Received 12/19/08

VORTEX
ENGINEERING & ARCHITECTURE, INC.

Storm Water Management/Drainage Report
For
Fruita Industrial Park

Replaces reports dated 1/11/2008 & 7/11/2008

Date: July 11, 2008
Revision 1: December 19, 2008

Prepared by: Vortex Engineering, Inc.
255 Vista Valley Drive
Fruita, CO 81521
970-245-9051
VEI # F07-006

The narrative portion of the report does not ... several important ... the report: ... on the ... arch ... ets & pipes capacity of ... nels vs design

Submitted To: City of Fruita
Division of Engineering
325 E. Aspen Avenue
Fruita, Colorado 81521

Type of Design: Industrial Subdivision

Owners: Rockies Investment Group, LLC
Fruita Industrial Park, LLC
2452 Patterson Rd., Suite 201
Grand Junction, CO 81502

Property Address: 703 Greenway Drive
Fruita, CO 81521

Drainage Impact Fee p. 8

Tax Schedule No.: 2697-181-00-091

9/22/10 Impact fee is recalculated 3/10/10 based on revised values. Refer to Vortex submittal with that corresponding date.

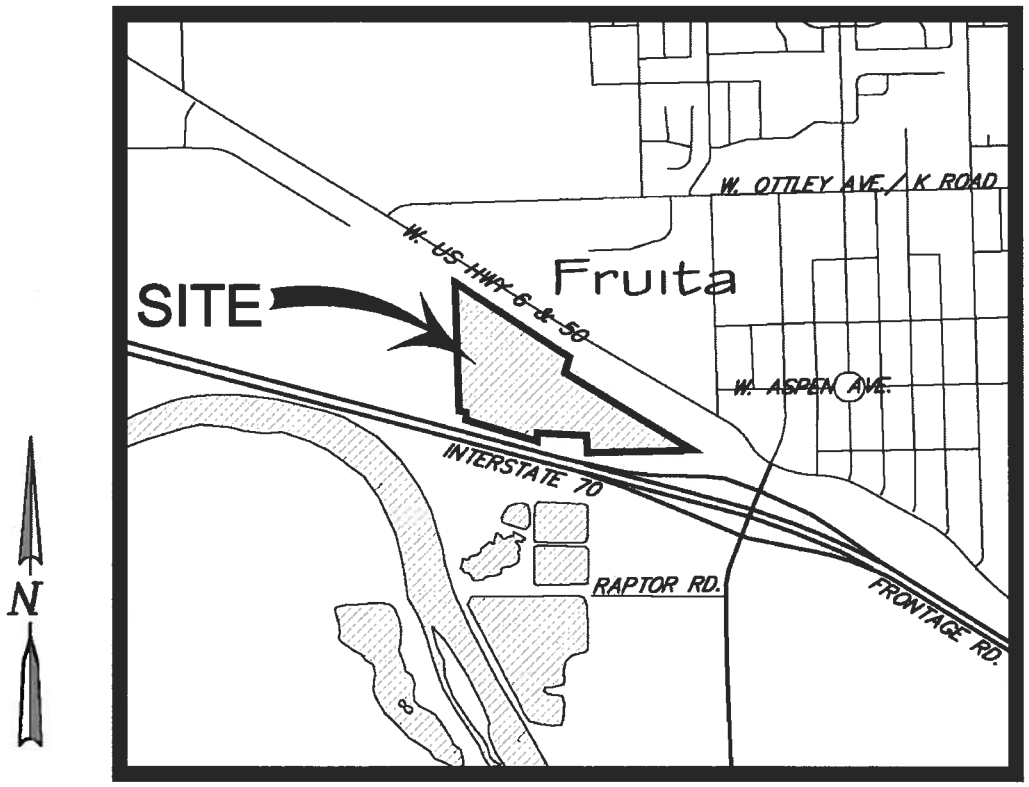
Table of Contents

I. Introduction/Site History

A. Property Location

The site is located in the west 1/2 of the northeast 1/4 of Section 18, Township 1 North, Range 2 West and in the east 1/2 of Section 18, Township 1 North, Range 2 West of the Ute Meridian, City of Fruita, Mesa County, State of Colorado. More specifically, to the north the site is adjacent to Union Pacific rail road right-of-way, to the south the I-70 right-of-way, to the east S. Coulson Street.

B. Vicinity Map



LOCATION MAP

N.T.S.

C. Description of Property

The property is approximately 41.88 acres in size. The site is bisected by Little Salt Wash, entering the site from the north through an existing rail road culvert and exiting in the south via an existing I-70 bridge. Currently the site is undeveloped and covered by native grasses, shrubs and tamarisk along the banks of the wash.

D. Purpose of Drainage Report

The purpose of this report is to show the proposed conditions will not adversely impact the existing conditions down and upstream of the development. The site is to be developed in two phases: Phase 1, consisting of about 16 acres located on the east bank of the Little Salt Wash and Phase 2 consisting of about 26 acres is located on the west side of the bank.

The mentioned above proposed conditions consist of the subdivision infrastructure, paved streets, sidewalks, underground wet utilities, and a Double 28x10 Concrete Arch Culvert on Little Salt Wash. It is proposed that the flood plain in Phase 2 be filled short of the floodway limits (see open channel analysis in the appendix IV).

II. Existing Drainage Conditions

A. Major Basin Description

The majority of the site is located in the Little Salt Wash basin. The existing drainage comprises of sheet flow and shallow concentrated flow across the site towards the Little Salt Wash, except for about 10 acres (Basin EX1) drains towards southeast to Big Salt Wash basin, located about 2000 feet northwest of the Little Salt Wash.

B. Existing Conditions Description

The site, in predevelopment conditions, is covered with native grasses, shrubs, and along the banks tamarisk. The soils on site are classified as hydrologic group B. Currently the runoff from the site drains to Little Salt Wash via overland flows and shallow concentrated flows.

The site slopes towards the Little Salt Wash, and about the 10 acres (Basin EX1) of the west portion of the site drains to the Big Salt Wash. The grades vary from 0.5% to 8%, to 1 to 1 slopes at the bank of the Little Salt Wash, averaging to about 4%. The minimum elevation on the site is 4468 the maximum elevation is 4501.

The following are the Natural Resource Conservation Service (NRCS) soils found at the site: Sagers silty loam, Sagers silty clay loam, Fruitland sandy clay (majority of site), Turley clay loam, and Ustifluvents. All soils are Hydrologic Soils Group "B" (see Appendix I).

III. Proposed Drainage Conditions

A. *Description*

The proposed development will increase imperviousness of the site. There is no detention planned for this system due to the proximity of the site to the ultimate discharge to Colorado River, located about 1500 feet south (downstream) of the I-70 bridge. The proposed runoff is to be collected in area inlets or curb inlets. The proposed storm sewer is sized to handle minor (2 years) storms. The major event runoff (100 year storm) will be routed via the storm sewer and streets into the Little Salt Wash.

B. *Drainage at Project's Entrance (Greenway Dr and Hwy 6&50)*

The proposed entrance of the project is located at the Greenway Dr (N. Coulson St north of intersection) and Hwy 6&50 intersection. The intersection happens to be located at a high point of the Hwy 6&50. Currently the runoff from the intersection flows, either directly or via the existing storm sewer to the UPRR Right-of-Way. From there, the water flows through culverts and ditches into an existing concrete lined ditch south of the rail road tracts flowing south to I-70 culvert.

The proposed conditions call for construction of street pavement, curb and gutter, sidewalk chases (trough) and additional storm sewer. There is low point between Hwy 6&50 and the RR on Greenway Drive. The drainage from the low points on either side of the street will be discharged into sidewalk chase and into RR ROW.

There are two storm pipes, located on either side of Greenway Dr, each discharging water from basins located north of the Hwy 6&50 and the Hwy 6&50 into RR ROW. The pipe on the west side of Greenway Dr. is proposed to be extended further south to a manhole which directs the flow east under the drive to the east side of the of the drive. The pipe on the east side is also proposed to be extended further south to accommodate the additional street grading. The discharge from this pipe and the pipe from the west flows in a ditch which directs the flow to an 18" CMP culvert under the RR. It is proposed that the existing 18" CMP culvert be extended also to accommodate the street grading.

The proposed changes to the storm sewer at the entrance will not change the existing drainage patterns, nor will it adversely impact the surrounding areas.

C. *Flood Plain Revisions – Double 28'x10' Concrete Arch Culvert*

This development plan requires culvert/bridge crossing over Little Salt Wash under Greenway Drive. A double 28'x10' concrete arch culvert was chosen to facilitate this demand. Also, in block 4, an encroachment condition was created, filling the floodplain to the limits of floodway (see Appendix VI for details).

28'x11'

D. *Maintenance Issues*

Based on the drainage concept of the development and the relatively low storm water runoff rates, no maintenance to the storm sewer facilities is anticipated beyond normal situations.

IV. Design Criteria and Approach

A. *General Considerations*

The proposed storm sewer for the project site was designed to handle minor (2 year) storm peak runoff. The major (100 year) storm peak runoff and the emergency overflow is to be handled by the streets and overland conditions

B. *Hydrology*

The hydrologic analysis presented in this drainage report used the rational method procedures per the Mesa County Storm Water Management Manual (SWMM) guidelines.

V. Results and Conclusions

A. Runoff for the 2-Year and the 100-Year Storm

The following table is the summary of basin routing:

DRAINAGE AREA	2-Yr. Q (cfs) Basin Runoff	100-Yr. Q (cfs) Basin Runoff
101	0.89	3.47
102	3.03	11.81
103	3.90	15.21
104	0.57	2.22
105	4.39	17.13
106	0.15	0.58
107	0.20	0.78
	13.13	51.2
201	3.30	12.88
202	6.17	24.06
203	0.59	2.32
204	1.15	4.49
205	1.63	6.37
206	1.89	7.38
207	4.22	16.45
	18.95	73.95
OS1	0.13	3.43
OS2	0.34	8.78
EX1	0.74	19.26
EX2	1.13	29.33
EX3	1.15	29.80
	3.49	90.6

Developed

$Q_2 = 32.08$

$Q_{100} = 125.15$

Historical

$\Sigma = 35.57$

B. Detention

No detention is proposed for this development, due to proximity of Colorado River.

C. Street Flow

Runoff from the streets will sheet flow across lots and drain into inlets. The inlets will direct the storm flow to a network of piping that will discharge into the Little Salt Wash flood plain.

D. Finish Floor Elevations of Structures

The finished floor elevations for the permanent structures are a minimum of 1.0 foot above the 100-year water surface elevation, either in the street or in Little Salt Wash (4482.5).

E. Overall Compliance

The drainage plan for the proposed development will effectively manage discharge of the runoff from developed conditions into the Little Salt Wash. The proposed drainage system, that includes the storm sewer and triple 20'x10' concrete box culvert for Greenway Dr. crossing of the Little Salt Wash will not have an adverse impact on either the downstream nor upstream areas of the project.

double 28'x11'

F. Construction Phasing

There are two construction phases proposed for this site. See the phase line on sheet 2 of 2 of the drainage plan in Exhibit B. It is anticipated at this time to construct the concrete box culvert in Phase 1.

G. Drainage Fee Calculation

The runoff from the site directly discharges into Little Salt Wash. The following is the drainage impact fee required to offset the impact:

A Rational Runoff Coefficient of 0.40 was selected to represent existing conditions (brush). In the post-development condition the combined runoff coefficient is calculated to be 0.73. Therefore, utilizing the Drainage Impact Fee formula in lieu of detention the estimated storm water impact fee is as follows:

$B*(C100D-C100H)*A^{0.7}$

PHASE 1+PHASE 2 = $\$14,828*(0.76-0.4)*41.88^{0.7} = \$72,910.44$

91.9

4.917

Fee estimate by Phases:

Phase 1= 0.3801 X $72,910.44=$27,713.25

Phase 2= $72,910.44 - $27,713.25=$45,197.18

Phase 1 = 17.33 acres = 0.414 %

Phase 2 = 24.57 acres = 0.586 %

VI. Limitations/Restrictions

This report is a site-specific design for Storm Water Management and is applicable only for the client for whom our work was performed. Use of this report under other circumstances is not an appropriate application of this document. This report is a product of Vortex Engineering and Architecture, Incorporated and is to be taken in its entirety. Excerpts from this report may be taken out of context and may not convey the true intent of the report. It is the owner's and owner's agent's responsibility to read this report and become familiar with recommendations and design guidelines contained herein.

The recommendations and design guidelines outlined in this report are based on: 1) the proposed site development and plot plan prepared by Vortex Engineering and Architecture, Inc., 2) the site conditions disclosed at the specific time of the site investigation of reference, and 3) the boundary and topographic survey prepared by Rolland Engineering of Grand Junction, CO. Vortex Engineering and Architecture, Inc. assumes no liability for the accuracy or completeness of information furnished by the client. Site conditions are subject to external environmental effects and may change over time. Use of this plan under different site conditions is inappropriate. If it becomes apparent that current site conditions vary from those anticipated, the design engineer should be contacted to develop any required design modifications. Vortex Engineering and Architecture, Inc. is not responsible and accepts no liability for any variation in assumed design parameters.

Vortex Engineering and Architecture, Inc. represents this report, this report has been prepared within the limits prescribed by the owner and in accordance with the current accepted practice of the civil engineering profession in the area. No warranty or representation either expressed or implied is included or intended in this report or in any of our contracts.

VII. References

The following manuals and computer programs were used for this drainage report:

- Storm Water Management Manual, City of Grand Junction and Mesa County, May 1996.
- The NRCS method Technical Release 55 entitled "Urban Hydrology for Small Watersheds" was used to calculate runoff curve numbers and time of concentrations.
- The NRCS method Technical Release 20 entitled "Project Formulation-Hydrology" was used to calculate runoff rates and basin sizing.
- Storm Water Management Master Plan (SWMMP) for the City of Fruita, June 1998.

VIII. EXHIBIT 'A'

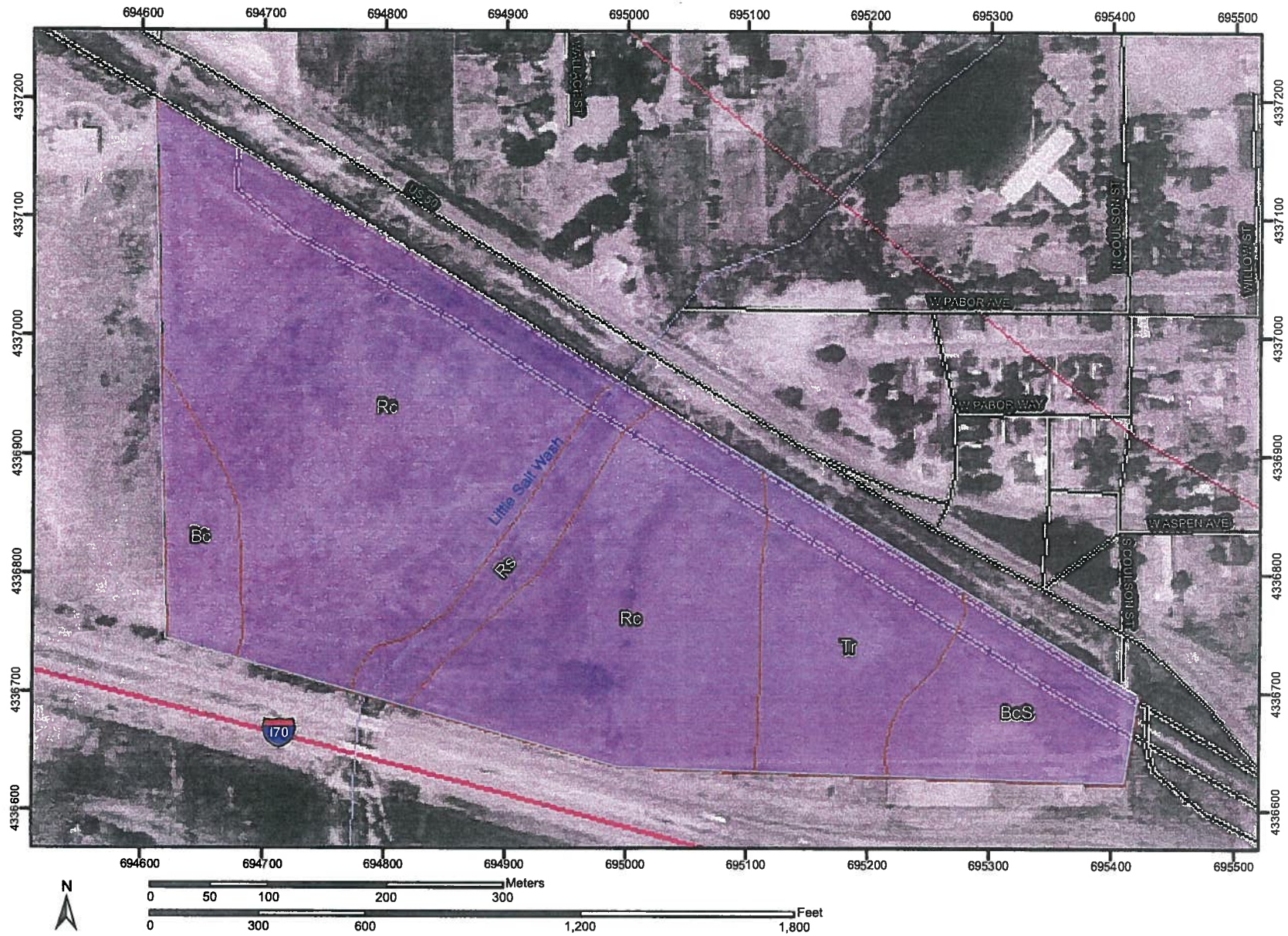
PRE-DEVELOPMENT DRAINAGE AREA MAP

IX. EXHIBIT 'B'

POST-DEVELOPMENT DRAINAGE AREA MAP

APPENDIX I USDA – (NRCS) SOILS INFORMATION

Hydrologic Soil Group–Mesa County Area, Colorado
(Fruita Industrial Park)



USDA Natural Resources Conservation Service

Web Soil Survey 2.0
National Cooperative Soil Survey

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

Municipalities
- Cities
- Urban Areas

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mesa County Area, Colorado
Survey Area Data: Version 3, Sep 25, 2007

Date(s) aerial images were photographed: 8/1/1993; 8/3/1993

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Mesa County Area, Colorado				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Bc	Sagers silty clay loam, 0 to 2 percent slopes	B	2.9	4.8%
BcS	Sagers silty clay loam, saline, 0 to 2 percent slopes	B	5.6	9.4%
Rc	Fruitland sandy clay loam, 0 to 2 percent slopes	B	39.9	67.5%
Rs	Ustifluvents, 0 to 2 percent slopes	B	3.3	5.6%
Tr	Turley clay loam, 0 to 2 percent slopes	B	7.5	12.7%
Totals for Area of Interest (AOI)			59.2	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

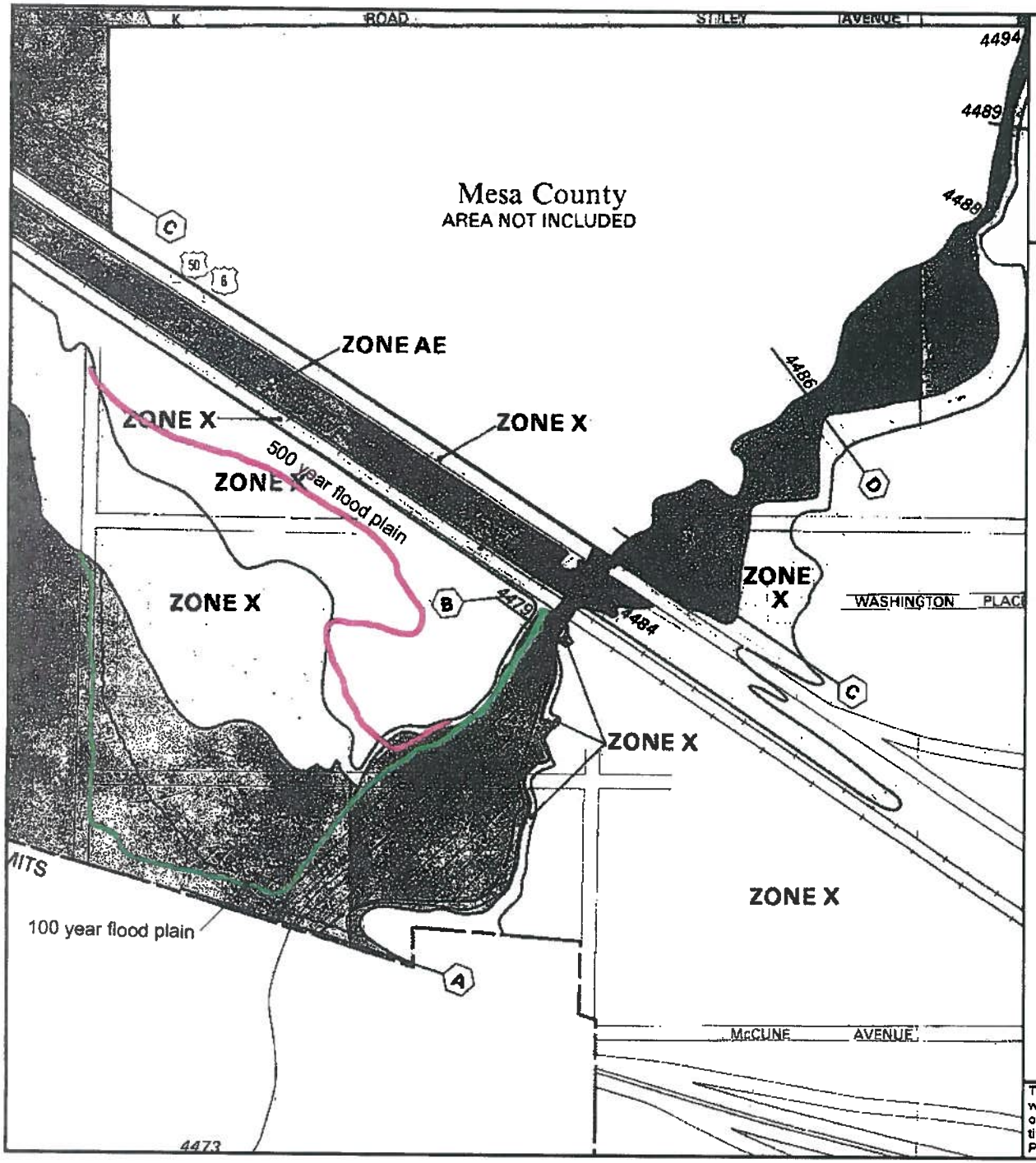
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

APPENDIX II FEMA FLOOD PANEL



APPROXIMATE SCALE IN FEET

400 0 400

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

TOWN OF
FRUITA, COLORADO
MESA COUNTY

PANEL 1 OF 4
(SEE MAP INDEX FOR PANELS NOT PRINTED)

PANEL LOCATION

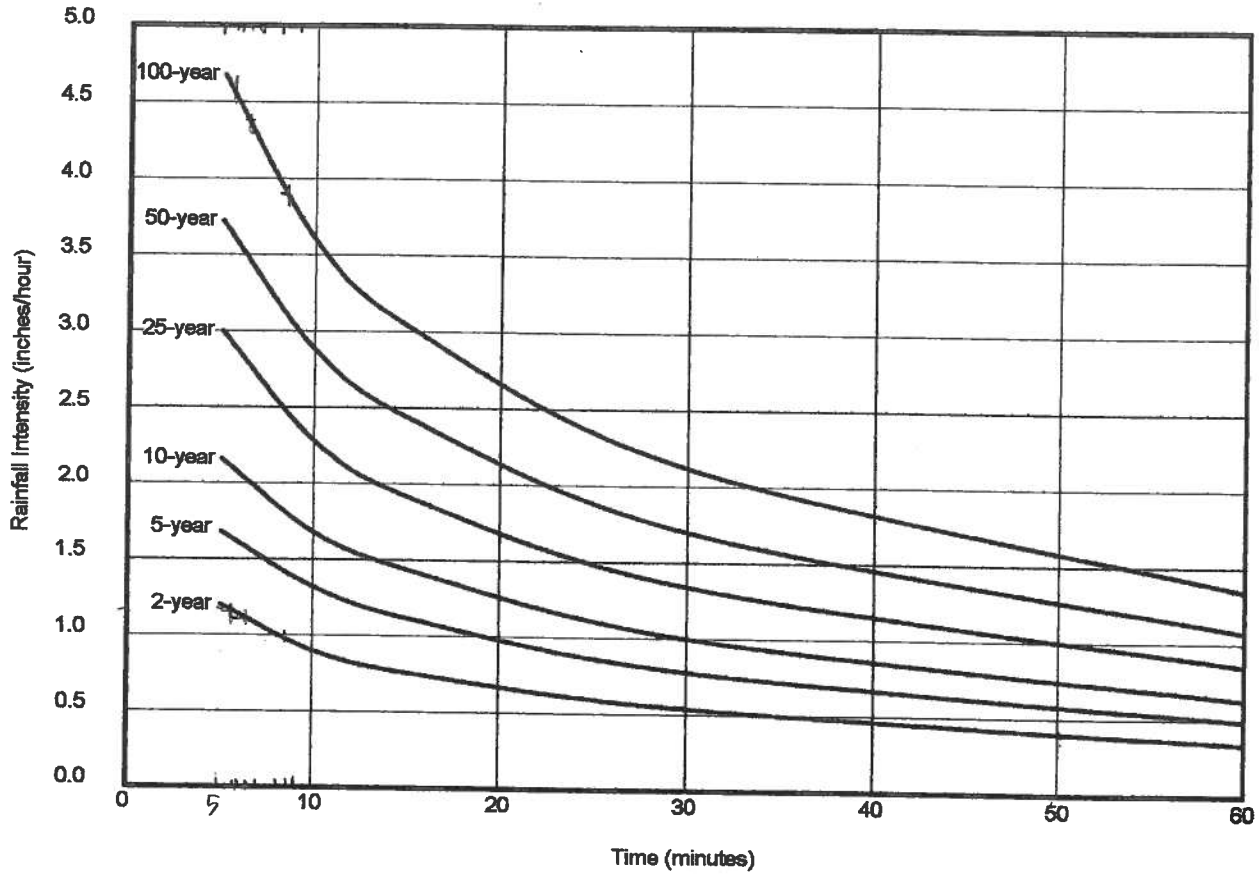
COMMUNITY-PANEL NUMBER
080194 0001 B

MAP REVISED:
JULY 15, 1992

Federal Emergency Management Agency

APPENDIX III EXISTING/PROPOSED CONDITIONS

INTENSITY-DURATION-FREQUENCY CURVES
GRAND VALLEY AREA



Revision	Date
ORIGINAL ISSUE	3/27/06

WRC ENGINEERING, INC.

REFERENCE:
Henz Meteorological Services 1992. Mesa County Storm Drainage Criteria Manual Technical Memorandum 1 and 2

FIGURE 616

RECOMMENDED IMPERVIOUSNESS VALUES

Land Use or Surface Characteristic	Percentage Imperviousness
Business	
Commercial Areas	95
Neighborhood Areas	85
Residential	
Single Family	(see figures)
Multi-unit (detached)	60
Multi-unit (attached)	75
Half-acre lot or larger	(see figures)
Apartments	80
Industrial	
Light industrial	80
Heavy industrial	90
Parks, cemeteries	5
Playgrounds	10
Schools	50
Railroad yards	15
Undeveloped Areas	
Historic flow analysis	2
Greenbelts, agriculture	2
Off-site flow analysis (when land use not defined)	45
Streets	
Paved (concrete/asphalt)	100
Gravel	40
Drives and walks	90
Roofs	90
Lawns (all soils)	0

NOTE: The imperviousness values are representative of land uses shown and are for future development projections only. Impervious values for existing land uses may vary.

Revision	Date
ORIGINAL ISSUE	3/27/06

WRC ENGINEERING, INC.

REFERENCE:
UDFCD 2001. Urban Storm Drainage Criteria Manual, Volume 1

TABLE 701

STORMWATER MANAGEMENT MANUAL

RATIONAL FORMULA RUNOFF COEFFICIENTS

Equation: $C_{CD} = K_{CD} + (0.858i^3 - 0.786i^2 + 0.774i + 0.04)$

$C_A = K_A + (1.31i^3 - 1.44i^2 + 1.135i - 0.12)$

$C_B = (C_A + C_{CD})/2$

K_{CD} VALUES						
NRCS Soil	**2-year**	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**
C and D	0	-0.10i+0.11	-0.18i+0.21	-0.28i+.33	-0.33i+0.40	-0.39i+0.46
A	0	-0.08i+0.09	-0.14i+0.17	0.19i+0.24	-0.22i+0.28	-0.25i+0.32

Impervious Decimal	**Type A**					
	2-year	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**
0.1	0.00	0.06	0.14	0.20	0.24	0.28
0.2	0.06	0.13	0.20	0.26	0.30	0.33
0.3	0.13	0.19	0.25	0.31	0.34	0.37
0.4	0.19	0.25	0.30	0.35	0.38	0.41
0.5	0.25	0.30	0.35	0.40	0.42	0.45
0.6	0.33	0.37	0.41	0.45	0.47	0.50
0.7	0.42	0.45	0.49	0.53	0.54	0.56
0.8	0.54	0.56	0.60	0.63	0.64	0.66
0.9	0.69	0.71	0.73	0.76	0.77	0.79
1.0	0.89	0.90	0.92	0.94	0.95	0.96

Impervious Decimal	**Type B**					
	2-year	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**
0.1	0.06	0.14	0.22	0.31	0.36	0.40
0.2	0.12	0.20	0.27	0.35	0.40	0.44
0.3	0.18	0.25	0.32	0.39	0.43	0.47
0.4	0.23	0.30	0.36	0.42	0.46	0.50
0.5	0.29	0.35	0.40	0.46	0.50	0.52
0.6	0.37	0.41	0.46	0.51	0.54	0.56
0.7	0.45	0.49	0.53	0.58	0.60	0.62
0.8	0.57	0.59	0.63	0.66	0.69	0.70
0.9	0.71	0.73	0.75	0.78	0.80	0.81
1	0.89	0.90	0.92	0.94	0.95	0.96

Impervious Decimal	**Type C and D Soil**					
	2-year	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**
0.1	0.11	0.21	0.30	0.41	0.48	0.53
0.2	0.17	0.26	0.34	0.44	0.50	0.55
0.3	0.22	0.30	0.38	0.47	0.53	0.57
0.4	0.28	0.35	0.42	0.50	0.55	0.58
0.5	0.34	0.40	0.46	0.53	0.57	0.60
0.6	0.41	0.46	0.51	0.57	0.61	0.63
0.7	0.49	0.53	0.57	0.62	0.66	0.68
0.8	0.60	0.63	0.66	0.70	0.73	0.74
0.9	0.73	0.75	0.77	0.80	0.83	0.83
1.0	0.89	0.90	0.92	0.94	0.96	0.96

Revision	Date
ORIGINAL ISSUE	3/27/06

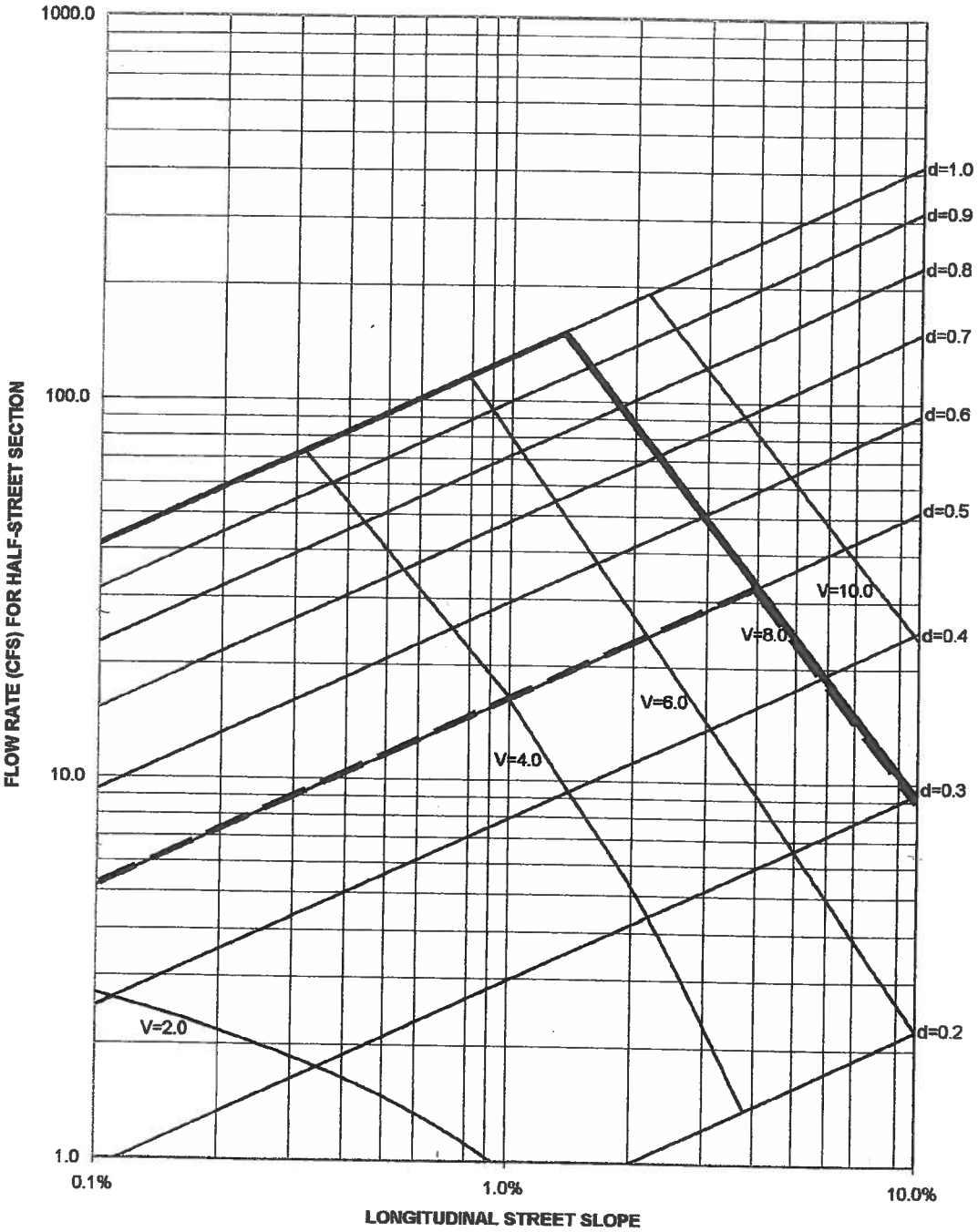
WRC ENGINEERING, INC

REFERENCE:

UDFCD 2001. Urban Storm Drainage Criteria Manual, Volume 1

TABLE 702

HALF-STREET FLOW CAPACITY
(COLLECTOR, VERTICAL CURB)



DESIGN LIMITS

- MINOR STORM
- MAJOR STORM

Revision	Date
ORIGINAL ISSUE	3/27/06

WRC ENGINEERING, INC.

REFERENCE:

FIGURE 1108

FRUITA INDUSTRIAL PARK- Fruita, CO
Drainage Area C Calculations - 2 yr Storm

BASIN	TOTAL AREA (ft^2)	BASIN AREA (ac)	LOT AREA (ft^2)	LOT AREA C	STREET IMP. AREA (ft^2)	STREET AREA C	2 yr WEIGHTED C VALUE
101	38,557.00	0.89	6,325.00	0.57	32,232.00	0.89	0.84
102	175,126.00	4.02	143,501.00	0.57	31,625.00	0.89	0.63
103	223,097.00	5.12	178,097.00	0.57	45,000.00	0.89	0.63
104	24,712.00	0.57	4,120.00	0.57	20,592.00	0.89	0.84
105	279,687.00	6.42	279,687.00	0.57	0.00	0.89	0.57
106	6,105.00	0.14	0.00	0.57	6,105.00	0.89	0.89
107	8,114.00	0.19	0.00	0.57	8,114.00	0.89	0.89
201	185,654.00	4.26	141,704.00	0.57	43,950.00	0.89	0.65
202	373,998.00	8.59	340,298.00	0.57	33,700.00	0.89	0.60
203	37,866.00	0.87	37,866.00	0.57	0.00	0.89	0.57
204	73,334.00	1.68	73,334.00	0.57	0.00	0.89	0.57
205	93,904.00	2.16	75,904.00	0.57	18,000.00	0.89	0.63
206	110,429.00	2.54	92,429.00	0.57	18,000.00	0.89	0.62
207	268,599.00	6.17	268,599.00	0.57	0.00	0.89	0.57
TOTAL AREA (S.F.) =	**1,899,182.00**		1641864.00	0.57	257318.00	0.89	**0.61**
TOTAL AREA (AC.) =	**43.60**						

FRUITA INDUSTRIAL PARK- Fruita, CO
Drainage Area C Calculations - 100 yr Storm

BASIN	TOTAL AREA (ft^2)	BASIN AREA (ac)	LOT AREA (ft^2)	LOT AREA C	STREET IMP. AREA (ft^2)	STREET AREA C	100 yr WEIGHTED C VALUE
101	38,557.00	0.89	6,325.00	0.70	32,232.00	0.96	0.92
102	175,126.00	4.02	143,501.00	0.70	31,625.00	0.96	0.75
103	223,097.00	5.12	178,097.00	0.70	45,000.00	0.96	0.75
104	24,712.00	0.57	4,120.00	0.70	20,592.00	0.96	0.92
105	279,687.00	6.42	112,677.00	0.70	167,010.00	0.96	0.86
106	6,105.00	0.14	0.00	0.70	6,105.00	0.96	0.96
107	8,114.00	0.19	0.00	0.70	8,114.00	0.96	0.96
201	185,654.00	4.26	141,704.00	0.70	43,950.00	0.96	0.76
202	373,998.00	8.59	340,298.00	0.70	33,700.00	0.96	0.72
203	37,866.00	0.87	37,866.00	0.70	0.00	0.96	0.70
204	73,334.00	1.68	73,334.00	0.70	0.00	0.96	0.70
205	93,904.00	2.16	75,904.00	0.70	18,000.00	0.96	0.75
206	110,429.00	2.54	92,429.00	0.70	18,000.00	0.96	0.74
207	268,599.00	6.17	268,599.00	0.70	0.00	0.96	0.70
TOTAL AREA (S.F.) =	**1,899,182.00**		1474854.00	0.70	424328.00	0.96	**0.76**
TOTAL AREA (AC.) =	**43.60**						

Fruita Industrial Park - Fruita, CO
Basin Runoff and Inlet Capacity Calculations

DRAINAGE AREA	INLET #	Area (ac)	'C_2' Weighted	'C_{100}' Weighted	time of conc(min)	2-Yr. Storm Intensity (in/hr)	100-Yr. Storm Intensity	2-Yr. Q (cfs) Basin Runoff	100-Yr. Q (cfs) Basin Runoff	Inlet Type for Minor Storm
101	101	0.89	0.84	0.92	5	1.2	4.68	0.89	3.47	Single
102	102	4.02	0.63	0.75	5	1.2	4.68	3.03	11.81	Double
103	103	5.12	0.63	0.75	5	1.2	4.68	3.90	15.21	Double
104	104	0.57	0.84	0.92	5	1.2	4.68	0.57	2.22	Single
105	Dir. Discharge	6.42	0.57	0.86	5	1.2	4.68	4.39	17.13	NA
106	Dir. Discharge	0.14	0.89	0.96	5	1.2	4.68	0.15	0.58	NA
107	Dir. Discharge	0.19	0.89	0.96	5	1.2	4.68	0.20	0.78	NA
201	201	4.26	0.65	0.76	5	1.2	4.68	3.30	12.88	Single
202	202	8.59	0.60	0.72	5	1.2	4.68	6.17	24.06	Double
203	203	0.87	0.57	0.70	5	1.2	4.68	0.59	2.32	Single
204	204	1.68	0.57	0.70	5	1.2	4.68	1.15	4.49	Single
205	205	2.16	0.63	0.75	5	1.2	4.68	1.63	6.37	Single
206	206	2.54	0.62	0.74	5	1.2	4.68	1.89	7.38	Single
207	Dir. Discharge	6.17	0.57	0.70	5	1.2	4.68	4.22	16.45	NA
OS1	by pass	1.83	0.06	0.40	5	1.2	4.68	0.13	3.43	NA
OS2	by pass	4.69	0.06	0.40	5	1.2	4.68	0.34	8.78	NA
EX1	existing	10.29	0.06	0.40	5	1.2	4.68	0.74	19.26	NA
EX2	existing	15.67	0.06	0.40	5	1.2	4.68	1.13	29.33	NA
EX3	existing	15.92	0.06	0.40	5	1.2	4.68	1.15	29.80	NA

Maximum Inlet Capacities
Sump or Sag Condition

	INLET TYPE	6-INCH VERTICAL CURB					
		SINGLE		DOUBLE		TRIPLE	
		2-YR	100-YR	2-YR	100-YR	2-YR	100-YR
2-INCH CURB-OPENING DEPRESSION	COMBINATION INLET (TYPE D GRATES)	6.4	17.0	9.6	24.7	12.7	32.4
	COMBINATION INLET (TYPE R GRATES)	6.4	14.4	9.6	22.1	12.7	29.9
	CURB-OPENING INLET CAPACITY	5.0	10.3	8.3	20.6	9.8	30.9
NO CURB-OPENING DEPRESSION	COMBINATION INLET (TYPE D GRATES)	6.4	15.4	9.6	22.4	12.7	29.3
	COMBINATION INLET (TYPE R GRATES)	6.4	13.0	9.6	20.0	12.7	27.0
	CURB-OPENING INLET CAPACITY	4.2	9.3	8.5	18.6	12.7	27.9

	INLET TYPE	4.5-INCH MOUNTABLE CURB					
		SINGLE		DOUBLE		TRIPLE	
		2-YR	100-YR	2-YR	100-YR	2-YR	100-YR
2-INCH CURB-OPENING DEPRESSION	COMBINATION INLET (TYPE D GRATES)	4.1	17.0	6.2	24.7	8.3	32.4
	COMBINATION INLET (TYPE R GRATES)	4.1	14.4	6.2	22.1	8.3	29.9
	CURB-OPENING INLET CAPACITY	3.3	10.3	5.4	20.6	6.3	30.9
NO CURB-OPENING DEPRESSION	COMBINATION INLET (TYPE D GRATES)	4.1	15.4	6.2	22.4	8.3	29.3
	COMBINATION INLET (TYPE R GRATES)	4.1	13.0	6.2	20.0	8.3	27.0
	CURB-OPENING INLET CAPACITY	2.8	9.3	5.5	18.6	8.3	27.9

See Chart Legend (Figure 1113) for standard inlet lengths.

Inlet capacities shown above are based upon the following:
1. Type D grate used for calculation is Neenah model R-3577.
2. Type R grate used for calculation is Neenah model R-3289-C.
3. Angled- and curved-vane grates are not allowed for sump or sag design conditions.
4. Capacities shown are based upon maximum ponding depths for the 2-year and 100-year storm events:
   a. 2-year event maximum ponding depth: curb height
   b. 100-year event maximum ponding depth: 1.0 foot
5. Combination inlets are preferred for sump or sag conditions. Curb-opening inlets without grates are allowed
6. Grate-only inlets are not allowed for sump or sag conditions.

Revision	Date
ORIGINAL ISSUE	3/27/06

Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Friday, Oct 17 2008

<Name> OVERFLOW PHASE I

Trapezoidal

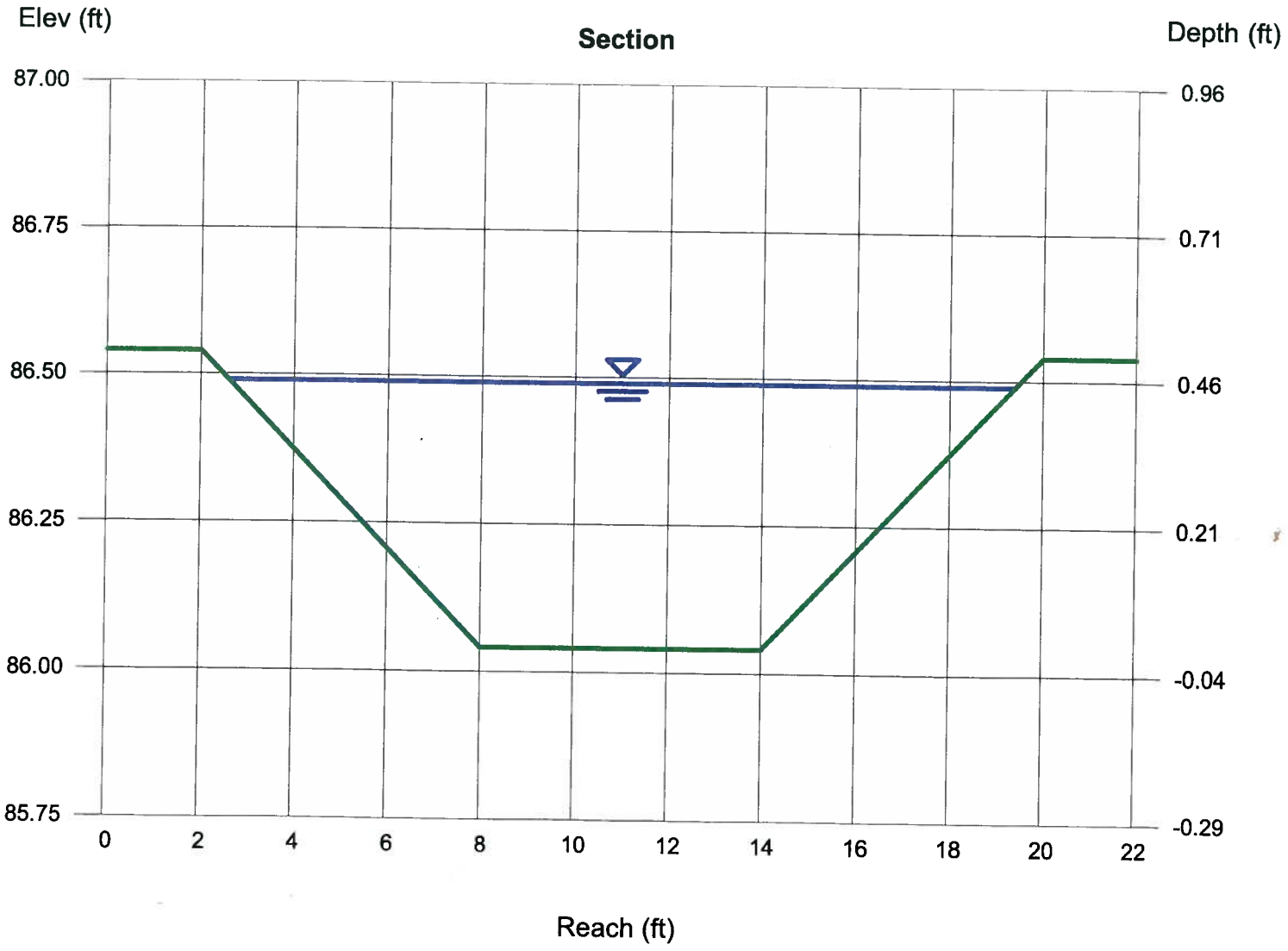
Bottom Width (ft)	= 6.00
Side Slopes (z:1)	= 12.00, 12.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 86.04
Slope (%)	= 2.00
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.45
Q (cfs)	= 37.53
Area (sqft)	= 5.13
Velocity (ft/s)	= 7.32
Wetted Perim (ft)	= 16.84
Crit Depth, Yc (ft)	= 0.50
Top Width (ft)	= 16.80
EGL (ft)	= 1.28



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Friday, Oct 17 2008

<Name> OVERFLOW V-DITCH

Triangular

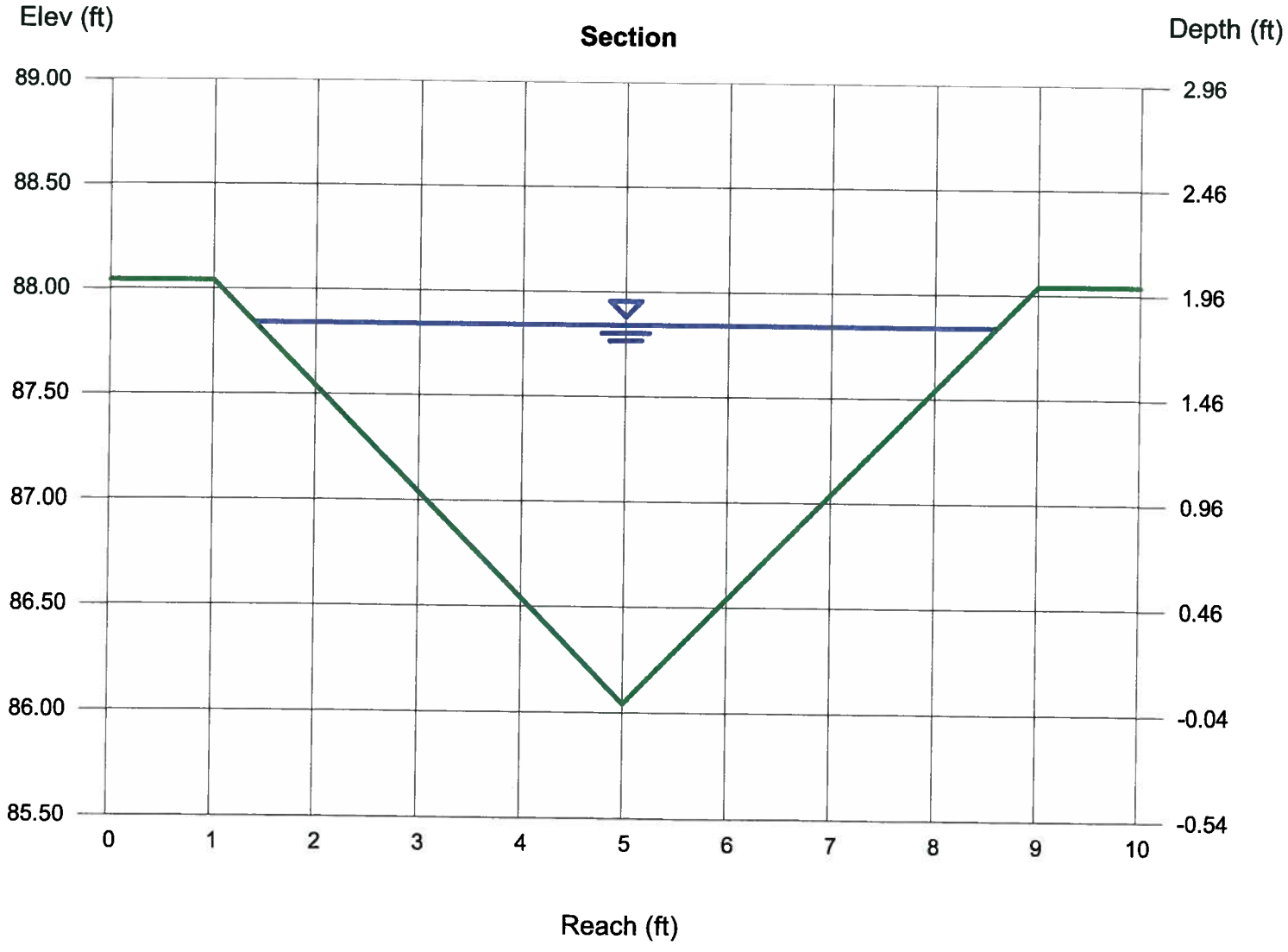
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 86.04
Slope (%)	= 2.00
N-Value	= 0.030

Calculations

Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 1.80
Q (cfs)	= 39.28
Area (sqft)	= 6.48
Velocity (ft/s)	= 6.06
Wetted Perim (ft)	= 8.05
Crit Depth, Yc (ft)	= 1.78
Top Width (ft)	= 7.20
EGL (ft)	= 2.37



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Friday, Oct 17 2008

<Name> OVERFLOW V-DITCH

Triangular

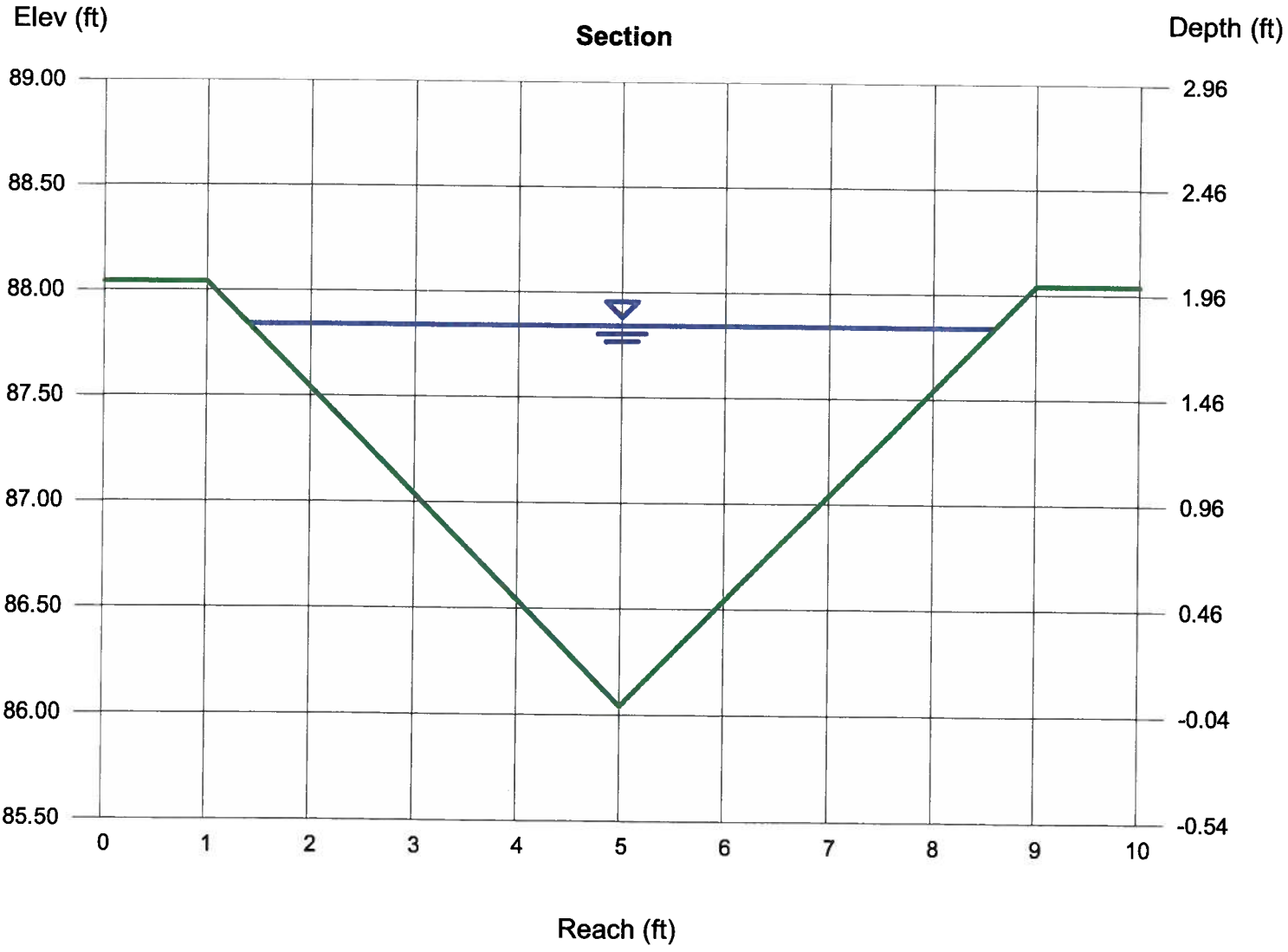
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 86.04
Slope (%)	= 2.00
N-Value	= 0.030

Calculations

Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 1.80
Q (cfs)	= 39.28
Area (sqft)	= 6.48
Velocity (ft/s)	= 6.06
Wetted Perim (ft)	= 8.05
Crit Depth, Yc (ft)	= 1.78
Top Width (ft)	= 7.20
EGL (ft)	= 2.37



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Friday, Oct 17 2008

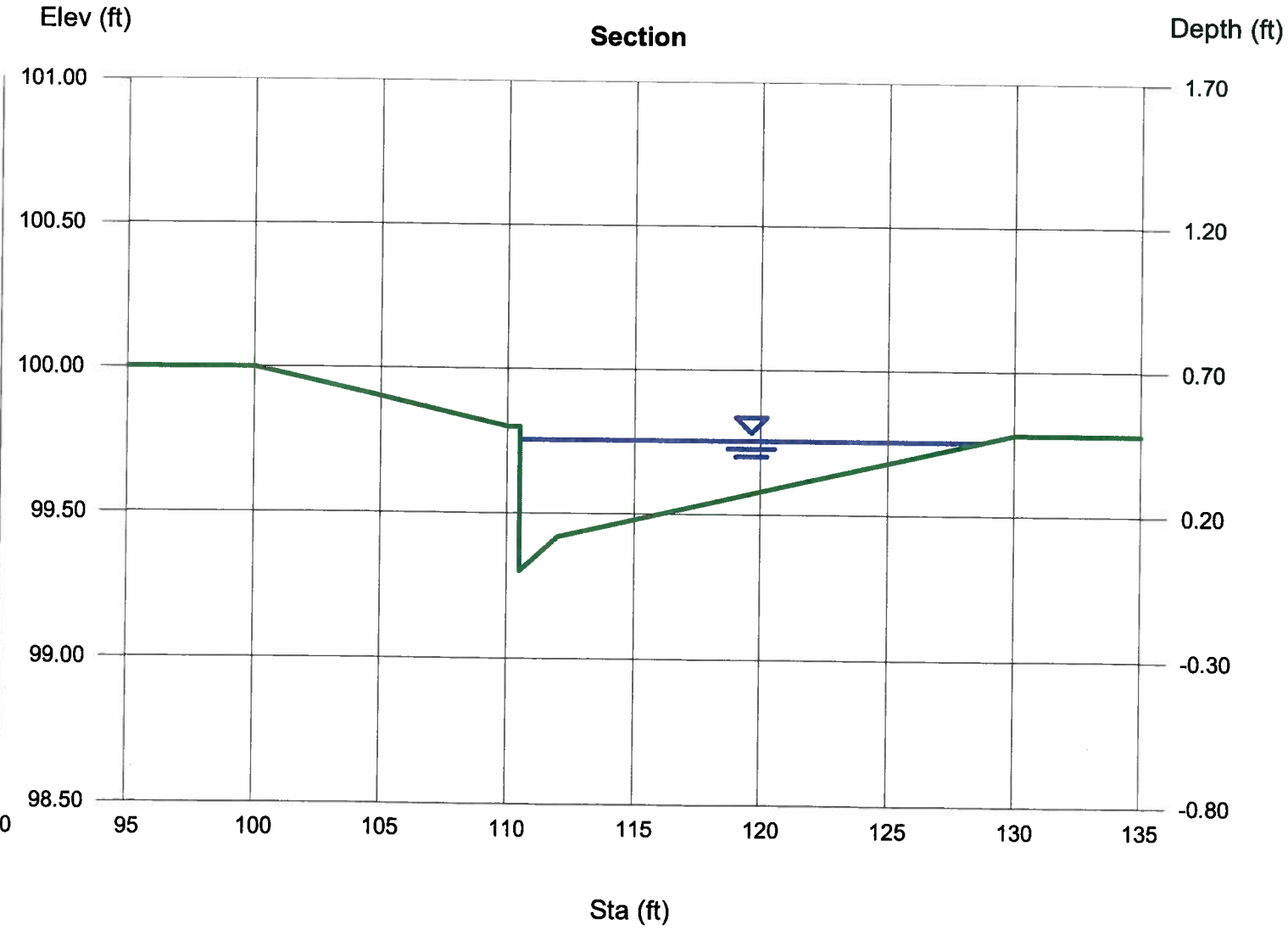
<Name> STREET CAPACITY

User-defined
Invert Elev (ft) = 99.30
Slope (%) = 0.50
N-Value = Composite

Calculations
Compute by: Q vs Depth
No. Increments = 20

Highlighted
Depth (ft) = 0.45
Q (cfs) = 8.822
Area (sqft) = 3.40
Velocity (ft/s) = 2.60
Wetted Perim (ft) = 18.71
Crit Depth, Yc (ft) = 0.43
Top Width (ft) = 18.25
EGL (ft) = 0.56

(Sta, El, n)-(Sta, El, n)...
(100.00, 100.00)-(105.00, 99.90, 0.013)-(110.00, 99.80, 0.030)-(110.50, 99.80, 0.013)-(110.50, 99.30, 0.013)-(112.00, 99.42, 0.013)-(130.00, 99.78, 0.013)



Depth	Q	Area	Veloc	Wp	Yc
(ft)	(cfs)	(sqft)	(ft/s)	(ft)	(ft)
0.03	0.004	0.008	0.52	0.47	0.01
0.07	0.025	0.031	0.82	0.95	0.04
0.10	0.074	0.069	1.08	1.42	0.07
0.14	0.141	0.130	1.09	2.65	0.10
0.17	0.294	0.248	1.18	4.43	0.13
0.21	0.581	0.428	1.36	6.22	0.17
0.24	1.033	0.668	1.55	8.00	0.21
0.28	1.682	0.970	1.73	9.79	0.24
0.31	2.555	1.333	1.92	11.57	0.28
0.35	3.680	1.758	2.09	13.36	0.32
0.38	5.084	2.243	2.27	15.14	0.36
0.42	6.790	2.790	2.43	16.93	0.39
0.45	8.822	3.398	2.60	18.71	0.43
0.49	11.38	4.065	2.80	20.00	0.47
0.52	12.86	4.776	2.69	21.76	0.51
0.56	14.26	5.550	2.57	23.51	0.53
0.59	15.98	6.386	2.50	25.26	0.55
0.63	19.09	7.283	2.62	27.01	0.57
0.66	22.78	8.241	2.76	28.76	0.61
0.70	26.92	9.260	2.91	30.51	0.65

Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Friday, Oct 17 2008

<Name> STREET CAPACITY

User-defined

Invert Elev (ft)	= 99.30
Slope (%)	= 0.50
N-Value	= Composite

Calculations

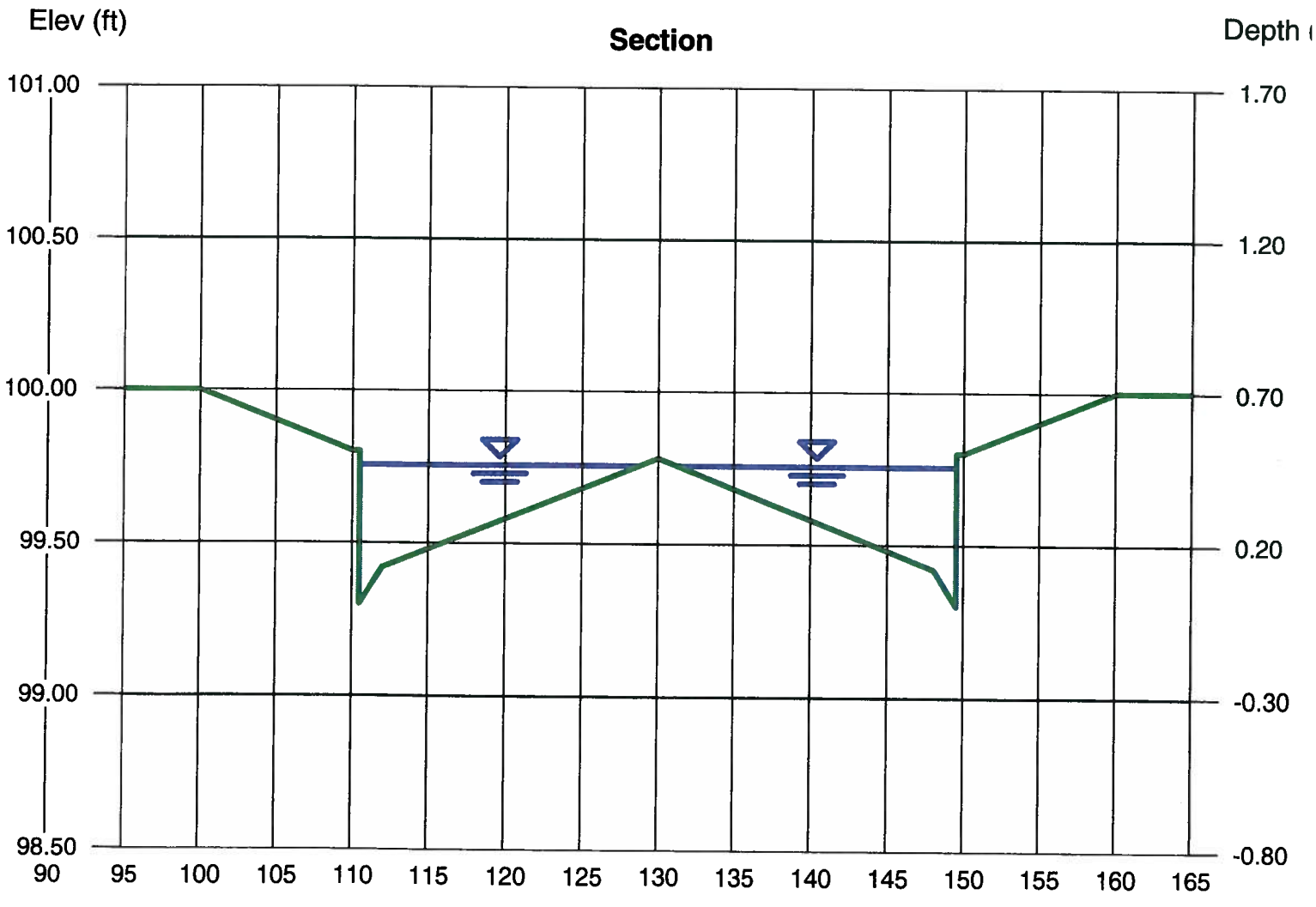
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.45
Q (cfs)	= 17.64
Area (sqft)	= 6.80
Velocity (ft/s)	= 2.60
Wetted Perim (ft)	= 37.43
Crit Depth, Yc (ft)	= 0.43
Top Width (ft)	= 36.50
EGL (ft)	= 0.56

(Sta, El, n)-(Sta, El, n)...

(100.00, 100.00)-(105.00, 99.90, 0.013)-(110.00, 99.80, 0.030)-(110.50, 99.80, 0.013)-(110.50, 99.30, 0.013)-(112.00, 99.42, 0.013)-(130.00, 99.78, 0.0
-(148.00, 99.42, 0.013)-(149.50, 99.30, 0.013)-(149.50, 99.80, 0.013)-(150.00, 99.80, 0.013)-(155.00, 99.90, 0.013)-(160.00, 100.00, 0.013)



Depth	Q	Area	Veloc	Wp	Yc
(ft)	(cfs)	(sqft)	(ft/s)	(ft)	(ft)
0.03	0.008	0.015	0.52	0.95	0.01
0.07	**0.050**	**0.061**	0.82	1.90	0.04
0.10	0.148	0.138	1.08	2.84	0.07
0.14	0.282	0.260	1.09	5.29	0.10
0.17	0.588	0.496	1.18	8.86	0.13
0.21	1.162	0.855	1.36	12.43	0.17
0.24	2.066	1.336	1.55	16.00	0.21
0.28	3.363	1.940	1.73	19.57	0.24
0.31	5.110	2.666	1.92	23.14	0.28
0.35	7.361	3.515	2.09	26.71	0.32
0.38	10.17	4.486	2.27	30.28	0.36
0.42	13.58	5.580	2.43	33.86	0.39
0.45	17.64	6.796	2.60	37.43	0.43
0.49	22.76	8.130	2.80	40.00	0.47
0.52	26.86	9.551	2.81	43.52	0.51
0.56	31.10	11.10	2.80	47.02	0.54
0.59	35.90	12.77	2.81	50.52	0.57
0.63	42.83	14.57	2.94	54.02	0.59
0.66	50.85	16.48	3.09	57.52	0.63
0.70	59.79	18.52	3.23	61.02	0.67

APPENDIX IV ARCH CULVERT SCOUR CALCULATIONS

```
**************************************************
*      Maryland State Highway Administration     *
*         Bottomless Culvert Scour Program       *
*      Version 8 Build 1.03, August 16, 2006     *
**************************************************

Time stamp: 10/22/2008 5:04:42 PM

Input Data:

Project information:
-------------------------------------------------------------------------------------------------------
Project name: Fruita Industrial Park
Project number: F07-006
Description: Proposed 28 x 10 Concrete Arch Culvert


Project options:
  Program calculates critical and boundary shear stresses at approach section
  Program decides the scour type as either live bed or clear water scour
  Program calculates the unit width discharge at the bridge section
  Program calculates critical velocity at bridge section
  Program calculates sediment transport parameter k2
  Program calculate the flow velocity at abutment face
  Clear-water scour uses Neill's method
  English Units
  Section orientation is looking downstream

Approach Section Data:
-------------------------------------------------------------------------------------------------------
```

	Left	Channel	Right
Approach section discharge (cfs):	533.16	3757.30	9.54
Approach section top width (ft):	46.58	41.76	3.37
Approach flow depth (hydraulic depth) (y1) (ft):	2.71	6.81	1.28
Approach median particle size, D50(ft):	.02	.02	.02
Bank slope (Z) in the vicinity of the bridge (Z=H/V):	3		2

```
Energy slope (S) at approach section: 0.004385

ABSCOUR Overrides

Reserved for override approach critical shear stress
Reserved for override approach boundary shear stress
Reserved for override scour type
Reserved for override sediment transport parameter
Reserved for override location header
Reserved for override unit width discharge
Reserved for override critical velocity
Reserved for override 2-D velocity at side wall
Reserved for override average velocity in portion of culvert

Downstream Culvert Data:
-------------------------------------------------------------------------------------------------------
Downstream water surface elevation under culvert: 4481.51 ft
```

	Left	Channel	Right
HEC-RAS discharge under Culvert (cfs):	0	4300	0
Waterway area (A) measured normal to flow (sf):	235.24	603.13	12.64
Culvert flow width (W) measured normal to flow (ft):	5.55	5.55	5.55
Hydraulic depth (A/W) (ft):	42.39	108.67	2.28
ABSCOUR X-Section elevation (#54-#61) (ft):	4439.12	4372.84	4479.23
Culvert type:		Arched	
Setback (- for an abutment in channel) (ft):	0		0
Low chord elevation downstream side of culvert (ft):	4479	4481.83	4479
Correction factor for low chord submergence (#54-#65>0)(ft):	0.00	0.00	0.00
Median particle size under culvert, D50(ft):	.6667	.6667	.6667
Estimated long-term aggradation(+) or degradation(-) (ft):	1	1	1

```
Safety factor (typical ranges 1.2 to 1.4): 1

Upstream Culvert Data
-------------------------------------------------------------------------------------------------------
Water surface elevation upstream side of culvert: 4481.91 ft
```

	Left	Channel	Right
Water depth at upstream side of culvert (#73-#62) (ft):	42.79	109.07	2.68
Low chord elevation upstream side of culvert (ft):	4479	4481.83	4479
Low chord height (#78-#62) (ft):	39.88	108.99	-0.23
Pressure flow, Yes or NO: (Yes if #77>#79 at channel)	Yes	Yes	Yes
Embankment skew angle (degrees):	71		45

```
Is future lateral migration of channel likely to occur?: Yes
```

Output Computation And Results

Approach Section:

Total approach discharge (cfs): 4300

	Left	Channel	Right
Approach average flow velocity (fps):	4.224	13.212	2.212
Approach unit width discharge (cfs/ft):	11.446	89.974	2.831
Approach section depth (ft):	2.71	6.81	1.28
Approach section Froude Number:	0.4521	0.8922	0.3445
Approach section critical shear stress(psf):	0.08	0.08	0.08
Approach boundary shear stress(psf):	0.7415	1.8634	0.3502
Approach sediment transport parameter (k2):	0.648	0.641	0.663
Scour type:	Live Bed	Live Bed	Live Bed

Downstream Culvert Computations:

Total discharge under Culvert (cfs): 4300

	Left	Channel	Right
Method of computing flow velocity adjustment:	Short Setback		Short Setback
Flow velocity (fps):	5.053	5.053	5.053
Adjustment to hydraulic depth (y0)adj (ft):	108.672	108.672	108.672
Unit width discharge (#107*#106)(cfs/ft):	549.1	549.1	549.1
Control soil layer No.:	1	1	1
Critical velocity (fps):	17.81	17.812	17.81

Downstream Contraction Scour Computations:

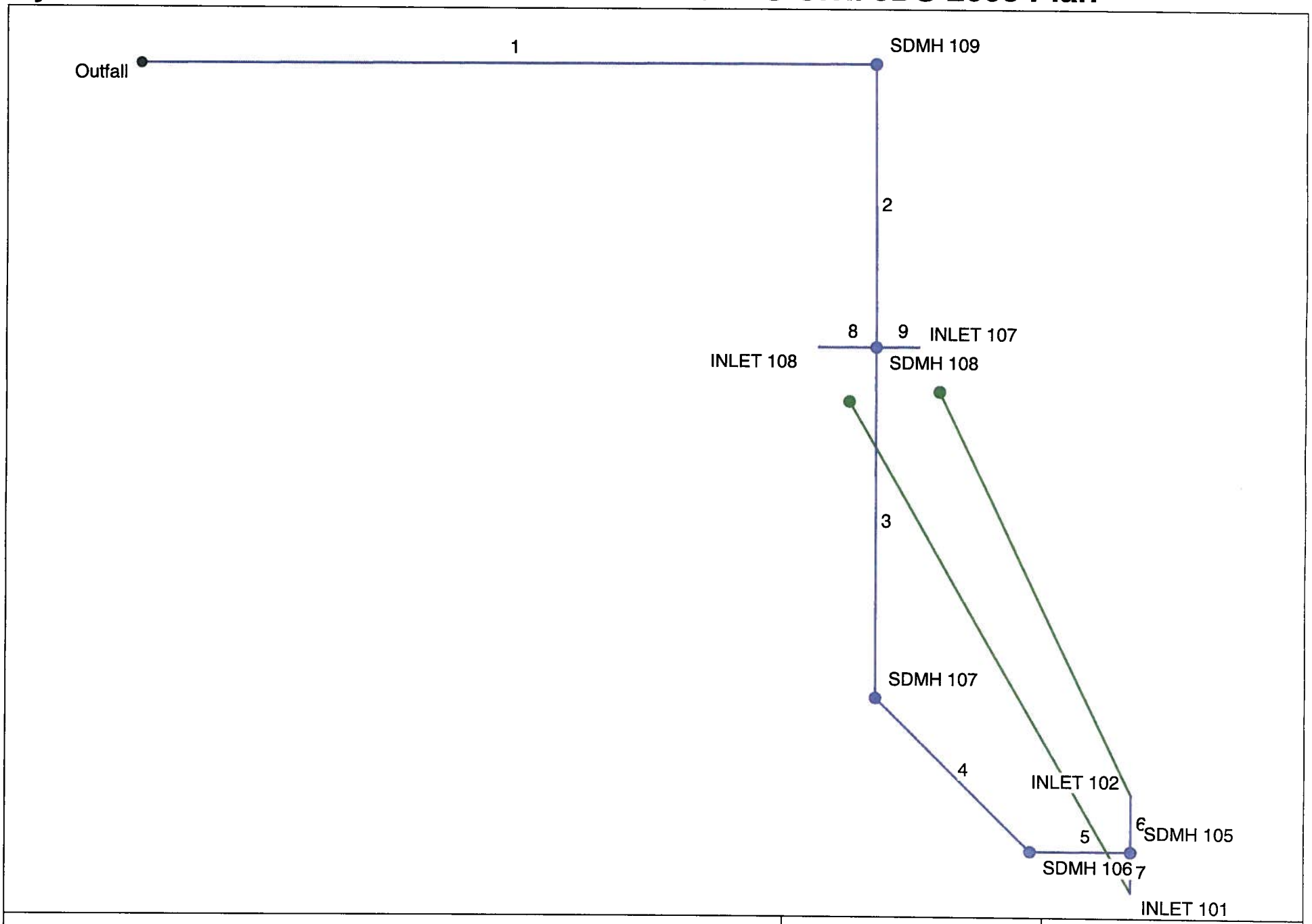
	Left	Channel	Right
Clear water scour flow depth (y2)(ft):	30.831	30.845	30.831
Live bed scour flow depth (y2)(ft):	33.257	21.724	41.979
Interpolated scour flow depth (y2)(ft):	**21.724**	**21.724**	**21.724**
Pressure flow coefficient (Kp):	1.1	1.1	1.1
Adjusted scour flow depth (y2)adj (#119*#118(ft):	23.896	23.896	23.896
Contraction scour depth (ys) (#120-#107>T/SF)(ft):	0	0	0
Final contraction scour depth (#121*#69)(ft):	**0**	**0**	**0**
Aggr/Degr + Contraction scour EL.(#54-#107-#122-#66+#68)(ft):	4373.838	4373.838	4373.838

Total Culvert Scour At Side wall:

	Left	Channel	Right
Side wall local velocity factor (Kv):	1.002		1
Side wall spiral flow factor (Kf):	2.341		1.893
Pressure flow coefficient (Kp):	1.1		1.1
Wall scour flow depth (y2a)adj(#118*#130*#129^#97*#131)(ft):	**56.027**		**45.247**
Initial side wall scour depth (ysa)(#132-#107>0)(ft):	0		0
Coefficient for side wall shape factor (Kt):	1		1
Coefficient for embankment angle (Ke):	0.97		0.914
Final side wall scour depth (ysa)adj(#133*#134*#135*#69)(ft):	**0**		**0**
Recommended minimum side wall scour depth (ft):	**5**		**5**
Control side wall scour depth (ft):	**5**		**5**
Aggr/Degr + Side wall scour EL.(#54-#107-#139-#66+#68)(ft):	4368.838		4368.838

APPENDIX V PROPOSED STORM DRAIN NETWORK

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2008 Plan



Project File: FIPEastPipes2YR.stm	Number of lines: 9	Date: 07-10-2008

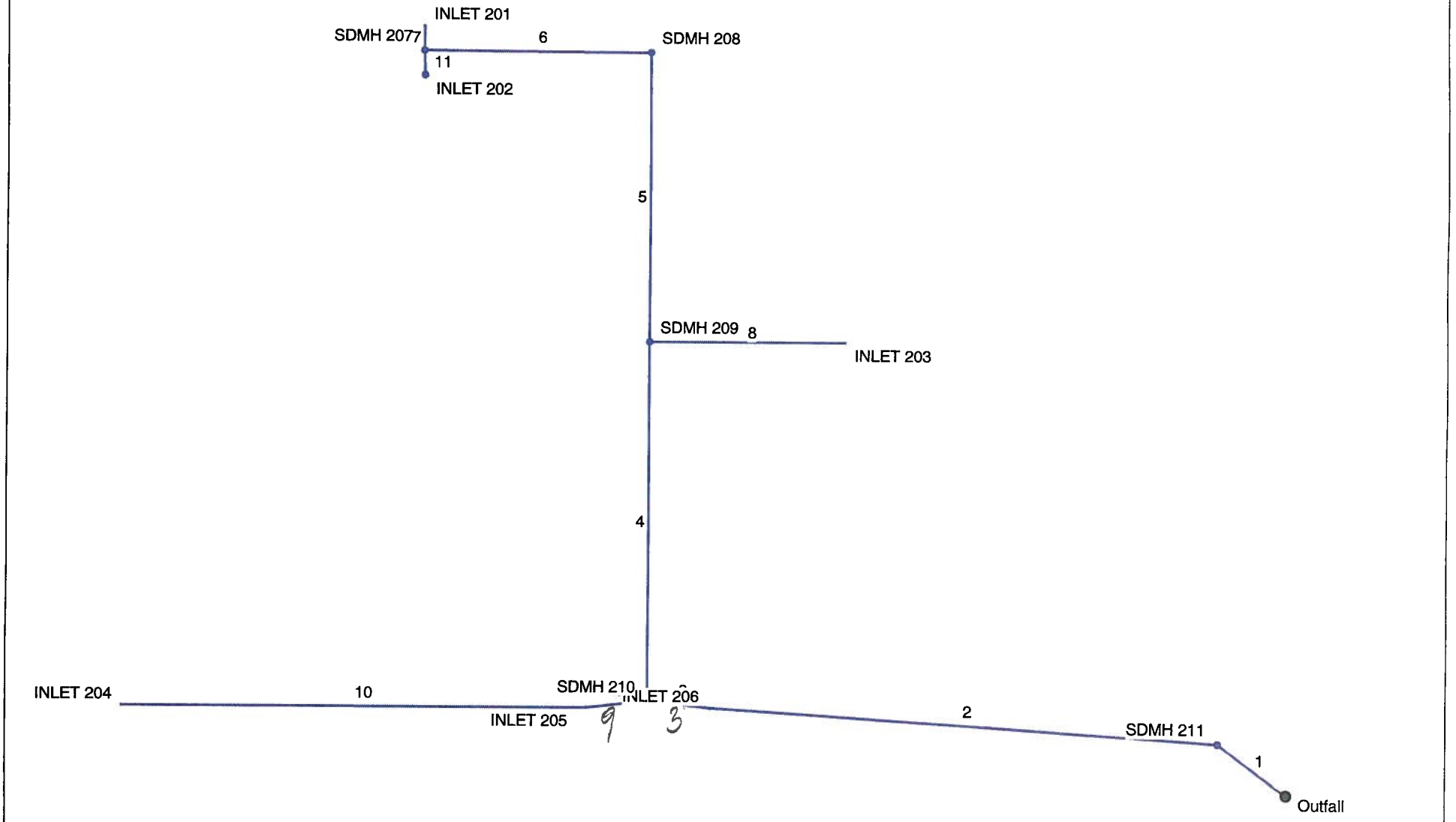
Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	24	8.39	4475.15	4476.30	1.15	1.87	4.49	0.31	4476.61	0.348	280.000	4476.60	4477.63 j	1.03**	1.62	5.17	0.42	4478.04	0.505	0.426	n/a	1.00	n/a
2	24	8.39	4476.80	4477.87	1.06*	1.70	4.93	0.38	4478.24	0.446	107.673	4477.28	4478.35	1.07	1.70	4.93	0.38	4478.72	0.445	0.445	0.479	1.00	0.38
3	18	3.92	4477.98	4478.89	0.91*	1.12	3.49	0.19	4479.08	0.298	134.000	4478.38	4479.29	0.91	1.12	3.50	0.19	4479.48	0.300	0.299	0.401	0.75	0.14
4	18	3.92	4478.38	4479.43	1.05	1.32	2.96	0.14	4479.57	0.198	83.000	4478.76	4479.58	0.82	0.98	3.99	0.25	4479.82	0.422	0.310	0.257	0.75	0.19
5	18	3.92	4478.76	4479.76	1.00	1.25	3.13	0.15	4479.91	0.226	38.000	4478.96	4479.80	0.84	1.02	3.86	0.23	4480.03	0.386	0.306	0.116	1.00	0.23
6	18	3.03	4479.16	4480.03	0.87	1.06	2.85	0.13	4480.16	0.205	21.770	4479.38	4480.04 j	0.66**	0.76	4.01	0.25	4480.29	0.508	0.356	n/a	1.00	0.25
7	18	0.89	4479.16	4480.03	0.87	1.06	0.84	0.01	4480.04	0.018	15.644	4479.38	4480.02	0.64	0.73	1.23	0.02	4480.05	0.049	0.033	0.005	1.00	0.02
8	18	0.57	4477.98	4478.72	0.74	0.87	0.65	0.01	4478.73	0.012	21.960	4478.20	4478.72	0.52	0.54	1.05	0.02	4478.74	0.045	0.028	0.006	1.00	0.02
9	18	3.90	4477.98	4478.72	0.74	0.87	4.47	0.31	4479.03	0.569	16.033	4478.20	4478.95	0.75**	0.89	4.39	0.30	4479.25	0.542	0.556	n/a	1.00	0.30

Project File: FIPEastPipes2YR.stm | Number of lines: 9 | Run Date: 07-10-2008

Notes: * Normal depth assumed.; ** Critical depth.; j-Line contains hyd. jump. ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2008 Plan



Project File: FIPWestPipes2yr.stm	Number of lines: 11	Date: 07-10-2008

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev. (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	SDMH 211	Manhole	4477.79	Cir	4.00	4.00	24	Cir	4470.96	24	Cir	4471.16
2	INLET 206	Curb-Horiz	4480.33	Rect	0.17	0.25	24	Cir	4473.11	24	Cir	4473.31
3	SDMH 210	Manhole	4480.30	Cir	4.00	4.00	24	Cir	4473.55	24 18	Cir Cir	4473.75 4474.05
4	SDMH 209	Manhole	4482.70	Cir	4.00	4.00	24	Cir	4475.13	24 15	Cir Cir	4475.33 4475.88
5	SDMH 208	Manhole	4480.60	Cir	4.00	4.00	24	Cir	4476.44	24	Cir	4476.63
6	SDMH 207	Manhole	4481.45	Cir	4.00	4.00	24	Cir	4477.50	18 18	Cir Cir	4477.70 4477.70
7	INLET 201	Curb-Horiz	4481.51	Rect	0.17	0.50	18	Cir	4477.80			
8	INLET 203	Grate	4482.00	Rect	0.17	0.17	15	Cir	4479.03			
9	INLET 205	Curb-Horiz	4480.20	Rect	0.17	0.25	18	Cir	4474.29	18	Cir	4474.48
10	INLET 204	Grate	4479.50	Rect	0.17	0.17	18	Cir	4476.61			
11	INLET 202	Curb-Horiz	4481.51	Cir	4.00	4.00	18	Cir	4477.80			

Project File: FIPWestPipes2yr.stm | Number of Structures: 11 | Run Date: 07-10-2008

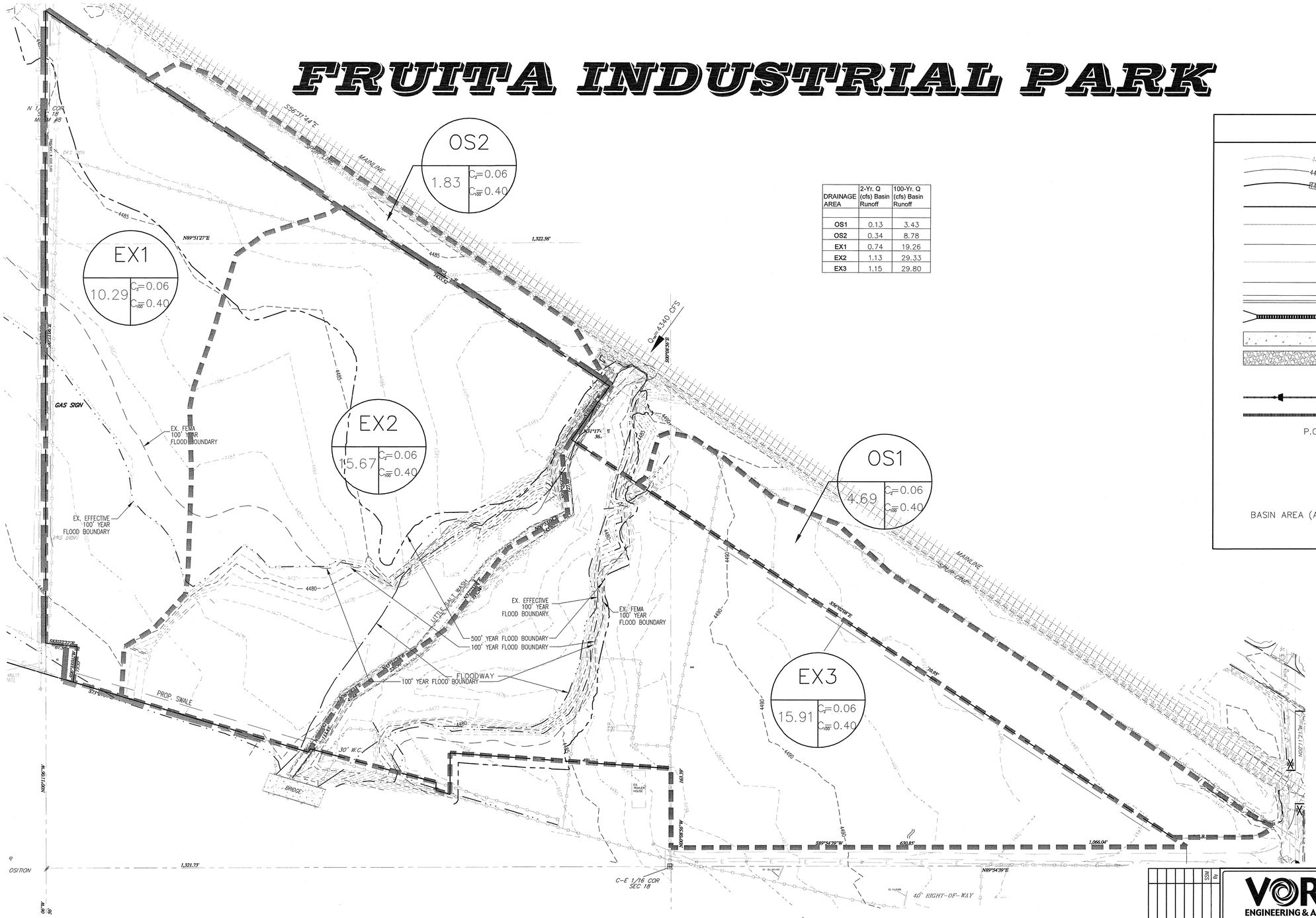
Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	24	14.73	4470.71	4475.00	2.00	3.14	4.69	0.34	4475.34	0.424	65.200	4470.96	4475.28	2.00	3.14	4.69	0.34	4475.62	0.424	0.424	0.277	0.61	0.21
2	24	14.73	4471.16	4475.49	2.00	3.14	4.69	0.34	4475.83	0.424	389.100	4473.11	4477.14	2.00	3.14	4.69	0.34	4477.48	0.424	0.424	1.651	0.50	0.17
3	24	12.84	4473.31	4477.31	2.00	3.14	4.09	0.26	4477.57	0.322	47.500	4473.55	4477.46	2.00	3.14	4.09	0.26	4477.72	0.322	0.322	0.153	0.99	0.26
4	24	10.06	4473.75	4477.72	2.00	3.14	3.20	0.16	4477.88	0.198	275.800	4475.13	4478.26	2.00	3.14	3.20	0.16	4478.42	0.198	0.198	0.546	1.00	0.16
5	24	9.47	4475.33	4478.42	2.00	3.14	3.01	0.14	4478.56	0.175	221.500	4476.44	4478.81	2.00	3.14	3.01	0.14	4478.95	0.175	0.175	0.388	1.00	0.14
6	24	9.47	4476.63	4478.95	2.00	3.14	3.01	0.14	4479.09	0.175	174.000	4477.50	4479.22	1.72	2.87	3.30	0.17	4479.39	0.163	0.169	0.294	1.00	0.17
7	18	6.17	4477.70	4479.39	1.50	1.77	3.49	0.19	4479.58	0.345	19.000	4477.80	4479.45	1.50	1.77	3.49	0.19	4479.64	0.345	0.345	0.066	1.00	0.19
8	15	0.59	4475.88	4478.42	1.25	1.23	0.48	0.00	4478.43	0.008	150.000	4479.03	4479.34 j	0.31**	0.23	2.52	0.10	4479.44	0.475	0.242	n/a	1.00	0.10
9	18	2.78	4474.05	4477.72	1.50	1.77	1.57	0.04	4477.76	0.070	47.500	4474.29	4477.75	1.50	1.77	1.57	0.04	4477.79	0.070	0.070	0.033	0.50	0.02
10	18	1.15	4474.48	4477.77	1.50	1.77	0.65	0.01	4477.78	0.012	354.835	4476.61	4477.81	1.20	1.52	0.76	0.01	4477.82	0.013	0.012	0.044	1.00	0.01
11	18	3.30	4477.70	4479.39	1.50	1.77	1.87	0.05	4479.44	0.099	19.000	4477.80	4479.41	1.50	1.77	1.87	0.05	4479.46	0.099	0.099	0.019	1.00	0.05

Project File: FIPWestPipes2yr.stm | Number of lines: 11 | Run Date: 07-10-2008

Notes: ; ** Critical depth.; j-Line contains hyd. jump. ; c = cir e = ellip b = box

FRUITA INDUSTRIAL PARK



DRAINAGE AREA	2-Yr. Q (cfs) Basin Runoff	100-Yr. Q (cfs) Basin Runoff
OS1	0.13	3.43
OS2	0.34	8.78
EX1	0.74	19.26
EX2	1.13	29.33
EX3	1.15	29.80

LEGEND

- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPERTY BOUNDARY
- EASEMENT
- EDGE OF GRAVEL/ROADBASE
- EXISTING EDGE OF ROAD
- PROPOSED EDGE OF ASPHALT
- PROPOSED CURB & GUTTER
- PROPOSED CULVERT
- PROPOSED CONCRETE
- PROPOSED GRAVEL/ROADBASE
- DIRECTION OF FLOW
- TIME OF CONCENTRATION PATH
- DRAINAGE BASIN BOUNDARY
- P.O.I. — POINT OF INTEREST
- EX2 — BASIN DESIGNATION
- BASIN AREA (AC): 15.91 — C_f=0.06 MINOR C COEFICIENT; C_{100}=0.40 MAJOR C COEFICIENT

N

SCALE IN FEET

100 50 0 100 200

1" = 100'

Rev.	Date	Comment	By
2	10/22/08	REVISED PER COUNTY COMMENTS	SSM
1	07/10/08	REVISED PER COUNTY COMMENTS	

VORTEX ENGINEERING & ARCHITECTURE, INC.

- CONSTRUCTION MANAGERS & SITE PLANNERS
- PROJECT MANAGERS
- CIVIL & CONSULTING ENGINEERS / ARCHITECTS

255 Vista Valley Drive, Fruita, Colorado 81521
Phone: (970) 245-9051
Fax (970) 245-7639

PRELIMINARY PLAN

PROJECT: *Fruita Industrial Park*
703 Greenway Dr.
Fruita, Colorado

TITLE: *PRE-DEVELOPMENT DRAINAGE PLAN*

SCALE: 1" = 100'
DATE: 10/09/07
DRAWN BY: ssm
PROJECT NO: F07-006
CHECKED BY: RWJII
CAD ID: drainagemap.dwg
SHEET No: 1 OF 2
REV. No. 2
CONSTRUCTION CHECK: DATE:

R.W. JONES II
PROFESSIONAL ENGINEER
COLORADO LICENSE No. 37506
VIRGINIA LICENSE No. 0402 037460

S. SYLVESTER MIKOSZ
PROFESSIONAL ENGINEER
COLORADO LICENSE No. 36191

F1 P

FRUITA INDUSTRIAL PARK

RUNOFF SUMMARY TABLE

DRAINAGE AREA	2-Yr. Q (cfs) Basin Runoff	100-Yr. Q (cfs) Basin Runoff
101	0.89	3.47
102	3.03	11.81
103	3.90	15.21
104	0.57	2.22
105	4.39	17.13
106	0.15	0.58
107	0.20	0.78
201	3.30	12.88
202	6.17	24.06
203	0.59	2.32
204	1.15	4.49
205	1.63	6.37
206	1.89	7.38
207	4.22	16.45
OS1	0.13	3.43
OS2	0.34	8.78
EX1	0.74	19.26
EX2	1.13	29.33
EX3	1.15	29.80

LEGEND

- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPERTY BOUNDARY
- EASEMENT
- EDGE OF GRAVEL/ROADBASE
- EXISTING EDGE OF ROAD
- PROPOSED EDGE OF ASPHALT
- PROPOSED CURB & GUTTER
- PROPOSED CULVERT
- PROPOSED CONCRETE
- PROPOSED GRAVEL/ROADBASE
- DIRECTION OF FLOW
- TIME OF CONCENTRATION PATH
- DRAINAGE BASIN BOUNDARY
- P.O.I. — POINT OF INTEREST
- BASIN DESIGNATION
- BASIN AREA (AC) — MINOR C COEFICIENT / MAJOR C COEFICIENT
- FLOW ARROW

N

SCALE IN FEET

100 50 0 100 200

1" = 100'

By	Comment	Rev. Date
SSM	REVISED PER COUNTY COMMENTS	10/22/08
SSM	REVISED PER COUNTY COMMENTS	07/10/08

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255 Vista Valley Drive
Fruita, Colorado 81521
Phone: (970) 245-9051
Fax (970) 245-7639

PRELIMINARY PLAN

PROJECT: *Fruita Industrial Park*
703 Greenway Dr.
Fruita, Colorado

TITLE: *POST-DEVELOPMENT DRAINAGE PLAN*

R.W. JONES II
PROFESSIONAL ENGINEER
COLORADO LICENSE No. 37506
VIRGINIA LICENSE No. 0402 037460

S. SYLVESTER MIKOSZ
PROFESSIONAL ENGINEER
COLORADO LICENSE No. 39191

SCALE: 1" = 100'
DATE: 10/09/07
DRAWN BY: ssm
PROJECT NO: F07-006
CHECKED BY: RWJII
CAD ID: drainagemap.dwg
CONSTRUCTION CHECK: DATE:
SHEET No: 2 OF 2
REV. No. 2