COMBINE COP & DES3									
192	HC	2									
	*										
193	KK	CP3									
194	KM	COMBINES CSTG2 & CDES3									
195	HC	2									
	*										
196	KK	Q									
197	BA	0.0057									
198	PB	3.38									
199	LS	0									
200	UD	0.057									
	*										
201	KK	R									
202	BA	0.0055									
203	PB	3.37									
204	LS	0									
205	UD	0.053									
	*										
206	KK	CQR									
207	KM	COMBINE R AND Q									
208	HC	2									
	*										

V22.OUT

209	KK	CARR2		
210	BA	0.0056		
211	PB	3.38		
212	LS	0	98.0	
213	UD	0.075		
	*			
214	KK	CCARR2		
215	KM	COMBINE CQR AND CARR2		
216	HC	2		
	*			

1 HEC-1 INPUT PAGE 7

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

217	KK	CP4		
218	KM	COMBINE CP3, CCARR1, AND CCARR2		
219	HC	3		
	*			
220	KK	II		
221	BA	0.0306		
222	PB	3.37		
223	LS	0	92.7	
224	UD	0.062		
	*			
225	KK	X		
226	BA	0.0257		
227	PB	3.37		
228	LS	0	90.0	
229	UD	0.080		
	*			
230	KK	B		
231	BA	0.1361		
232	PB	3.36		
233	LS	0	93.5	
234	UD	0.077		
	*			
235	KK	DC-1		
236	BA	0.0169		
237	PB	3.35		
238	LS	0	98.0	
239	UD	0.050		
	*			
240	KK	COS-3		
241	BA	0.0027		
242	PB	3.36		
243	LS	0	84.7	
244	UD	0.140		
	*			
245	KK	DUMMY1		
246	KM	REGIONAL FACILITY - BELTWAY CHANNEL NORTH		
247	KM	COMBINE CP1, CP4, II, X, B, DC1, AND COS-3		
248	HC	7		
	*			
249	KK	3-0*		
250	KM	REFERENCED FROM THE OVERALL SWPA MPU		
251	BA	0.0805		
252	PB	3.48		
253	LS	0	94.5	
254	UD	0.103		
	*			

1 HEC-1 INPUT PAGE 8

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

255	KKOFF-COS2			
256	KM	OFFSITE BASIN		
257	BA	.0299		
258	PB	3.45		
259	LS	0	86.0	
260	UD	0.110		
	*			
261	KKCOFFCOS2			
262	KM	COMBINE 3-0 AND OFF-COS2		
263	HC	2		
	*			
264	KK	E		
265	BA	0.0218		

V22.OUT

266	PB	3.43	
267	LS	0	95.0
268	UD	0.062	
	*		
269	KK	STJ1	
270	KM	STREET J1	
271	BA	0.0059	
272	PB	3.43	
273	LS	0	98.0
274	UD	0.050	
	*		
275	KK	CSTJ1	
276	KM	COMBINE OFF-COS2, E, AND STJ1	
277	HC	3	
	*		
278	KK	NP-2	
279	BA	0.0024	
280	PB	3.43	
281	LS	0	89.0
282	UD	0.059	
	*		
283	KK	ES-1	
284	BA	0.0220	
285	PB	3.43	
286	LS	0	95.0
287	UD	0.063	
	*		
288	KK	CES-1	
289	KM	COMBINE CSTJ, NP-2, AND ES-1	
290	HC	3	
	*		

1

HEC-1 INPUT

PAGE 9

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
------	---

291	KK	OFF4	
292	BA	0.0823	
293	PB	3.44	
294	LS	0	94.8
295	UD	0.077	
	*		
296	KK	L	
297	BA	0.0126	
298	PB	3.42	
299	LS	0	94.6
300	UD	0.050	
	*		
301	KK	STL1	
302	BA	0.0028	
303	PB	3.42	
304	LS	0	98.0
305	UD	0.050	
	*		
306	KK	CSTL1	
307	KM	COMBINE L AND STL1	
308	HC	2	
	*		
309	KK	STG1	
310	BA	0.0028	
311	PB	3.42	
312	LS	0	98.0
313	UD	0.050	
	*		
314	KK	CSTG1	
315	KM	COMBINE OFF4, CSTL, AND STG1	
316	HC	3	
	*		
317	KK	M	
318	BA	0.0176	
319	PB	3.42	
320	LS	0	94.3
321	UD	0.053	
	*		
322	KK	STJ2	
323	BA	0.0048	
324	PB	3.42	

325 LS 0 98.0
 326 UD 0.072
 *

1

HEC-1 INPUT

PAGE 10

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

327 KK DUMMY2
 328 KM REGIONAL FACILITY
 329 HC 4
 *

330 KK S
 331 BA 0.0047
 332 PB 3.40
 333 LS 0 88.3
 334 UD 0.064
 *

335 KK STF
 336 BA 0.0029
 337 PB 3.40
 338 LS 0 98.0
 339 UD 0.050
 *

340 KK NP-3
 341 BA 0.0056
 342 PB 3.4
 343 LS 0 80.3
 344 UD 0.079
 *

345 KK U
 346 BA 0.0055
 347 PB 3.40
 348 LS 0 86.3
 349 UD 0.069
 *

350 KK DES4
 351 BA 0.0027
 352 PB 3.40
 353 LS 0 98.0
 354 UD 0.050
 *

355 KK CDES4
 356 KM COMBINE U AND DES4
 357 HC 2
 *

358 KK DUMMY3
 359 KM COMBINE S, STF, NP-3, CDES4
 360 HC 5
 *

1

HEC-1 INPUT

PAGE 11

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

361 KK V
 362 BA 0.0060
 363 PB 3.37
 364 LS 0 90.0
 365 UD 0.060
 *

366 KK W
 367 BA 0.0062
 368 PB 3.40
 369 LS 0 90.0
 370 UD 0.065
 *

371 KK CVW
 372 KM COMBINE W AND V
 373 HC 2
 *

374 KK CARR3
 375 BA 0.0046
 376 PB 3.37
 377 LS 0 98.0
 378 UD 0.050
 *

379 KK DUMMY4

V22.OUT

380 KM REGIONAL FACILITY
 381 HC 3
 *
 382 KK STE3
 383 BA 0.0017
 384 PB 3.40
 385 LS 0 98.0
 386 UD 0.050
 *
 387 KK EE
 388 BA 0.0104
 389 PB 3.39
 390 LS 0 90.5
 391 UD 0.075
 *
 392 KK DUMMY5
 393 KM REGIONAL FACILITY
 394 HC 3
 *

1 HEC-1 INPUT PAGE 12

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

395 KK STEE3
 396 BA 0.0023
 397 PB 3.39
 398 LS 0 98.0
 399 UD 0.050
 *
 400 KK HH
 401 BA 0.0072
 402 PB 3.39
 403 LS 0 94.2
 404 UD 0.055
 *
 405 KK CARR4
 406 BA 0.0048
 407 PB 3.37
 408 LS 0 98.0
 409 UD 0.056
 *
 410 KK DUMMY6
 411 KM REGIONAL FACILITY - BELTWAY CHANNEL SOUTH
 412 HC 4
 *
 413 KK OFF5
 414 BA 0.0199
 415 PB 3.44
 416 LS 0 92.2
 417 UD 0.050
 *
 418 KK STE1
 419 BA 0.0027
 420 PB 3.42
 421 LS 0 98.0
 422 UD 0.050
 *
 423 KK Y
 424 BA 0.0126
 425 PB 3.44
 426 LS 0 92.4
 427 UD 0.071
 *
 428 KK CY
 429 KM COMBINES OFF5, Y, AND STE1
 430 HC 3
 *

1 HEC-1 INPUT PAGE 13

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

431 KK STL2
 432 BA 0.0028
 433 PB 3.44
 434 LS 0 98.0
 435 UD 0.050
 *

436 KK CSTL2
 437 KM COMBINES CY AND STL2
 438 HC 2
 *

 439 KK Z
 440 BA 0.0110
 441 PB 3.42
 442 LS 0 87.6
 443 UD 0.086
 *

 444 KK STJ3
 445 BA 0.0038
 446 PB 3.42
 447 LS 0 98.0
 448 UD 0.058
 *

 449 KK CSTJ3
 450 KM COMBINE Z AND STJ3
 451 HC 2
 *

 452 KK DUMMY7
 453 KM REGIONAL FACILITY
 454 HC 2
 *

 455 KK STE2
 456 BA 0.0028
 457 PB 3.40
 458 LS 0 98.0
 459 UD 0.050
 *

 460 KK BB
 461 BA 0.0097
 462 PB 3.42
 463 LS 0 91.0
 464 UD 0.074
 *

1

HEC-1 INPUT

PAGE 14

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

465 KK T
 466 BA 0.0063
 467 PB 3.42
 468 LS 0 92.0
 469 UD 0.055
 *

 470 KK CC
 471 BA 0.0086
 472 PB 3.42
 473 LS 0 90.7
 474 UD 0.079
 *

 475 KK DD
 476 BA 0.0071
 477 PB 3.40
 478 LS 0 90.6
 479 UD 0.079
 *

 480 KK DUMMY8
 481 KM REGIONAL FACILITY
 482 HC 6
 *

 483 KK DESS
 484 BA 0.0028
 485 PB 3.40
 486 LS 0 98.0
 487 UD 0.050
 *

 488 KK NP-4
 489 BA 0.0011
 490 PB 3.39
 491 LS 0 84.1
 492 UD 0.071
 *

 493 KK DUMMY9

494 KM REGIONAL FACILITY V22.OUT
 495 HC 3
 *
 496 KK AA
 497 BA 0.0073
 498 PB 3.43
 499 LS 0 93.0
 500 UD 0.065
 *

1 HEC-1 INPUT PAGE 15

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

501 KK STJ4
 502 BA 0.0016
 503 PB 3.41
 504 LS 0 98.0
 505 UD 0.059
 *
 506 KK CSTJ4
 507 KM COMBINE AA AND STJ4
 508 HC 2
 *
 509 KK STEE1
 510 BA 0.0023
 511 PB 3.44
 512 LS 0 98.0
 513 UD 0.050
 *
 514 KK CSTEE2
 515 KM COMBINES CSTJ4 AND STEE1
 516 HC 2
 *

517 KK STEE2
 518 BA 0.0038
 519 PB 3.41
 520 LS 0 98.0
 521 UD 0.050
 *

522 KK FF
 523 BA 0.0048
 524 PB 3.41
 525 LS 0 94.2
 526 UD 0.059
 *

527 KK CFF
 528 KM COMBINES CSTEE2,STEE2, AND FF
 529 HC 3
 *

530 KK DUMMY10
 531 KM REGIONAL FACILITY
 532 HC 2
 *
 533 KK GG
 534 BA 0.0058
 535 PB 3.41
 536 LS 0 94.2
 537 UD 0.050
 *

1 HEC-1 INPUT PAGE 16

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

538 KK DES6
 539 BA 0.0017
 540 PB 3.39
 541 LS 0 98.0
 542 UD 0.053
 *
 543 KK DUMMY11
 544 KM REGIONAL FACILITY - DESERT FOOTHILLS
 545 HC 3
 *
 546 ZZ

1 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT

LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
22	LM	
	.	
35	.	D
	.	
40	.	DES1
	.	
45	CDES1.....	
	.	
48	.	COS-2
	.	
53	CCOS-2.....	
	.	
56	.	A
	.	
61	CA.....	
	.	
64	CP1.....	
	.	
67	STI	
	.	
73	.	C
	.	
78	CSTI.....	
	.	
81	.	G
	.	
86	CG.....	
	.	
89	.	H
	.	
94	CH.....	
	.	
97	.	STH
	.	
103	.	J
	.	
108	CJ.....	
	.	
111	.	K
	.	
116	CK.....	
	.	
119	.	NP-1
	.	
124	CNP-1.....	
	.	
127	.	DES2
	.	
132	CDES2.....	
	.	
135	CP2.....	
	.	
138	.	CARR1
	.	
143	.	I
	.	
148	CCARR1.....	

151	.	.	N						
	.	.	.						
156	.	.	.	STFF					
	.	.	.	.					
161	.	.	CSTFF.....						
	.	.	.						
164	.	.	.	STG2					
	.	.	.	.					
169	.	.	CSTG2.....						
	.	.	.						
172	.	.	.	O					
	.	.	.	.					
177	.	.	.	.	P				
	.	.	.	.	.				
182	.	.	COP.....						
	.	.	.	.					
185	.	.	.	DES3					
	.	.	.	.					
190	.	.	CDES3.....						
	.	.	.	.					
193	.	.	CP3.....						
	.	.	.	.					
196	.	.	.	Q					
	.	.	.	.					
201	.	.	.	.	R				
	.	.	.	.	.				
206	.	.	CQR.....						
	.	.	.	.					
209	.	.	.	CARR2					
	.	.	.	.					
214	.	.	CCARR2.....						
	.	.	.	.					
217	.	CP4.....							
	.	.	.						
220	.	.	II						
	.	.	.						
225	.	.	.	X					
	.	.	.	.					
230	.	.	.	.	B				
	.	.	.	.	.				
235	.	.	.	.	DC-1				
	.	.	.	.	.				
240	.	.	.	.	.	COS-3			
	.	.	.	.	.	.			
245	DUMMY1.....	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.
249	.	3-O*	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.
255	.	.	OFF-COS2						
	.	.	.						
261	COFFCOS2.....	.	.						
	.	.	.						
264	.	.	E						
	.	.	.						
269	.	.	.	STJ1					
	.	.	.	.					
275	CSTJ1.....	.	.						
	.	.	.	.					

278	.	.	NP-2						
	.	.	.						
283	.	.	.	ES-1					
	.	.	.						
288	.	CES-1	.....						
	.	.							
291	.	.	OFF4						
	.	.	.						
296	.	.	.	L					
	.	.	.	.					
301	.	.	.	.	STL1				
	.	.	.	.	.				
306	.	.	.	CSTL1	.....				
	.	.	.	.					
309	.	.	.	.	STG1				
	.	.	.	.	.				
314	.	.	CSTG1	.....					
	.	.	.						
317	.	.	.	M					
	.	.	.	.					
322	.	.	.	.	STJ2				
	.	.	.	.	.				
327	.	DUMMY2	.....						
	.	.							
330	.	.	S						
	.	.	.						
335	.	.	.	STF					
	.	.	.	.					
340	.	.	.	.	NP-3				
	.	.	.	.	.				
345	.	.	.	.	.	U			
	.	.	.	.	.	.			
350	.	.	.	.	.	.	DES4		
	.	.	.	.	.	.	.		
355	.	.	.	.	.	.	.	CDES4	.....
	.	.	.	.	.	.	.	.	
358	.	DUMMY3	.....						
	.	.							
361	.	.	V						
	.	.	.						
366	.	.	.	W					
	.	.	.	.					
371	.	.	CVW	.....					
	.	.	.						
374	.	.	.	CARR3					
	.	.	.	.					
379	.	DUMMY4	.....						
	.	.							
382	.	.	STE3						
	.	.	.						
387	.	.	.	EE					
	.	.	.	.					
392	.	DUMMYS	.....						
	.	.							
395	.	.	STEE3						
	.	.	.						
400	.	.	.	HH					
	.	.	.	.					
405	.	.	.	.	CARR4				
	.	.	.	.	.				

410	.	DUMMY6.....	.	.	.	.	.
413	.	.	OFF5	.	.	.	.
418	.	.	.	STE1	.	.	.
423	.	.	.	.	.	Y	.
428	.	.	CY.....	.	.	.	.
431	.	.	.	STL2	.	.	.
436	.	.	CSTL2.....	.	.	.	.
439	.	.	.	Z	.	.	.
444	.	.	.	.	STJ3	.	.
449	.	.	CSTJ3.....	.	.	.	.
452	.	.	DUMMY7.....	.	.	.	.
455	.	.	.	STE2	.	.	.
460	.	.	.	.	BB	.	.
465	.	.	.	.	.	T	.
470	.	.	.	.	.	.	CC
475	.	.	.	.	.	.	.
480	.	.	DUMMY8.....	.	.	.	DD
483	.	.	.	DESS	.	.	.
488	.	.	.	.	NP-4	.	.
493	.	.	DUMMY9.....	.	.	.	.
496	.	.	.	AA	.	.	.
501	.	.	.	.	STJ4	.	.
506	.	.	CSTJ4.....	.	.	.	.
509	.	.	.	.	STEE1	.	.
514	.	.	CSTEE2.....	.	.	.	.
517	.	.	.	.	STEE2	.	.
522	.	.	.	.	.	FF	.
527	.	.	CFF.....	.	.	.	.
530	.	.	DUMMY10.....	.	.	.	.
533	.	.	.	GG	.	.	.

V22.OUT

```

      .      .      .      .
538    .      .      .      .      DES6
      .      .      .      .
543    .      .      DUMMY11.....

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*   JUN 1998                    *
*   VERSION 4.1                  *
* RUN DATE 19MAR19 TIME 11:17:59 *
*                               *
*****

```

```
*****
*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
*   609 SECOND STREET          *
*   DAVIS, CALIFORNIA 95616     *
*   (916) 756-1104              *
*                               *
*****

```

ULTIMATE CONDITION HYDROLOGIC MODEL
INPUT FILE DATE = NOVEMBER 1, 2018
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY VTN (JYA)

```
*****
* UPDATE #1 - SUMMERLIN WEST VILLAGE 22 *
*****

```

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

100-YEAR, 6-HOUR STORM, SDN3

```
19 IO      OUTPUT CONTROL VARIABLES
          IPRNT      5 PRINT CONTROL
          IPLOT      0 PLOT CONTROL
          QSCAL      0. HYDROGRAPH PLOT SCALE

IT         HYDROGRAPH TIME DATA
          NMIN      5 MINUTES IN COMPUTATION INTERVAL
          IDATE      1 0 STARTING DATE
          ITIME      0000 STARTING TIME
          NQ         100 NUMBER OF HYDROGRAPH ORDINATES
          NDDATE      1 0 ENDING DATE
          NDTIME      0815 ENDING TIME
          ICENT      19 CENTURY MARK

          COMPUTATION INTERVAL .08 HOURS
          TOTAL TIME BASE 8.25 HOURS

ENGLISH UNITS
DRAINAGE AREA      SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW               CUBIC FEET PER SECOND
STORAGE VOLUME     ACRE-FEET
SURFACE AREA       ACRES
TEMPERATURE        DEGREES FAHRENHEIT

JP         MULTI-PLAN OPTION
          NPLAN      1 NUMBER OF PLANS

JR         MULTI-RATIO OPTION
          RATIOS OF PRECIPITATION
          1.00

```

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION
				RATIO 1
				1.00
HYDROGRAPH AT				
+	LM	.01	1 FLOW	41.
			TIME	3.50
HYDROGRAPH AT				
+	D	.02	1 FLOW	47.

				TIME	3.50
HYDROGRAPH AT					
+	DES1	.01	1	FLOW	14.
				TIME	3.50
2 COMBINED AT					
+	CDES1	.02	1	FLOW	62.
				TIME	3.50
HYDROGRAPH AT					
+	COS-2	.02	1	FLOW	32.
				TIME	3.50
2 COMBINED AT					
+	CCOS-2	.04	1	FLOW	93.
				TIME	3.50
HYDROGRAPH AT					
+	A	.03	1	FLOW	66.
				TIME	3.50
2 COMBINED AT					
+	CA	.07	1	FLOW	160.
				TIME	3.50
2 COMBINED AT					
+	CP1	.08	1	FLOW	201.
				TIME	3.50
HYDROGRAPH AT					
+	STI	.00	1	FLOW	11.
				TIME	3.50
HYDROGRAPH AT					
+	C	.02	1	FLOW	50.
				TIME	3.50
2 COMBINED AT					
+	CSTI	.02	1	FLOW	61.
				TIME	3.50
HYDROGRAPH AT					
+	G	.01	1	FLOW	30.
				TIME	3.50
2 COMBINED AT					
+	CG	.03	1	FLOW	91.
				TIME	3.50
HYDROGRAPH AT					
+	H	.01	1	FLOW	33.
				TIME	3.50
2 COMBINED AT					
+	CH	.05	1	FLOW	124.
				TIME	3.50
HYDROGRAPH AT					
+	STH	.00	1	FLOW	10.
				TIME	3.50
HYDROGRAPH AT					
+	J	.01	1	FLOW	25.
				TIME	3.50
2 COMBINED AT					
+	CJ	.01	1	FLOW	35.
				TIME	3.50
HYDROGRAPH AT					
+	K	.01	1	FLOW	22.
				TIME	3.50
2 COMBINED AT					
+	CK	.02	1	FLOW	58.
				TIME	3.50
HYDROGRAPH AT					
+	NP-1	.00	1	FLOW	2.
				TIME	3.50
2 COMBINED AT					
+	CNP-1	.02	1	FLOW	59.
				TIME	3.50
HYDROGRAPH AT					
+	DES2	.01	1	FLOW	15.
				TIME	3.50

2 COMBINED AT +	CDES2	.03	1	FLOW TIME	74. 3.50
2 COMBINED AT +	CP2	.07	1	FLOW TIME	198. 3.50
HYDROGRAPH AT +	CARR1	.01	1	FLOW TIME	29. 3.50
HYDROGRAPH AT +	I	.02	1	FLOW TIME	38. 3.50
3 COMBINED AT +	CCARR1	.10	1	FLOW TIME	265. 3.50
HYDROGRAPH AT +	N	.01	1	FLOW TIME	28. 3.50
HYDROGRAPH AT +	STFF	.00	1	FLOW TIME	5. 3.50
2 COMBINED AT +	CSTFF	.01	1	FLOW TIME	33. 3.50
HYDROGRAPH AT +	STG2	.00	1	FLOW TIME	13. 3.50
2 COMBINED AT +	CSTG2	.02	1	FLOW TIME	46. 3.50
HYDROGRAPH AT +	O	.01	1	FLOW TIME	13. 3.50
HYDROGRAPH AT +	P	.01	1	FLOW TIME	13. 3.50
2 COMBINED AT +	COP	.01	1	FLOW TIME	26. 3.50
HYDROGRAPH AT +	DES3	.00	1	FLOW TIME	8. 3.50
2 COMBINED AT +	CDES3	.01	1	FLOW TIME	34. 3.50
2 COMBINED AT +	CP3	.03	1	FLOW TIME	80. 3.50
HYDROGRAPH AT +	Q	.01	1	FLOW TIME	14. 3.50
HYDROGRAPH AT +	R	.01	1	FLOW TIME	15. 3.50
2 COMBINED AT +	CQR	.01	1	FLOW TIME	29. 3.50
HYDROGRAPH AT +	CARR2	.01	1	FLOW TIME	15. 3.50
2 COMBINED AT +	CCARR2	.02	1	FLOW TIME	44. 3.50
3 COMBINED AT +	CP4	.15	1	FLOW TIME	389. 3.50

HYDROGRAPH AT +	II	.03	1	FLOW TIME	77. 3.50
HYDROGRAPH AT +	X	.03	1	FLOW TIME	56. 3.50
HYDROGRAPH AT +	B	.14	1	FLOW TIME	328. 3.50
HYDROGRAPH AT +	DC-1	.02	1	FLOW TIME	48. 3.50
HYDROGRAPH AT +	COS-3	.00	1	FLOW TIME	4. 3.58
7 COMBINED AT +	DUMMY1	.44	1	FLOW TIME	1103. 3.50
HYDROGRAPH AT +	3-0*	.08	1	FLOW TIME	189. 3.50
HYDROGRAPH AT +	OFF-COS2	.03	1	FLOW TIME	53. 3.50
2 COMBINED AT +	COFFCOS2	.11	1	FLOW TIME	242. 3.50
HYDROGRAPH AT +	E	.02	1	FLOW TIME	58. 3.50
HYDROGRAPH AT +	STJ1	.01	1	FLOW TIME	17. 3.50
3 COMBINED AT +	CSTJ1	.14	1	FLOW TIME	317. 3.50
HYDROGRAPH AT +	NP-2	.00	1	FLOW TIME	6. 3.50
HYDROGRAPH AT +	ES-1	.02	1	FLOW TIME	59. 3.50
3 COMBINED AT +	CES-1	.16	1	FLOW TIME	382. 3.50
HYDROGRAPH AT +	OFF4	.08	1	FLOW TIME	209. 3.50
HYDROGRAPH AT +	L	.01	1	FLOW TIME	35. 3.50
HYDROGRAPH AT +	STL1	.00	1	FLOW TIME	8. 3.50
2 COMBINED AT +	CSTL1	.02	1	FLOW TIME	43. 3.50
HYDROGRAPH AT +	STG1	.00	1	FLOW TIME	8. 3.50
3 COMBINED AT +	CSTG1	.10	1	FLOW TIME	260. 3.50
HYDROGRAPH AT +	M	.02	1	FLOW TIME	48. 3.50
HYDROGRAPH AT					

V22.OUT

+	STJ2	.00	1	FLOW TIME	13. 3.50
4 COMBINED AT +	DUMMY2	.29	1	FLOW TIME	702. 3.50
HYDROGRAPH AT +	S	.00	1	FLOW TIME	11. 3.50
HYDROGRAPH AT +	STF	.00	1	FLOW TIME	8. 3.50
HYDROGRAPH AT +	NP-3	.01	1	FLOW TIME	9. 3.50
HYDROGRAPH AT +	U	.01	1	FLOW TIME	11. 3.50
HYDROGRAPH AT +	DES4	.00	1	FLOW TIME	8. 3.50
2 COMBINED AT +	CDES4	.01	1	FLOW TIME	19. 3.50
5 COMBINED AT +	DUMMY3	.31	1	FLOW TIME	749. 3.50
HYDROGRAPH AT +	V	.01	1	FLOW TIME	14. 3.50
HYDROGRAPH AT +	W	.01	1	FLOW TIME	15. 3.50
2 COMBINED AT +	CVW	.01	1	FLOW TIME	29. 3.50
HYDROGRAPH AT +	CARR3	.00	1	FLOW TIME	13. 3.50
3 COMBINED AT +	DUMMY4	.32	1	FLOW TIME	791. 3.50
HYDROGRAPH AT +	STE3	.00	1	FLOW TIME	5. 3.50
HYDROGRAPH AT +	EE	.01	1	FLOW TIME	24. 3.50
3 COMBINED AT +	DUMMY5	.34	1	FLOW TIME	820. 3.50
HYDROGRAPH AT +	STEE3	.00	1	FLOW TIME	7. 3.50
HYDROGRAPH AT +	HH	.01	1	FLOW TIME	19. 3.50
HYDROGRAPH AT +	CARR4	.00	1	FLOW TIME	13. 3.50
4 COMBINED AT +	DUMMY6	.35	1	FLOW TIME	859. 3.50
HYDROGRAPH AT +	OFF5	.02	1	FLOW TIME	53. 3.50
HYDROGRAPH AT +	STE1	.00	1	FLOW	8.

				TIME	3.50
HYDROGRAPH AT					
+	Y	.01	1	FLOW TIME	31. 3.50
3 COMBINED AT					
+	CY	.04	1	FLOW TIME	92. 3.50
HYDROGRAPH AT					
+	STL2	.00	1	FLOW TIME	8. 3.50
2 COMBINED AT					
+	CSTL2	.04	1	FLOW TIME	100. 3.50
HYDROGRAPH AT					
+	Z	.01	1	FLOW TIME	22. 3.50
HYDROGRAPH AT					
+	STJ3	.00	1	FLOW TIME	11. 3.50
2 COMBINED AT					
+	CSTJ3	.01	1	FLOW TIME	33. 3.50
2 COMBINED AT					
+	DUMMY7	.05	1	FLOW TIME	133. 3.50
HYDROGRAPH AT					
+	STE2	.00	1	FLOW TIME	8. 3.50
HYDROGRAPH AT					
+	BB	.01	1	FLOW TIME	23. 3.50
HYDROGRAPH AT					
+	T	.01	1	FLOW TIME	16. 3.50
HYDROGRAPH AT					
+	CC	.01	1	FLOW TIME	20. 3.50
HYDROGRAPH AT					
+	DD	.01	1	FLOW TIME	16. 3.50
6 COMBINED AT					
+	DUMMY8	.09	1	FLOW TIME	215. 3.50
HYDROGRAPH AT					
+	DES5	.00	1	FLOW TIME	8. 3.50
HYDROGRAPH AT					
+	NP-4	.00	1	FLOW TIME	2. 3.50
3 COMBINED AT					
+	DUMMY9	.09	1	FLOW TIME	225. 3.50
HYDROGRAPH AT					
+	AA	.01	1	FLOW TIME	19. 3.50
HYDROGRAPH AT					
+	STJ4	.00	1	FLOW TIME	4. 3.50
2 COMBINED AT					
+	CSTJ4	.01	1	FLOW TIME	23. 3.50
HYDROGRAPH AT					
+	STEE1	.00	1	FLOW TIME	7. 3.50
2 COMBINED AT					
+	CSTEE2	.01	1	FLOW TIME	30. 3.50

V22.OUT

HYDROGRAPH AT					
+	STEE2	.00	1	FLOW	11.
				TIME	3.50
HYDROGRAPH AT					
+	FF	.00	1	FLOW	13.
				TIME	3.50
3 COMBINED AT					
+	CFF	.02	1	FLOW	53.
				TIME	3.50
2 COMBINED AT					
+	DUMMY10	.11	1	FLOW	279.
				TIME	3.50
HYDROGRAPH AT					
+	GG	.01	1	FLOW	16.
				TIME	3.50
HYDROGRAPH AT					
+	DES6	.00	1	FLOW	5.
				TIME	3.50
3 COMBINED AT					
+	DUMMY11	.12	1	FLOW	299.
				TIME	3.50

*** NORMAL END OF HEC-1 ***

APPENDIX C

HYDRAULIC CALCULATIONS

**LOCAL FACILITY
NORMAL DEPTH CALCULATIONS**

Worksheet for 4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	5.4	%
Diameter	30.0	in
Discharge	41.00	ft ³ /s

Results

Normal Depth	13.75	in
Flow Area	2.19	ft ²
Wetted Perimeter	3.72	ft
Hydraulic Radius	7.08	in
Top Width	2.49	ft
Critical Depth	2.15	ft
Percent Full	45.8	%
Critical Slope	0.00925	ft/ft
Velocity	18.69	ft/s
Velocity Head	5.43	ft
Specific Energy	6.57	ft
Froude Number	3.51	
Maximum Discharge	102.53	ft ³ /s
Discharge Full	95.31	ft ³ /s
Slope Full	0.00999	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	45.83	%
Downstream Velocity	Infinity	ft/s

Worksheet for 4

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	13.75	in
Critical Depth	2.15	ft
Channel Slope	5.4	%
Critical Slope	0.00925	ft/ft

Cross Section for 4

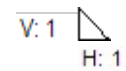
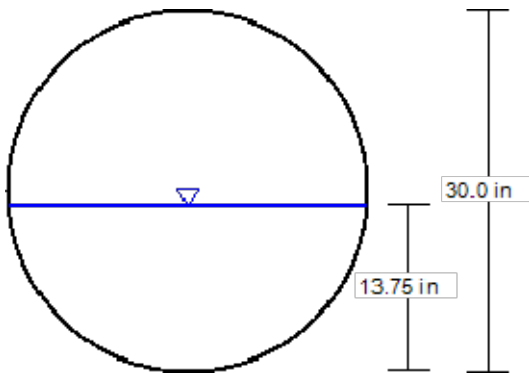
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	5.4 %
Normal Depth	13.75 in
Diameter	30.0 in
Discharge	41.00 ft ³ /s

Cross Section Image



Worksheet for 5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.0	%
Diameter	30.0	in
Discharge	47.00	ft ³ /s

Results

Normal Depth	20.49	in
Flow Area	3.57	ft ²
Wetted Perimeter	4.86	ft
Hydraulic Radius	8.81	in
Top Width	2.33	ft
Critical Depth	2.26	ft
Percent Full	68.3	%
Critical Slope	0.01153	ft/ft
Velocity	13.16	ft/s
Velocity Head	2.69	ft
Specific Energy	4.40	ft
Froude Number	1.87	
Maximum Discharge	62.40	ft ³ /s
Discharge Full	58.00	ft ³ /s
Slope Full	0.01313	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	68.30	%
Downstream Velocity	Infinity	ft/s

Worksheet for 5

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	20.49	in
Critical Depth	2.26	ft
Channel Slope	2.0	%
Critical Slope	0.01153	ft/ft

Cross Section for 5

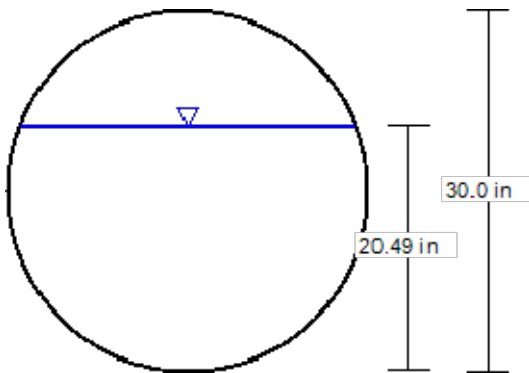
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.0 %
Normal Depth	20.49 in
Diameter	30.0 in
Discharge	47.00 ft ³ /s

Cross Section Image



V: 1
H: 1

A small right-angled triangle diagram illustrating a 1:1 slope, with the vertical side labeled 'V: 1' and the horizontal side labeled 'H: 1'.

Worksheet for 7

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.0	%
Diameter	30.0	in
Discharge	32.00	ft ³ /s

Results

Normal Depth	15.91	in
Flow Area	2.64	ft ²
Wetted Perimeter	4.08	ft
Hydraulic Radius	7.78	in
Top Width	2.50	ft
Critical Depth	1.93	ft
Percent Full	53.0	%
Critical Slope	0.00688	ft/ft
Velocity	12.11	ft/s
Velocity Head	2.28	ft
Specific Energy	3.60	ft
Froude Number	2.07	
Maximum Discharge	62.40	ft ³ /s
Discharge Full	58.00	ft ³ /s
Slope Full	0.00609	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	53.02	%
Downstream Velocity	Infinity	ft/s

Worksheet for 7

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	15.91	in
Critical Depth	1.93	ft
Channel Slope	2.0	%
Critical Slope	0.00688	ft/ft

Cross Section for 7

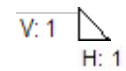
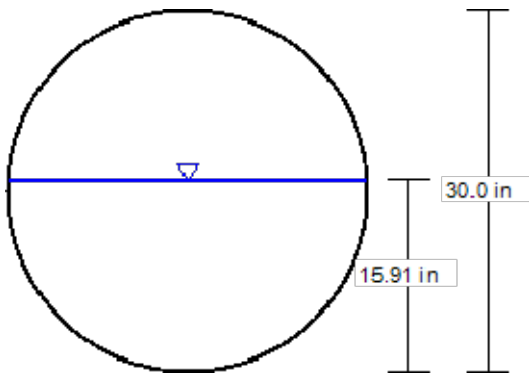
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.0 %
Normal Depth	15.91 in
Diameter	30.0 in
Discharge	32.00 ft ³ /s

Cross Section Image



Worksheet for 8

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.9	%
Diameter	36.0	in
Discharge	93.00	ft ³ /s

Results

Normal Depth	24.78	in
Flow Area	5.19	ft ²
Wetted Perimeter	5.87	ft
Hydraulic Radius	10.60	in
Top Width	2.78	ft
Critical Depth	2.86	ft
Percent Full	68.8	%
Critical Slope	0.01688	ft/ft
Velocity	17.93	ft/s
Velocity Head	4.99	ft
Specific Energy	7.06	ft
Froude Number	2.31	
Maximum Discharge	122.18	ft ³ /s
Discharge Full	113.58	ft ³ /s
Slope Full	0.01944	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	68.83	%
Downstream Velocity	Infinity	ft/s

Worksheet for 8

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	24.78	in
Critical Depth	2.86	ft
Channel Slope	2.9	%
Critical Slope	0.01688	ft/ft

Cross Section for 8

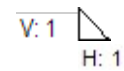
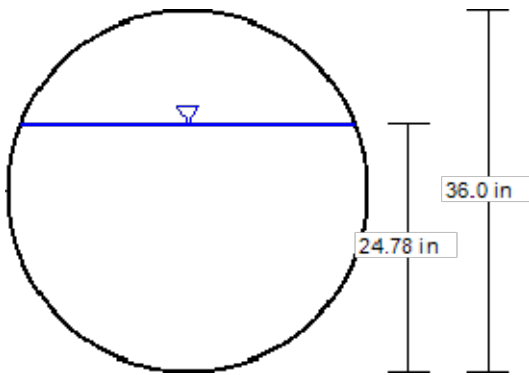
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.9 %
Normal Depth	24.78 in
Diameter	36.0 in
Discharge	93.00 ft ³ /s

Cross Section Image



Worksheet for 9

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.0	%
Diameter	36.0	in
Discharge	66.00	ft ³ /s

Results

Normal Depth	22.19	in
Flow Area	4.57	ft ²
Wetted Perimeter	5.42	ft
Hydraulic Radius	10.13	in
Top Width	2.92	ft
Critical Depth	2.60	ft
Percent Full	61.6	%
Critical Slope	0.00897	ft/ft
Velocity	14.44	ft/s
Velocity Head	3.24	ft
Specific Energy	5.09	ft
Froude Number	2.03	
Maximum Discharge	101.46	ft ³ /s
Discharge Full	94.32	ft ³ /s
Slope Full	0.00979	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	61.63	%
Downstream Velocity	Infinity	ft/s

Worksheet for 9

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	22.19	in
Critical Depth	2.60	ft
Channel Slope	2.0	%
Critical Slope	0.00897	ft/ft

Cross Section for 9

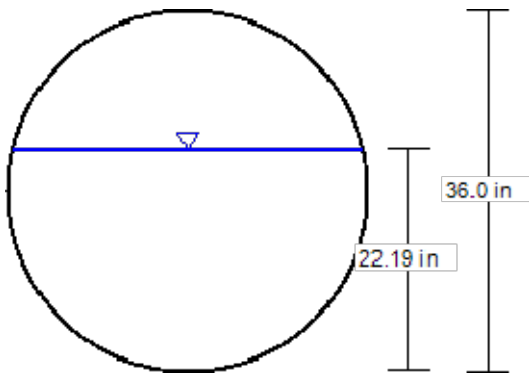
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.0 %
Normal Depth	22.19 in
Diameter	36.0 in
Discharge	66.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 12A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	36.0	in
Discharge	53.00	ft ³ /s

Results

Normal Depth	13.05	in
Flow Area	2.31	ft ²
Wetted Perimeter	3.88	ft
Hydraulic Radius	7.16	in
Top Width	2.88	ft
Critical Depth	2.37	ft
Percent Full	36.3	%
Critical Slope	0.00680	ft/ft
Velocity	22.91	ft/s
Velocity Head	8.16	ft
Specific Energy	9.25	ft
Froude Number	4.51	
Maximum Discharge	202.92	ft ³ /s
Discharge Full	188.64	ft ³ /s
Slope Full	0.00631	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	36.26	%
Downstream Velocity	Infinity	ft/s

Worksheet for 12A

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	13.05	in
Critical Depth	2.37	ft
Channel Slope	8.0	%
Critical Slope	0.00680	ft/ft

Cross Section for 12A

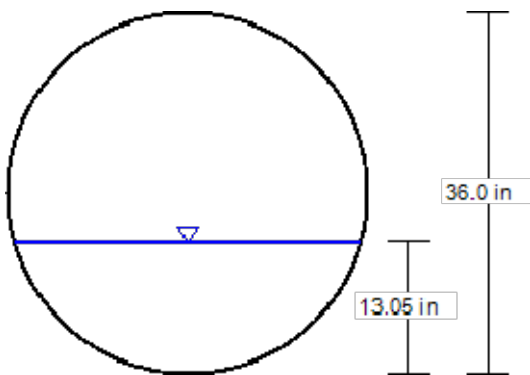
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	13.05 in
Diameter	36.0 in
Discharge	53.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 13

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.0	%
Diameter	36.0	in
Discharge	58.00	ft ³ /s

Results

Normal Depth	25.96	in
Flow Area	5.46	ft ²
Wetted Perimeter	6.09	ft
Hydraulic Radius	10.76	in
Top Width	2.69	ft
Critical Depth	2.47	ft
Percent Full	72.1	%
Critical Slope	0.00753	ft/ft
Velocity	10.63	ft/s
Velocity Head	1.76	ft
Specific Energy	3.92	ft
Froude Number	1.32	
Maximum Discharge	71.74	ft ³ /s
Discharge Full	66.69	ft ³ /s
Slope Full	0.00756	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	72.11	%
Downstream Velocity	Infinity	ft/s

Worksheet for 13

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	25.96	in
Critical Depth	2.47	ft
Channel Slope	1.0	%
Critical Slope	0.00753	ft/ft

Cross Section for 13

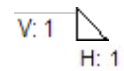
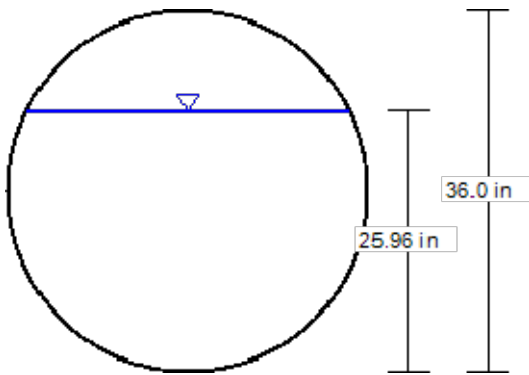
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.0 %
Normal Depth	25.96 in
Diameter	36.0 in
Discharge	58.00 ft ³ /s

Cross Section Image



Worksheet for 25

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.5 %
Diameter	30.0 in
Discharge	6.00 ft ³ /s

Results

Normal Depth	7.00 in
Flow Area	0.87 ft ²
Wetted Perimeter	2.52 ft
Hydraulic Radius	4.15 in
Top Width	2.12 ft
Critical Depth	0.81 ft
Percent Full	23.3 %
Critical Slope	0.00414 ft/ft
Velocity	6.89 ft/s
Velocity Head	0.74 ft
Specific Energy	1.32 ft
Froude Number	1.89
Maximum Discharge	54.04 ft ³ /s
Discharge Full	50.23 ft ³ /s
Slope Full	0.00021 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	23.35 %
Downstream Velocity	Infinity ft/s

Worksheet for 25

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	7.00	in
Critical Depth	0.81	ft
Channel Slope	1.5	%
Critical Slope	0.00414	ft/ft

Cross Section for 25

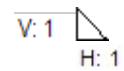
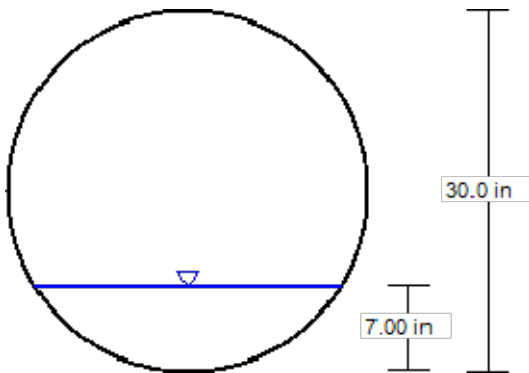
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.5 %
Normal Depth	7.00 in
Diameter	30.0 in
Discharge	6.00 ft ³ /s

Cross Section Image



Worksheet for 27

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.3	%
Diameter	36.0	in
Discharge	59.00	ft ³ /s

Results

Normal Depth	19.75	in
Flow Area	3.97	ft ²
Wetted Perimeter	5.00	ft
Hydraulic Radius	9.52	in
Top Width	2.99	ft
Critical Depth	2.48	ft
Percent Full	54.9	%
Critical Slope	0.00769	ft/ft
Velocity	14.86	ft/s
Velocity Head	3.43	ft
Specific Energy	5.08	ft
Froude Number	2.27	
Maximum Discharge	108.81	ft ³ /s
Discharge Full	101.15	ft ³ /s
Slope Full	0.00783	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	54.86	%
Downstream Velocity	Infinity	ft/s

Worksheet for 27

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	19.75	in
Critical Depth	2.48	ft
Channel Slope	2.3	%
Critical Slope	0.00769	ft/ft

Cross Section for 27

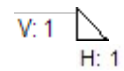
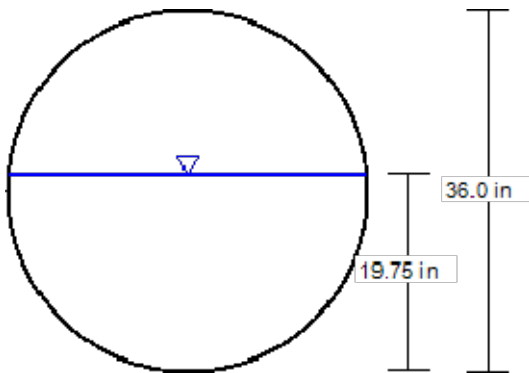
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.3 %
Normal Depth	19.75 in
Diameter	36.0 in
Discharge	59.00 ft ³ /s

Cross Section Image



Worksheet for 34

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	5.0	%
Diameter	36.0	in
Discharge	58.00	ft ³ /s

Results

Normal Depth	15.59	in
Flow Area	2.93	ft ²
Wetted Perimeter	4.31	ft
Hydraulic Radius	8.17	in
Top Width	2.97	ft
Critical Depth	2.47	ft
Percent Full	43.3	%
Critical Slope	0.00753	ft/ft
Velocity	19.78	ft/s
Velocity Head	6.08	ft
Specific Energy	7.38	ft
Froude Number	3.51	
Maximum Discharge	160.42	ft ³ /s
Discharge Full	149.13	ft ³ /s
Slope Full	0.00756	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	43.30	%
Downstream Velocity	Infinity	ft/s

Worksheet for 34

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	15.59	in
Critical Depth	2.47	ft
Channel Slope	5.0	%
Critical Slope	0.00753	ft/ft

Cross Section for 34

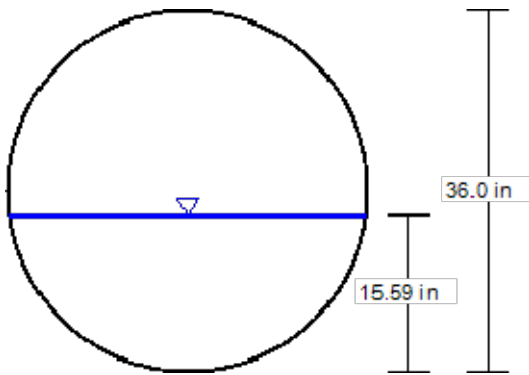
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	5.0 %
Normal Depth	15.59 in
Diameter	36.0 in
Discharge	58.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 35

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.0	%
Diameter	30.0	in
Discharge	2.00	ft ³ /s

Results

Normal Depth	4.51	in
Flow Area	0.46	ft ²
Wetted Perimeter	1.99	ft
Hydraulic Radius	2.79	in
Top Width	1.79	ft
Critical Depth	0.46	ft
Percent Full	15.0	%
Critical Slope	0.00430	ft/ft
Velocity	4.32	ft/s
Velocity Head	0.29	ft
Specific Energy	0.67	ft
Froude Number	1.50	
Maximum Discharge	44.12	ft ³ /s
Discharge Full	41.01	ft ³ /s
Slope Full	0.00002	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	15.02	%
Downstream Velocity	Infinity	ft/s

Worksheet for 35

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	4.51	in
Critical Depth	0.46	ft
Channel Slope	1.0	%
Critical Slope	0.00430	ft/ft

Cross Section for 35

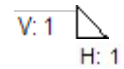
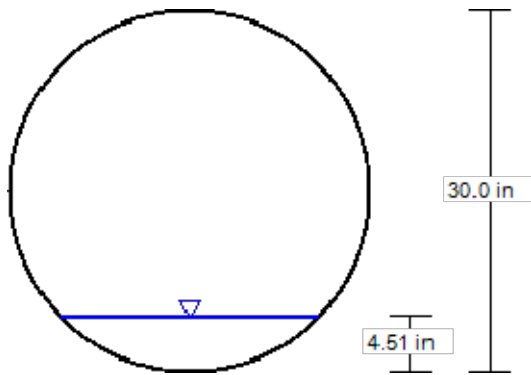
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.0 %
Normal Depth	4.51 in
Diameter	30.0 in
Discharge	2.00 ft ³ /s

Cross Section Image



Worksheet for 36

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.0	%
Diameter	42.0	in
Discharge	74.00	ft ³ /s

Results

Normal Depth	26.78	in
Flow Area	6.47	ft ²
Wetted Perimeter	6.47	ft
Hydraulic Radius	12.00	in
Top Width	3.37	ft
Critical Depth	2.69	ft
Percent Full	63.8	%
Critical Slope	0.00614	ft/ft
Velocity	11.43	ft/s
Velocity Head	2.03	ft
Specific Energy	4.26	ft
Froude Number	1.45	
Maximum Discharge	108.22	ft ³ /s
Discharge Full	100.60	ft ³ /s
Slope Full	0.00541	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	63.75	%
Downstream Velocity	Infinity	ft/s

Worksheet for 36

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	26.78	in
Critical Depth	2.69	ft
Channel Slope	1.0	%
Critical Slope	0.00614	ft/ft

Cross Section for 36

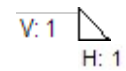
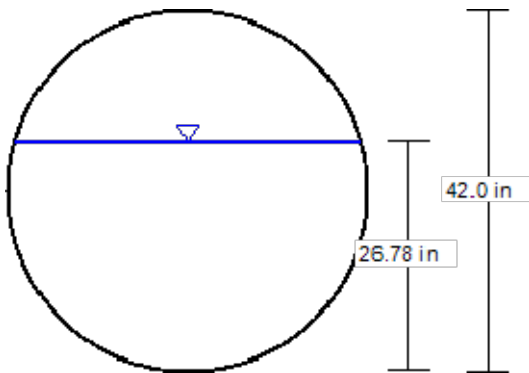
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.0 %
Normal Depth	26.78 in
Diameter	42.0 in
Discharge	74.00 ft ³ /s

Cross Section Image



Worksheet for 37

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.9	%
Diameter	60.0	in
Discharge	198.00	ft ³ /s

Results

Normal Depth	40.65	in
Flow Area	14.16	ft ²
Wetted Perimeter	9.67	ft
Hydraulic Radius	17.57	in
Top Width	4.67	ft
Critical Depth	4.02	ft
Percent Full	67.7	%
Critical Slope	0.00599	ft/ft
Velocity	13.98	ft/s
Velocity Head	3.04	ft
Specific Energy	6.43	ft
Froude Number	1.42	
Maximum Discharge	265.77	ft ³ /s
Discharge Full	247.06	ft ³ /s
Slope Full	0.00578	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	67.75	%
Downstream Velocity	Infinity	ft/s

Worksheet for 37

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	40.65	in
Critical Depth	4.02	ft
Channel Slope	0.9	%
Critical Slope	0.00599	ft/ft

Cross Section for 37

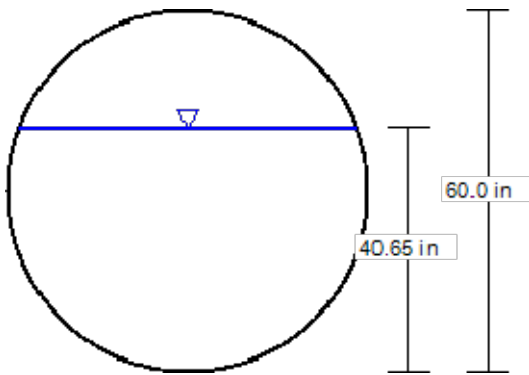
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.9 %
Normal Depth	40.65 in
Diameter	60.0 in
Discharge	198.00 ft ³ /s

Cross Section Image



V: 1
H: 1

A small right-angled triangle diagram illustrating the channel slope. The vertical side is labeled 'V: 1' and the horizontal side is labeled 'H: 1'.

Worksheet for 40

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.6	%
Diameter	30.0	in
Discharge	38.00	ft ³ /s

Results

Normal Depth	11.98	in
Flow Area	1.83	ft ²
Wetted Perimeter	3.42	ft
Hydraulic Radius	6.42	in
Top Width	2.45	ft
Critical Depth	2.08	ft
Percent Full	39.9	%
Critical Slope	0.00834	ft/ft
Velocity	20.77	ft/s
Velocity Head	6.70	ft
Specific Energy	7.70	ft
Froude Number	4.24	
Maximum Discharge	121.63	ft ³ /s
Discharge Full	113.07	ft ³ /s
Slope Full	0.00858	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	39.94	%
Downstream Velocity	Infinity	ft/s

Worksheet for 40

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	11.98	in
Critical Depth	2.08	ft
Channel Slope	7.6	%
Critical Slope	0.00834	ft/ft

Cross Section for 40

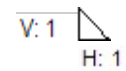
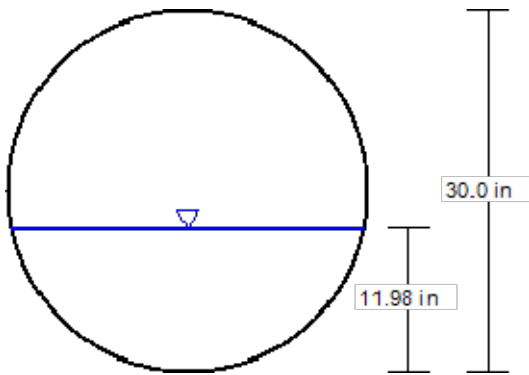
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.6 %
Normal Depth	11.98 in
Diameter	30.0 in
Discharge	38.00 ft ³ /s

Cross Section Image



Worksheet for 41

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.9	%
Height	5.00	ft
Bottom Width	6.00	ft
Discharge	265.00	ft ³ /s

Results

Normal Depth	41.21	in
Flow Area	20.60	ft ²
Wetted Perimeter	12.87	ft
Hydraulic Radius	19.21	in
Top Width	6.00	ft
Critical Depth	3.93	ft
Percent Full	68.7	%
Critical Slope	0.00634	ft/ft
Velocity	12.86	ft/s
Velocity Head	2.57	ft
Specific Energy	6.00	ft
Froude Number	1.22	
Discharge Full	346.69	ft ³ /s
Slope Full	0.01540	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	68.68	%
Downstream Velocity	Infinity	ft/s

Worksheet for 41

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	41.21	in
Critical Depth	3.93	ft
Channel Slope	0.9	%
Critical Slope	0.00634	ft/ft

Cross Section for 41

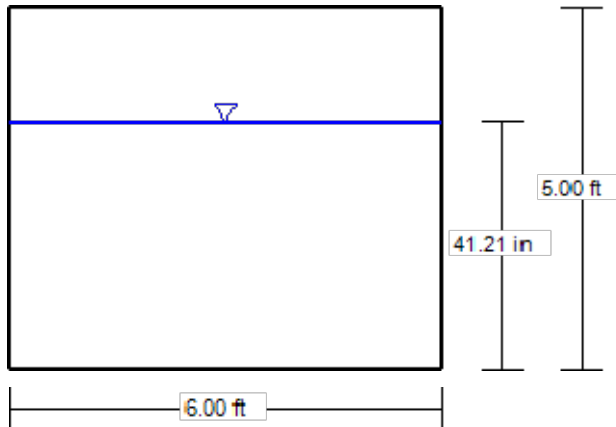
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015
Channel Slope	0.9 %
Normal Depth	41.21 in
Height	5.00 ft
Bottom Width	6.00 ft
Discharge	265.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 50

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.9	%
Diameter	30.0	in
Discharge	26.00	ft ³ /s

Results

Normal Depth	9.69	in
Flow Area	1.37	ft ²
Wetted Perimeter	3.02	ft
Hydraulic Radius	5.44	in
Top Width	2.34	ft
Critical Depth	1.74	ft
Percent Full	32.3	%
Critical Slope	0.00584	ft/ft
Velocity	18.97	ft/s
Velocity Head	5.59	ft
Specific Energy	6.40	ft
Froude Number	4.37	
Maximum Discharge	124.01	ft ³ /s
Discharge Full	115.28	ft ³ /s
Slope Full	0.00402	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	32.28	%
Downstream Velocity	Infinity	ft/s

Worksheet for 50

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	9.69	in
Critical Depth	1.74	ft
Channel Slope	7.9	%
Critical Slope	0.00584	ft/ft

Cross Section for 50

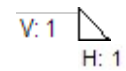
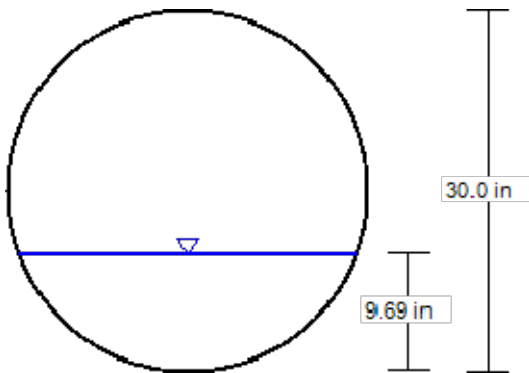
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.9 %
Normal Depth	9.69 in
Diameter	30.0 in
Discharge	26.00 ft ³ /s

Cross Section Image



Worksheet for 52

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.1	%
Diameter	36.0	in
Discharge	80.00	ft ³ /s

Results

Normal Depth	16.93	in
Flow Area	3.27	ft ²
Wetted Perimeter	4.53	ft
Hydraulic Radius	8.65	in
Top Width	2.99	ft
Critical Depth	2.77	ft
Percent Full	47.0	%
Critical Slope	0.01247	ft/ft
Velocity	24.48	ft/s
Velocity Head	9.31	ft
Specific Energy	10.73	ft
Froude Number	4.13	
Maximum Discharge	191.17	ft ³ /s
Discharge Full	177.71	ft ³ /s
Slope Full	0.01439	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	47.04	%
Downstream Velocity	Infinity	ft/s

Worksheet for 52

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	16.93	in
Critical Depth	2.77	ft
Channel Slope	7.1	%
Critical Slope	0.01247	ft/ft

Cross Section for 52

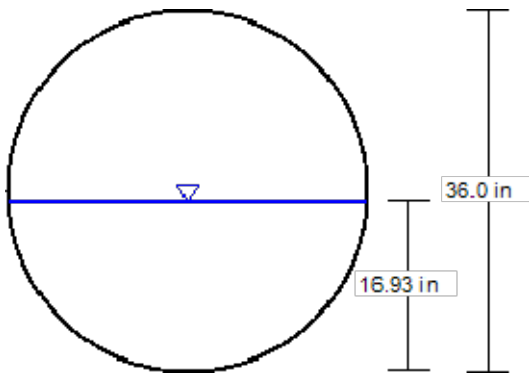
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.1 %
Normal Depth	16.93 in
Diameter	36.0 in
Discharge	80.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 55

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.3	%
Diameter	30.0	in
Discharge	29.00	ft ³ /s

Results

Normal Depth	10.47	in
Flow Area	1.53	ft ²
Wetted Perimeter	3.16	ft
Hydraulic Radius	5.79	in
Top Width	2.38	ft
Critical Depth	1.84	ft
Percent Full	34.9	%
Critical Slope	0.00632	ft/ft
Velocity	19.01	ft/s
Velocity Head	5.61	ft
Specific Energy	6.49	ft
Froude Number	4.19	
Maximum Discharge	119.21	ft ³ /s
Discharge Full	110.82	ft ³ /s
Slope Full	0.00500	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	34.91	%
Downstream Velocity	Infinity	ft/s

Worksheet for 55

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	10.47	in
Critical Depth	1.84	ft
Channel Slope	7.3	%
Critical Slope	0.00632	ft/ft

Cross Section for 55

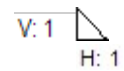
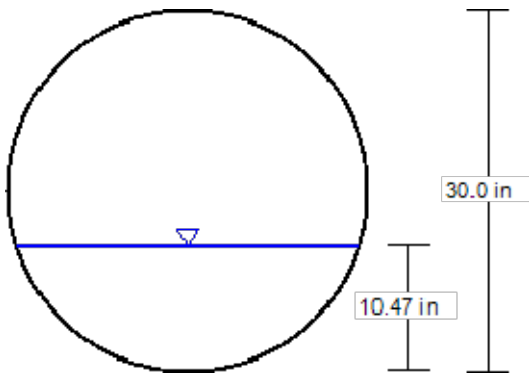
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.3 %
Normal Depth	10.47 in
Diameter	30.0 in
Discharge	29.00 ft ³ /s

Cross Section Image



Worksheet for 61

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.1	%
Diameter	60.0	in
Discharge	389.00	ft ³ /s

Results

Normal Depth	42.43	in
Flow Area	14.84	ft ²
Wetted Perimeter	9.99	ft
Hydraulic Radius	17.83	in
Top Width	4.55	ft
Critical Depth	4.87	ft
Percent Full	70.7	%
Critical Slope	0.01978	ft/ft
Velocity	26.21	ft/s
Velocity Head	10.67	ft
Specific Energy	14.21	ft
Froude Number	2.56	
Maximum Discharge	493.25	ft ³ /s
Discharge Full	458.53	ft ³ /s
Slope Full	0.02231	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	70.72	%
Downstream Velocity	Infinity	ft/s

Worksheet for 61

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	42.43	in
Critical Depth	4.87	ft
Channel Slope	3.1	%
Critical Slope	0.01978	ft/ft

Cross Section for 61

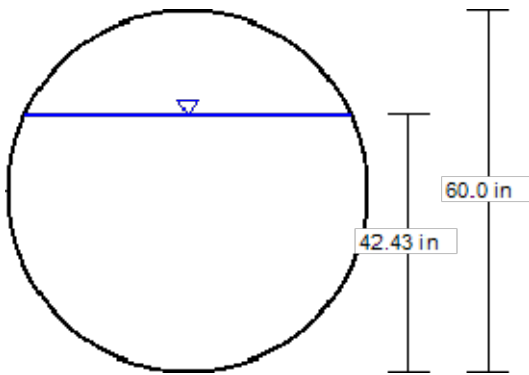
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	3.1 %
Normal Depth	42.43 in
Diameter	60.0 in
Discharge	389.00 ft ³ /s

Cross Section Image



V: 1
H: 1

A small right-angled triangle diagram illustrating the slope. The vertical side is labeled 'V: 1' and the horizontal side is labeled 'H: 1'.

Worksheet for 62

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	30.0	in
Discharge	35.00	ft ³ /s

Results

Normal Depth	11.30	in
Flow Area	1.69	ft ²
Wetted Perimeter	3.30	ft
Hydraulic Radius	6.14	in
Top Width	2.42	ft
Critical Depth	2.01	ft
Percent Full	37.7	%
Critical Slope	0.00755	ft/ft
Velocity	20.69	ft/s
Velocity Head	6.66	ft
Specific Energy	7.60	ft
Froude Number	4.37	
Maximum Discharge	124.79	ft ³ /s
Discharge Full	116.01	ft ³ /s
Slope Full	0.00728	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	37.66	%
Downstream Velocity	Infinity	ft/s

Worksheet for 62

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	11.30	in
Critical Depth	2.01	ft
Channel Slope	8.0	%
Critical Slope	0.00755	ft/ft

Cross Section for 62

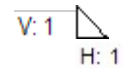
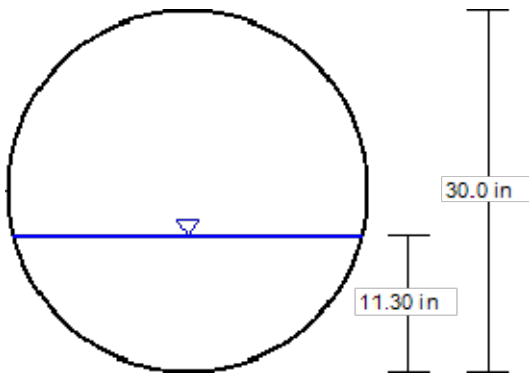
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	11.30 in
Diameter	30.0 in
Discharge	35.00 ft ³ /s

Cross Section Image



Worksheet for 63

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.5	%
Diameter	30.0	in
Discharge	43.00	ft ³ /s

Results

Normal Depth	21.36	in
Flow Area	3.74	ft ²
Wetted Perimeter	5.02	ft
Hydraulic Radius	8.93	in
Top Width	2.26	ft
Critical Depth	2.19	ft
Percent Full	71.2	%
Critical Slope	0.00994	ft/ft
Velocity	11.50	ft/s
Velocity Head	2.06	ft
Specific Energy	3.84	ft
Froude Number	1.58	
Maximum Discharge	54.04	ft ³ /s
Discharge Full	50.23	ft ³ /s
Slope Full	0.01099	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	71.21	%
Downstream Velocity	Infinity	ft/s

Worksheet for 63

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	21.36	in
Critical Depth	2.19	ft
Channel Slope	1.5	%
Critical Slope	0.00994	ft/ft

Cross Section for 63

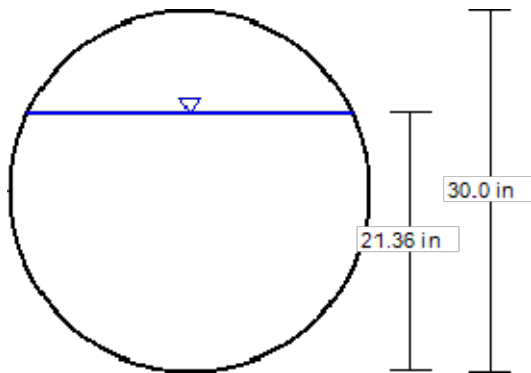
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.5 %
Normal Depth	21.36 in
Diameter	30.0 in
Discharge	43.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 64

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	36.0	in
Discharge	48.00	ft ³ /s

Results

Normal Depth	12.38	in
Flow Area	2.15	ft ²
Wetted Perimeter	3.76	ft
Hydraulic Radius	6.87	in
Top Width	2.85	ft
Critical Depth	2.26	ft
Percent Full	34.4	%
Critical Slope	0.00619	ft/ft
Velocity	22.29	ft/s
Velocity Head	7.72	ft
Specific Energy	8.76	ft
Froude Number	4.52	
Maximum Discharge	202.92	ft ³ /s
Discharge Full	188.64	ft ³ /s
Slope Full	0.00518	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	34.40	%
Downstream Velocity	Infinity	ft/s

Worksheet for 64

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	12.38	in
Critical Depth	2.26	ft
Channel Slope	8.0	%
Critical Slope	0.00619	ft/ft

Cross Section for 64

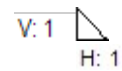
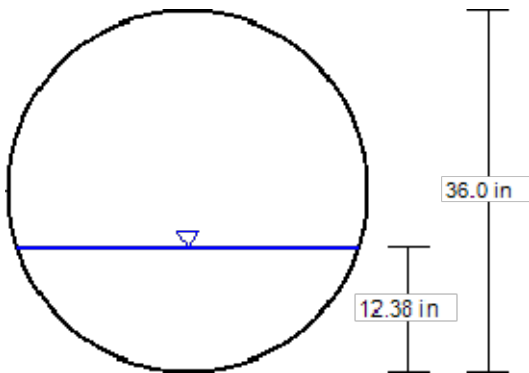
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	12.38 in
Diameter	36.0 in
Discharge	48.00 ft ³ /s

Cross Section Image



Worksheet for 66

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.1	%
Diameter	30.0	in
Discharge	11.00	ft ³ /s

Results

Normal Depth	7.91	in
Flow Area	1.03	ft ²
Wetted Perimeter	2.70	ft
Hydraulic Radius	4.60	in
Top Width	2.20	ft
Critical Depth	1.11	ft
Percent Full	26.4	%
Critical Slope	0.00434	ft/ft
Velocity	10.63	ft/s
Velocity Head	1.76	ft
Specific Energy	2.42	ft
Froude Number	2.73	
Maximum Discharge	77.68	ft ³ /s
Discharge Full	72.21	ft ³ /s
Slope Full	0.00072	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	26.38	%
Downstream Velocity	Infinity	ft/s

Worksheet for 66

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	7.91	in
Critical Depth	1.11	ft
Channel Slope	3.1	%
Critical Slope	0.00434	ft/ft

Cross Section for 66

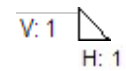
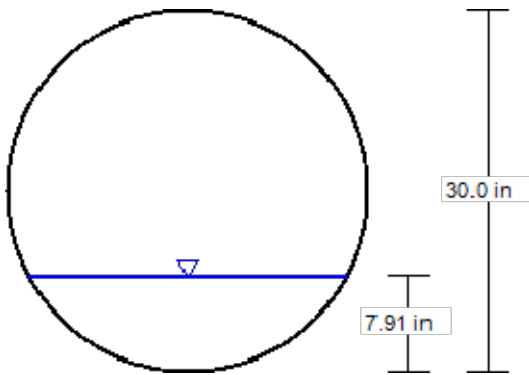
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	3.1 %
Normal Depth	7.91 in
Diameter	30.0 in
Discharge	11.00 ft ³ /s

Cross Section Image



Worksheet for 68

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.3	%
Diameter	30.0	in
Discharge	9.00	ft ³ /s

Results

Normal Depth	8.92	in
Flow Area	1.22	ft ²
Wetted Perimeter	2.88	ft
Hydraulic Radius	5.09	in
Top Width	2.29	ft
Critical Depth	1.00	ft
Percent Full	29.7	%
Critical Slope	0.00424	ft/ft
Velocity	7.36	ft/s
Velocity Head	0.84	ft
Specific Energy	1.58	ft
Froude Number	1.77	
Maximum Discharge	50.30	ft ³ /s
Discharge Full	46.76	ft ³ /s
Slope Full	0.00048	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	29.73	%
Downstream Velocity	Infinity	ft/s

Worksheet for 68

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	8.92	in
Critical Depth	1.00	ft
Channel Slope	1.3	%
Critical Slope	0.00424	ft/ft

Cross Section for 68

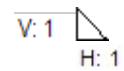
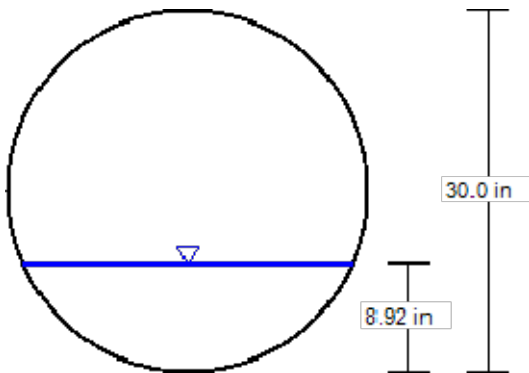
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.3 %
Normal Depth	8.92 in
Diameter	30.0 in
Discharge	9.00 ft ³ /s

Cross Section Image



Worksheet for 69

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	30.0	in
Discharge	11.00	ft ³ /s

Results

Normal Depth	6.24	in
Flow Area	0.74	ft ²
Wetted Perimeter	2.37	ft
Hydraulic Radius	3.75	in
Top Width	2.03	ft
Critical Depth	1.11	ft
Percent Full	20.8	%
Critical Slope	0.00434	ft/ft
Velocity	14.88	ft/s
Velocity Head	3.44	ft
Specific Energy	3.96	ft
Froude Number	4.35	
Maximum Discharge	124.79	ft ³ /s
Discharge Full	116.01	ft ³ /s
Slope Full	0.00072	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	20.80	%
Downstream Velocity	Infinity	ft/s

Worksheet for 69

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.24	in
Critical Depth	1.11	ft
Channel Slope	8.0	%
Critical Slope	0.00434	ft/ft

Cross Section for 69

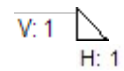
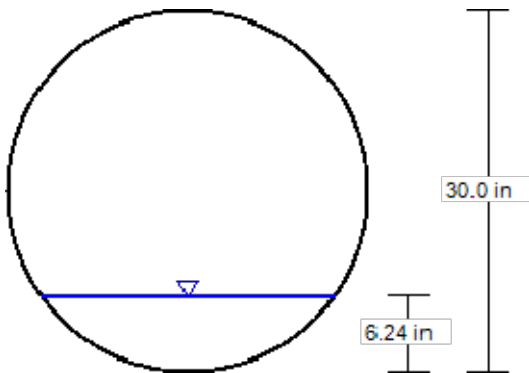
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	6.24 in
Diameter	30.0 in
Discharge	11.00 ft ³ /s

Cross Section Image



Worksheet for 72

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.0	%
Diameter	30.0	in
Discharge	29.00	ft ³ /s

Results

Normal Depth	10.59	in
Flow Area	1.55	ft ²
Wetted Perimeter	3.18	ft
Hydraulic Radius	5.84	in
Top Width	2.39	ft
Critical Depth	1.84	ft
Percent Full	35.3	%
Critical Slope	0.00632	ft/ft
Velocity	18.72	ft/s
Velocity Head	5.45	ft
Specific Energy	6.33	ft
Froude Number	4.10	
Maximum Discharge	116.73	ft ³ /s
Discharge Full	108.52	ft ³ /s
Slope Full	0.00500	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	35.30	%
Downstream Velocity	Infinity	ft/s

Worksheet for 72

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	10.59	in
Critical Depth	1.84	ft
Channel Slope	7.0	%
Critical Slope	0.00632	ft/ft

Cross Section for 72

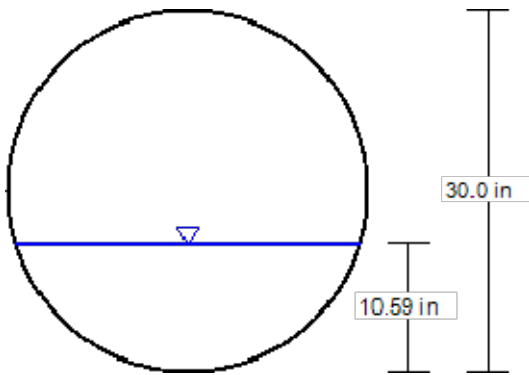
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.0 %
Normal Depth	10.59 in
Diameter	30.0 in
Discharge	29.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 74

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	6.3	%
Diameter	30.0	in
Discharge	5.00	ft ³ /s

Results

Normal Depth	4.50	in
Flow Area	0.46	ft ²
Wetted Perimeter	1.99	ft
Hydraulic Radius	2.79	in
Top Width	1.79	ft
Critical Depth	0.74	ft
Percent Full	15.0	%
Critical Slope	0.00414	ft/ft
Velocity	10.83	ft/s
Velocity Head	1.82	ft
Specific Energy	2.20	ft
Froude Number	3.76	
Maximum Discharge	110.74	ft ³ /s
Discharge Full	102.95	ft ³ /s
Slope Full	0.00015	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	14.99	%
Downstream Velocity	Infinity	ft/s

Worksheet for 74

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	4.50	in
Critical Depth	0.74	ft
Channel Slope	6.3	%
Critical Slope	0.00414	ft/ft

Cross Section for 74

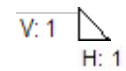
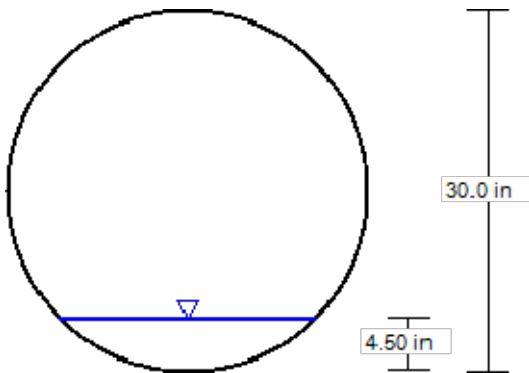
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	6.3 %
Normal Depth	4.50 in
Diameter	30.0 in
Discharge	5.00 ft ³ /s

Cross Section Image



Worksheet for 77A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	36.0	in
Discharge	53.00	ft ³ /s

Results

Normal Depth	13.05	in
Flow Area	2.31	ft ²
Wetted Perimeter	3.88	ft
Hydraulic Radius	7.16	in
Top Width	2.88	ft
Critical Depth	2.37	ft
Percent Full	36.3	%
Critical Slope	0.00680	ft/ft
Velocity	22.91	ft/s
Velocity Head	8.16	ft
Specific Energy	9.25	ft
Froude Number	4.51	
Maximum Discharge	202.92	ft ³ /s
Discharge Full	188.64	ft ³ /s
Slope Full	0.00631	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	36.26	%
Downstream Velocity	Infinity	ft/s

Worksheet for 77A

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	13.05	in
Critical Depth	2.37	ft
Channel Slope	8.0	%
Critical Slope	0.00680	ft/ft

Cross Section for 77A

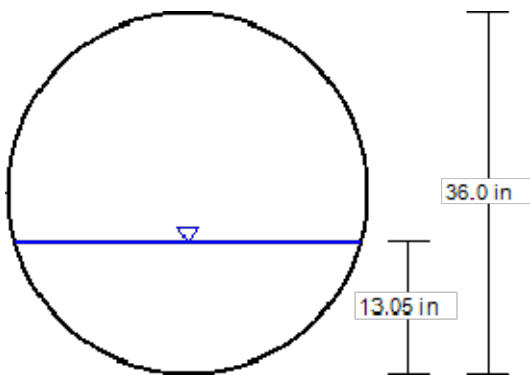
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	13.05 in
Diameter	36.0 in
Discharge	53.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 79

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	36.0	in
Discharge	92.00	ft ³ /s

Results

Normal Depth	17.74	in
Flow Area	3.47	ft ²
Wetted Perimeter	4.67	ft
Hydraulic Radius	8.92	in
Top Width	3.00	ft
Critical Depth	2.86	ft
Percent Full	49.3	%
Critical Slope	0.01650	ft/ft
Velocity	26.52	ft/s
Velocity Head	10.93	ft
Specific Energy	12.41	ft
Froude Number	4.35	
Maximum Discharge	202.92	ft ³ /s
Discharge Full	188.64	ft ³ /s
Slope Full	0.01903	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	49.27	%
Downstream Velocity	Infinity	ft/s

Worksheet for 79

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	17.74	in
Critical Depth	2.86	ft
Channel Slope	8.0	%
Critical Slope	0.01650	ft/ft

Cross Section for 78

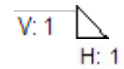
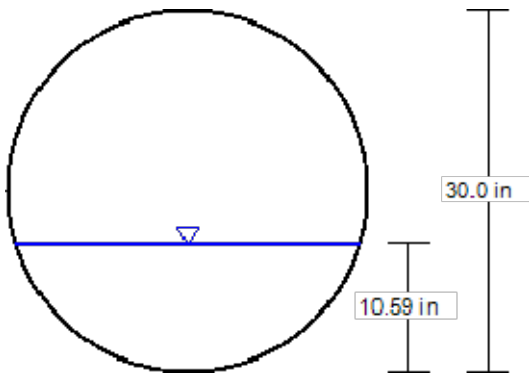
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	10.59 in
Diameter	30.0 in
Discharge	31.00 ft ³ /s

Cross Section Image



Worksheet for 79

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	36.0	in
Discharge	92.00	ft ³ /s

Results

Normal Depth	17.74	in
Flow Area	3.47	ft ²
Wetted Perimeter	4.67	ft
Hydraulic Radius	8.92	in
Top Width	3.00	ft
Critical Depth	2.86	ft
Percent Full	49.3	%
Critical Slope	0.01650	ft/ft
Velocity	26.52	ft/s
Velocity Head	10.93	ft
Specific Energy	12.41	ft
Froude Number	4.35	
Maximum Discharge	202.92	ft ³ /s
Discharge Full	188.64	ft ³ /s
Slope Full	0.01903	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	49.27	%
Downstream Velocity	Infinity	ft/s

Worksheet for 79

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	17.74	in
Critical Depth	2.86	ft
Channel Slope	8.0	%
Critical Slope	0.01650	ft/ft

Cross Section for 79

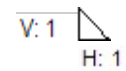
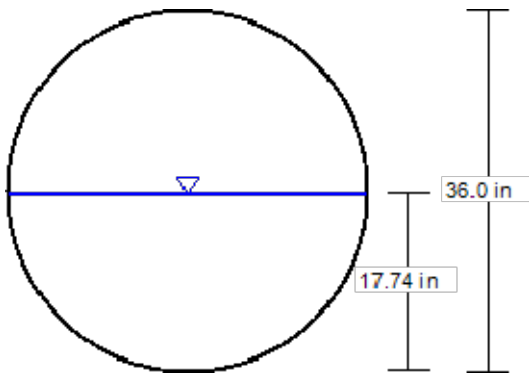
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	17.74 in
Diameter	36.0 in
Discharge	92.00 ft ³ /s

Cross Section Image



Worksheet for 80

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.1	%
Diameter	30.0	in
Discharge	8.00	ft ³ /s

Results

Normal Depth	6.74	in
Flow Area	0.83	ft ²
Wetted Perimeter	2.47	ft
Hydraulic Radius	4.01	in
Top Width	2.09	ft
Critical Depth	0.94	ft
Percent Full	22.5	%
Critical Slope	0.00419	ft/ft
Velocity	9.69	ft/s
Velocity Head	1.46	ft
Specific Energy	2.02	ft
Froude Number	2.72	
Maximum Discharge	77.68	ft ³ /s
Discharge Full	72.21	ft ³ /s
Slope Full	0.00038	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	22.47	%
Downstream Velocity	Infinity	ft/s

Worksheet for 80

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.74	in
Critical Depth	0.94	ft
Channel Slope	3.1	%
Critical Slope	0.00419	ft/ft

Cross Section for 80

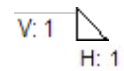
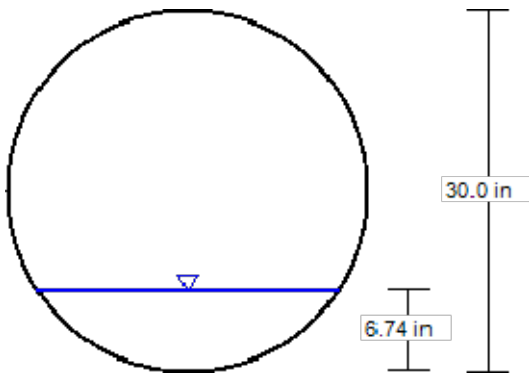
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	3.1 %
Normal Depth	6.74 in
Diameter	30.0 in
Discharge	8.00 ft ³ /s

Cross Section Image



Worksheet for 81

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	36.0	in
Discharge	100.00	ft ³ /s

Results

Normal Depth	18.64	in
Flow Area	3.69	ft ²
Wetted Perimeter	4.82	ft
Hydraulic Radius	9.20	in
Top Width	3.00	ft
Critical Depth	2.90	ft
Percent Full	51.8	%
Critical Slope	0.01968	ft/ft
Velocity	27.08	ft/s
Velocity Head	11.39	ft
Specific Energy	12.95	ft
Froude Number	4.30	
Maximum Discharge	202.92	ft ³ /s
Discharge Full	188.64	ft ³ /s
Slope Full	0.02248	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	51.76	%
Downstream Velocity	Infinity	ft/s

Worksheet for 81

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	18.64	in
Critical Depth	2.90	ft
Channel Slope	8.0	%
Critical Slope	0.01968	ft/ft

Cross Section for 81

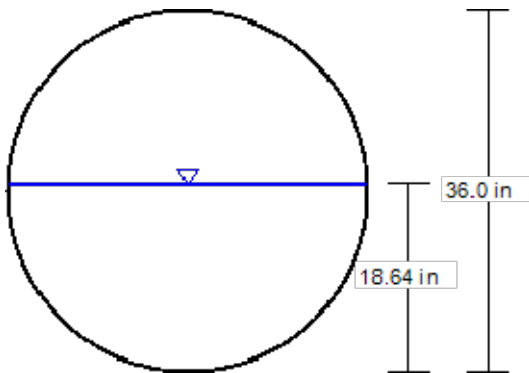
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	18.64 in
Diameter	36.0 in
Discharge	100.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 82

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.9	%
Diameter	30.0	in
Discharge	22.00	ft ³ /s

Results

Normal Depth	11.57	in
Flow Area	1.75	ft ²
Wetted Perimeter	3.35	ft
Hydraulic Radius	6.25	in
Top Width	2.43	ft
Critical Depth	1.60	ft
Percent Full	38.6	%
Critical Slope	0.00530	ft/ft
Velocity	12.60	ft/s
Velocity Head	2.47	ft
Specific Energy	3.43	ft
Froude Number	2.62	
Maximum Discharge	75.13	ft ³ /s
Discharge Full	69.85	ft ³ /s
Slope Full	0.00288	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	38.56	%
Downstream Velocity	Infinity	ft/s

Worksheet for 82

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	11.57	in
Critical Depth	1.60	ft
Channel Slope	2.9	%
Critical Slope	0.00530	ft/ft

Cross Section for 82

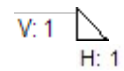
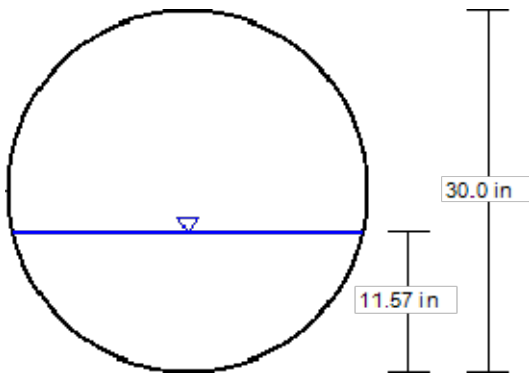
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.9 %
Normal Depth	11.57 in
Diameter	30.0 in
Discharge	22.00 ft ³ /s

Cross Section Image



Worksheet for 83

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.2	%
Diameter	30.0	in
Discharge	23.00	ft ³ /s

Results

Normal Depth	11.54	in
Flow Area	1.74	ft ²
Wetted Perimeter	3.34	ft
Hydraulic Radius	6.24	in
Top Width	2.43	ft
Critical Depth	1.63	ft
Percent Full	38.5	%
Critical Slope	0.00543	ft/ft
Velocity	13.22	ft/s
Velocity Head	2.72	ft
Specific Energy	3.68	ft
Froude Number	2.76	
Maximum Discharge	78.92	ft ³ /s
Discharge Full	73.37	ft ³ /s
Slope Full	0.00314	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	38.46	%
Downstream Velocity	Infinity	ft/s

Worksheet for 83

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	11.54	in
Critical Depth	1.63	ft
Channel Slope	3.2	%
Critical Slope	0.00543	ft/ft

Cross Section for 83

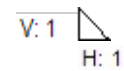
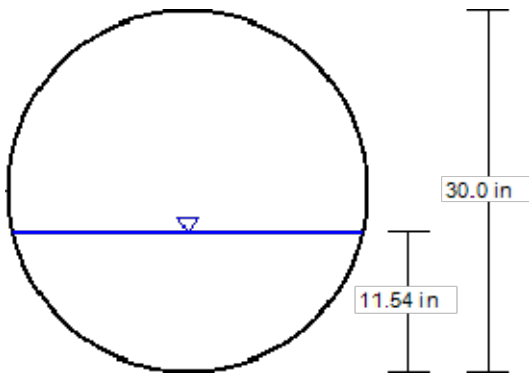
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	3.2 %
Normal Depth	11.54 in
Diameter	30.0 in
Discharge	23.00 ft ³ /s

Cross Section Image



Worksheet for 85

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.3	%
Diameter	30.0	in
Discharge	20.00	ft ³ /s

Results

Normal Depth	11.70	in
Flow Area	1.77	ft ²
Wetted Perimeter	3.37	ft
Hydraulic Radius	6.31	in
Top Width	2.44	ft
Critical Depth	1.52	ft
Percent Full	39.0	%
Critical Slope	0.00508	ft/ft
Velocity	11.29	ft/s
Velocity Head	1.98	ft
Specific Energy	2.95	ft
Froude Number	2.33	
Maximum Discharge	66.91	ft ³ /s
Discharge Full	62.20	ft ³ /s
Slope Full	0.00238	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	38.99	%
Downstream Velocity	Infinity	ft/s

Worksheet for 85

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	11.70	in
Critical Depth	1.52	ft
Channel Slope	2.3	%
Critical Slope	0.00508	ft/ft

Cross Section for 85

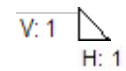
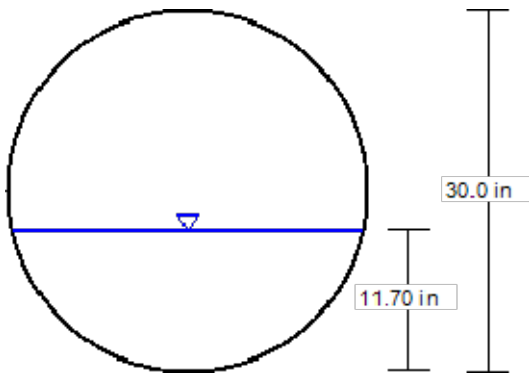
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.3 %
Normal Depth	11.70 in
Diameter	30.0 in
Discharge	20.00 ft ³ /s

Cross Section Image



Worksheet for 86

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	30.0	in
Discharge	16.00	ft ³ /s

Results

Normal Depth	7.53	in
Flow Area	0.96	ft ²
Wetted Perimeter	2.62	ft
Hydraulic Radius	4.41	in
Top Width	2.17	ft
Critical Depth	1.35	ft
Percent Full	25.1	%
Critical Slope	0.00470	ft/ft
Velocity	16.59	ft/s
Velocity Head	4.28	ft
Specific Energy	4.91	ft
Froude Number	4.39	
Maximum Discharge	124.79	ft ³ /s
Discharge Full	116.01	ft ³ /s
Slope Full	0.00152	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	25.09	%
Downstream Velocity	Infinity	ft/s

Worksheet for 86

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	7.53	in
Critical Depth	1.35	ft
Channel Slope	8.0	%
Critical Slope	0.00470	ft/ft

Cross Section for 86

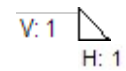
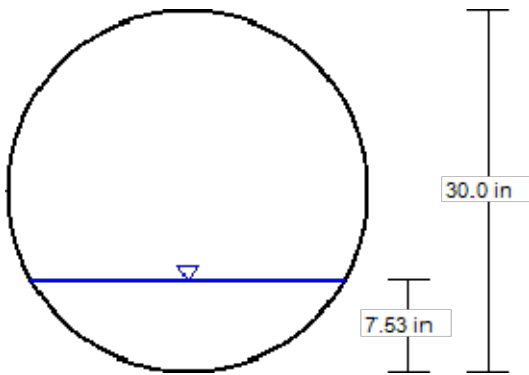
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	7.53 in
Diameter	30.0 in
Discharge	16.00 ft ³ /s

Cross Section Image



Worksheet for 87

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	30.0	in
Discharge	19.00	ft ³ /s

Results

Normal Depth	8.21	in
Flow Area	1.09	ft ²
Wetted Perimeter	2.75	ft
Hydraulic Radius	4.75	in
Top Width	2.23	ft
Critical Depth	1.48	ft
Percent Full	27.4	%
Critical Slope	0.00497	ft/ft
Velocity	17.43	ft/s
Velocity Head	4.72	ft
Specific Energy	5.41	ft
Froude Number	4.40	
Maximum Discharge	124.79	ft ³ /s
Discharge Full	116.01	ft ³ /s
Slope Full	0.00215	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	27.37	%
Downstream Velocity	Infinity	ft/s

Worksheet for 87

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	8.21	in
Critical Depth	1.48	ft
Channel Slope	8.0	%
Critical Slope	0.00497	ft/ft

Cross Section for 87

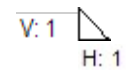
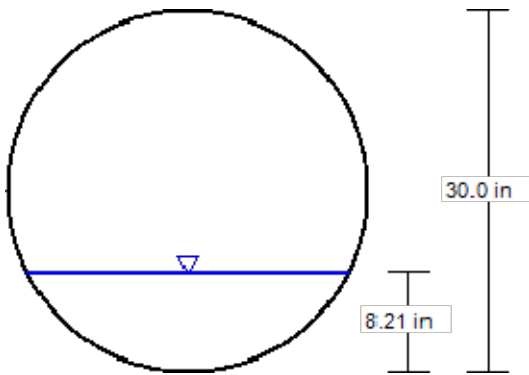
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	8.21 in
Diameter	30.0 in
Discharge	19.00 ft ³ /s

Cross Section Image



Worksheet for 88

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	30.0	in
Discharge	30.00	ft ³ /s

Results

Normal Depth	10.41	in
Flow Area	1.51	ft ²
Wetted Perimeter	3.15	ft
Hydraulic Radius	5.76	in
Top Width	2.38	ft
Critical Depth	1.87	ft
Percent Full	34.7	%
Critical Slope	0.00650	ft/ft
Velocity	19.83	ft/s
Velocity Head	6.11	ft
Specific Energy	6.98	ft
Froude Number	4.38	
Maximum Discharge	124.79	ft ³ /s
Discharge Full	116.01	ft ³ /s
Slope Full	0.00535	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	34.69	%
Downstream Velocity	Infinity	ft/s

Worksheet for 88

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	10.41	in
Critical Depth	1.87	ft
Channel Slope	8.0	%
Critical Slope	0.00650	ft/ft

Cross Section for 88

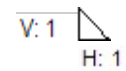
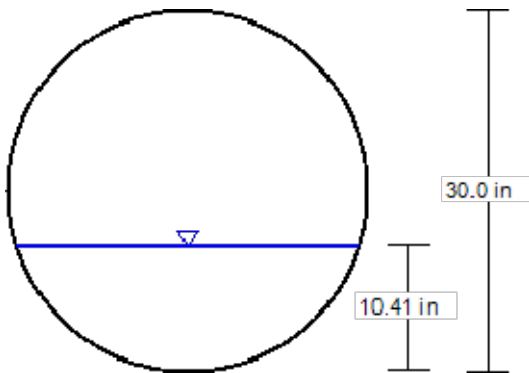
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	10.41 in
Diameter	30.0 in
Discharge	30.00 ft ³ /s

Cross Section Image



Worksheet for 89

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.0	%
Diameter	30.0	in
Discharge	13.00	ft ³ /s

Results

Normal Depth	6.78	in
Flow Area	0.83	ft ²
Wetted Perimeter	2.48	ft
Hydraulic Radius	4.03	in
Top Width	2.09	ft
Critical Depth	1.21	ft
Percent Full	22.6	%
Critical Slope	0.00447	ft/ft
Velocity	15.62	ft/s
Velocity Head	3.79	ft
Specific Energy	4.36	ft
Froude Number	4.37	
Maximum Discharge	124.79	ft ³ /s
Discharge Full	116.01	ft ³ /s
Slope Full	0.00100	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	22.60	%
Downstream Velocity	Infinity	ft/s

Worksheet for 89

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.78	in
Critical Depth	1.21	ft
Channel Slope	8.0	%
Critical Slope	0.00447	ft/ft

Cross Section for 89

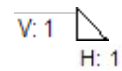
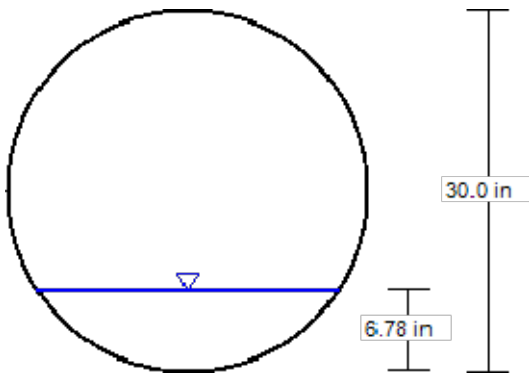
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.0 %
Normal Depth	6.78 in
Diameter	30.0 in
Discharge	13.00 ft ³ /s

Cross Section Image



Worksheet for 90

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.8	%
Diameter	36.0	in
Discharge	53.00	ft ³ /s

Results

Normal Depth	13.14	in
Flow Area	2.33	ft ²
Wetted Perimeter	3.89	ft
Hydraulic Radius	7.20	in
Top Width	2.89	ft
Critical Depth	2.37	ft
Percent Full	36.5	%
Critical Slope	0.00680	ft/ft
Velocity	22.70	ft/s
Velocity Head	8.01	ft
Specific Energy	9.11	ft
Froude Number	4.45	
Maximum Discharge	200.37	ft ³ /s
Discharge Full	186.27	ft ³ /s
Slope Full	0.00631	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	36.50	%
Downstream Velocity	Infinity	ft/s

Worksheet for 90

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	13.14	in
Critical Depth	2.37	ft
Channel Slope	7.8	%
Critical Slope	0.00680	ft/ft

Cross Section for 90

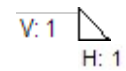
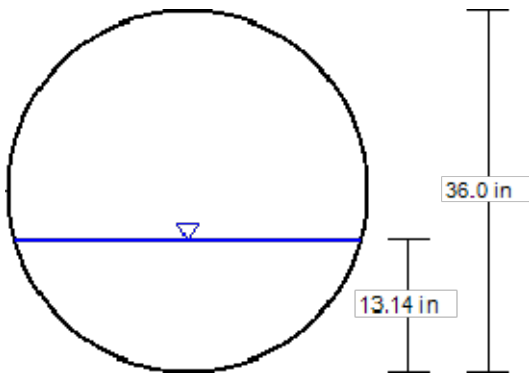
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.8 %
Normal Depth	13.14 in
Diameter	36.0 in
Discharge	53.00 ft ³ /s

Cross Section Image



Worksheet for 91

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.5	%
Diameter	30.0	in
Discharge	2.00	ft ³ /s

Results

Normal Depth	5.33	in
Flow Area	0.59	ft ²
Wetted Perimeter	2.18	ft
Hydraulic Radius	3.25	in
Top Width	1.91	ft
Critical Depth	0.46	ft
Percent Full	17.8	%
Critical Slope	0.00431	ft/ft
Velocity	3.39	ft/s
Velocity Head	0.18	ft
Specific Energy	0.62	ft
Froude Number	1.07	
Maximum Discharge	31.20	ft ³ /s
Discharge Full	29.00	ft ³ /s
Slope Full	0.00002	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	17.78	%
Downstream Velocity	Infinity	ft/s

Worksheet for 91

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	5.33	in
Critical Depth	0.46	ft
Channel Slope	0.5	%
Critical Slope	0.00431	ft/ft

Cross Section for 91

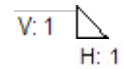
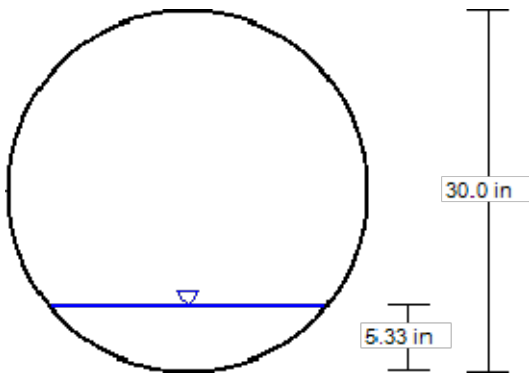
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.5 %
Normal Depth	5.33 in
Diameter	30.0 in
Discharge	2.00 ft ³ /s

Cross Section Image



Worksheet for 92

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.7 %
Diameter	30.0 in
Discharge	16.00 ft ³ /s

Results

Normal Depth	9.95 in
Flow Area	1.42 ft ²
Wetted Perimeter	3.07 ft
Hydraulic Radius	5.56 in
Top Width	2.35 ft
Critical Depth	1.35 ft
Percent Full	33.2 %
Critical Slope	0.00470 ft/ft
Velocity	11.25 ft/s
Velocity Head	1.97 ft
Specific Energy	2.79 ft
Froude Number	2.55
Maximum Discharge	72.50 ft ³ /s
Discharge Full	67.39 ft ³ /s
Slope Full	0.00152 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	33.17 %
Downstream Velocity	Infinity ft/s

Worksheet for 92

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	9.95	in
Critical Depth	1.35	ft
Channel Slope	2.7	%
Critical Slope	0.00470	ft/ft

Cross Section for 92

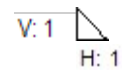
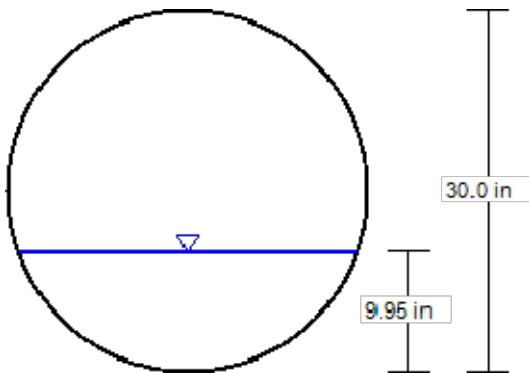
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.7 %
Normal Depth	9.95 in
Diameter	30.0 in
Discharge	16.00 ft ³ /s

Cross Section Image



Worksheet for 93

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.4	%
Diameter	30.0	in
Discharge	24.00	ft ³ /s

Results

Normal Depth	9.45	in
Flow Area	1.32	ft ²
Wetted Perimeter	2.98	ft
Hydraulic Radius	5.34	in
Top Width	2.32	ft
Critical Depth	1.67	ft
Percent Full	31.5	%
Critical Slope	0.00556	ft/ft
Velocity	18.12	ft/s
Velocity Head	5.10	ft
Specific Energy	5.89	ft
Froude Number	4.23	
Maximum Discharge	120.02	ft ³ /s
Discharge Full	111.57	ft ³ /s
Slope Full	0.00342	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	31.50	%
Downstream Velocity	Infinity	ft/s

Worksheet for 93

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	9.45	in
Critical Depth	1.67	ft
Channel Slope	7.4	%
Critical Slope	0.00556	ft/ft

Cross Section for 93

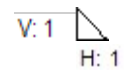
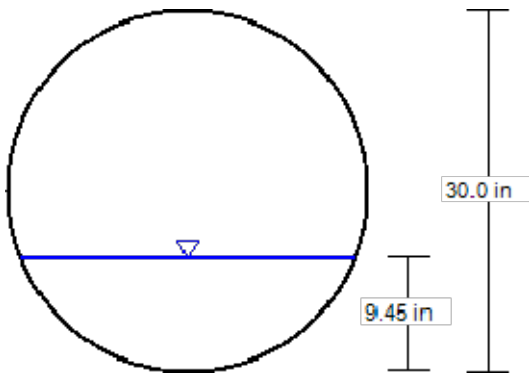
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.4 %
Normal Depth	9.45 in
Diameter	30.0 in
Discharge	24.00 ft ³ /s

Cross Section Image



Worksheet for 94

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	6.2	%
Diameter	30.0	in
Discharge	19.00	ft ³ /s

Results

Normal Depth	8.77	in
Flow Area	1.19	ft ²
Wetted Perimeter	2.86	ft
Hydraulic Radius	5.02	in
Top Width	2.27	ft
Critical Depth	1.48	ft
Percent Full	29.2	%
Critical Slope	0.00497	ft/ft
Velocity	15.91	ft/s
Velocity Head	3.94	ft
Specific Energy	4.67	ft
Froude Number	3.87	
Maximum Discharge	109.86	ft ³ /s
Discharge Full	102.13	ft ³ /s
Slope Full	0.00215	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	29.22	%
Downstream Velocity	Infinity	ft/s

Worksheet for 94

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	8.77	in
Critical Depth	1.48	ft
Channel Slope	6.2	%
Critical Slope	0.00497	ft/ft

Cross Section for 94

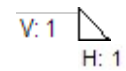
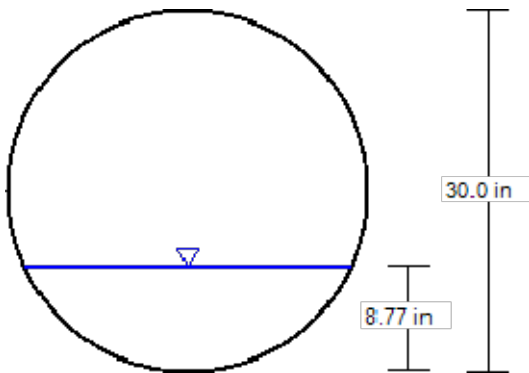
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	6.2 %
Normal Depth	8.77 in
Diameter	30.0 in
Discharge	19.00 ft ³ /s

Cross Section Image



Worksheet for 95

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.0	%
Diameter	42.0	in
Discharge	77.00	ft ³ /s

Results

Normal Depth	18.02	in
Flow Area	3.94	ft ²
Wetted Perimeter	5.00	ft
Hydraulic Radius	9.47	in
Top Width	3.46	ft
Critical Depth	2.75	ft
Percent Full	42.9	%
Critical Slope	0.00638	ft/ft
Velocity	19.52	ft/s
Velocity Head	5.92	ft
Specific Energy	7.42	ft
Froude Number	3.23	
Maximum Discharge	216.44	ft ³ /s
Discharge Full	201.21	ft ³ /s
Slope Full	0.00586	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	42.91	%
Downstream Velocity	Infinity	ft/s

Worksheet for 95

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	18.02	in
Critical Depth	2.75	ft
Channel Slope	4.0	%
Critical Slope	0.00638	ft/ft

Cross Section for 95

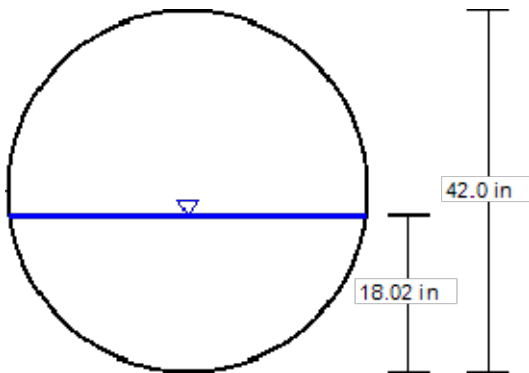
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	4.0 %
Normal Depth	18.02 in
Diameter	42.0 in
Discharge	77.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 96

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.8	%
Diameter	36.0	in
Discharge	56.00	ft ³ /s

Results

Normal Depth	13.53	in
Flow Area	2.43	ft ²
Wetted Perimeter	3.96	ft
Hydraulic Radius	7.36	in
Top Width	2.91	ft
Critical Depth	2.43	ft
Percent Full	37.6	%
Critical Slope	0.00722	ft/ft
Velocity	23.05	ft/s
Velocity Head	8.26	ft
Specific Energy	9.38	ft
Froude Number	4.44	
Maximum Discharge	200.37	ft ³ /s
Discharge Full	186.27	ft ³ /s
Slope Full	0.00705	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	37.60	%
Downstream Velocity	Infinity	ft/s

Worksheet for 96

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	13.53	in
Critical Depth	2.43	ft
Channel Slope	7.8	%
Critical Slope	0.00722	ft/ft

Cross Section for 96

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	7.8 %
Normal Depth	13.53 in
Diameter	36.0 in
Discharge	56.00 ft ³ /s

Cross Section Image

