BOARD OF COUNTY COMMISSIONERS SARPY COUNTY, NEBRASKA

RESOLUTION FLOOD PLAIN DEVELOPMENT
Sarpy County: 132nd Street culvert replacement, NE

WHEREAS, pursuant to Neb. Rev. Stat. § 23-104 (Reissue 2007), the County has the power to do all acts in relation to the concerns of the County necessary to the exercise of its corporate powers; and,

WHEREAS, pursuant to Neb. Rev. Stat. § 23-103 (Reissue 2007), the powers of the County as a body are exercised by the County Board; and,

WHEREAS, the County Board of Commissioners has the authority to adopt a Zoning Regulation, which shall have the force and effect of law pursuant to Neb. Rev. Stat.• 23-114 (Reissue 2007); and,

WHEREAS, said Zoning Regulations require the County Board of Commissioners to approve applications for development permits within any Flood Plain District; and

WHEREAS, Bruce Fountain, Planning Director has reviewed Sarpy County Public Works' application for a Flood Plain Development Permit for compliance with the Zoning Regulations on the property generally described in the attached Exhibit A; and,

WHEREAS, said application is in compliance with Section 30, Flood Plain District of Zoning Regulations and further, the Natural Resources District has no objection to the development permit; and,

WHEREAS, the Planning Director has made a recommendation of approval as noted in the attached Exhibit A, which Exhibit A includes the Planning Director report, the engineering certification, and the Natural Resources District comments.

NOW, THEREFORE, BE IT RESOLVED BY THE SARPY COUNTY BOARD OF COMMISSIONERS THAT the Flood Plain Development Permit Application for the property generally described in the attached Exhibit A is hereby approved.

The above Resolution was approved by a vote of the Sarpy County Board of Commissioners at a public meeting duly held in accordance with applicable law on the 27th day of November 2012.

Attest

SEAL

DEBRA J. HOUGHTALING, COUNTY CLERK
SEAL
SARPY COUNTY, NEBRASKA

Sarpy County Board Chairman

County Clerk

7

BOARD OF COUNTY COMMISSIONERS SARPY COUNTY, NEBRASKA

RESOLUTION FLOOD PLAIN DEVELOPMENT
Sarpy County: 132nd Street culvert replacement, NE

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WHEREAS, said application is in compliance with Section 30, Flood Plain District of Zoning Regulations and further, the Natural Resources District has no objection to the development permit; and,

WHEREAS, the Planning Director has made a recommendation of approval as noted in the attached Exhibit A, which Exhibit A includes the Planning Director report, the engineering certification, and the Natural Resources District comments.

NOW, THEREFORE, BE IT RESOLVED BY THE SARPY COUNTY BOARD OF COMMISSIONERS THAT the Flood Plain Development Permit Application for the property generally described in the attached Exhibit A is hereby approved.

The above Resolution was approved by a vote of the Sarpy County Board of Commissioners at a public meeting duly held in accordance with applicable law on the _____ day of _____ 2012.

Attest

SEAL

_____ _____

Sarpy County Board Chairman County Clerk

EXHIBIT A

Sarpy County Board of Commissioners Report
Staff Report Prepared: November 21, 2012
County Board Date: November 27, 2012

Subject	Type	By
Floodplain Development Permit for a Sarpy County Public Works Department project located on 132nd Street, ¼ mile south of Capehart Road	Resolution	Bruce Fountain, AICP, EDFP Planning Director

- **Application Overview**
  - This is a request by the Sarpy County Public Works Department for approval of a floodplain development permit to replace the existing single span, steel beam bridge located on 132nd Street, ¼ mile south of Capehart Road with a triple 12' x 12' x 56' long reinforced concrete box culvert. The project will be in conjunction with the proposed roadway improvements of 132nd Street in this area.

- **Comprehensive Development Plan**
  - The Sarpy County Development Structure Plan (Future Land Use Map) indicates this general area as Greenway along the Springfield Creek and Urban Residential in the surrounding area.

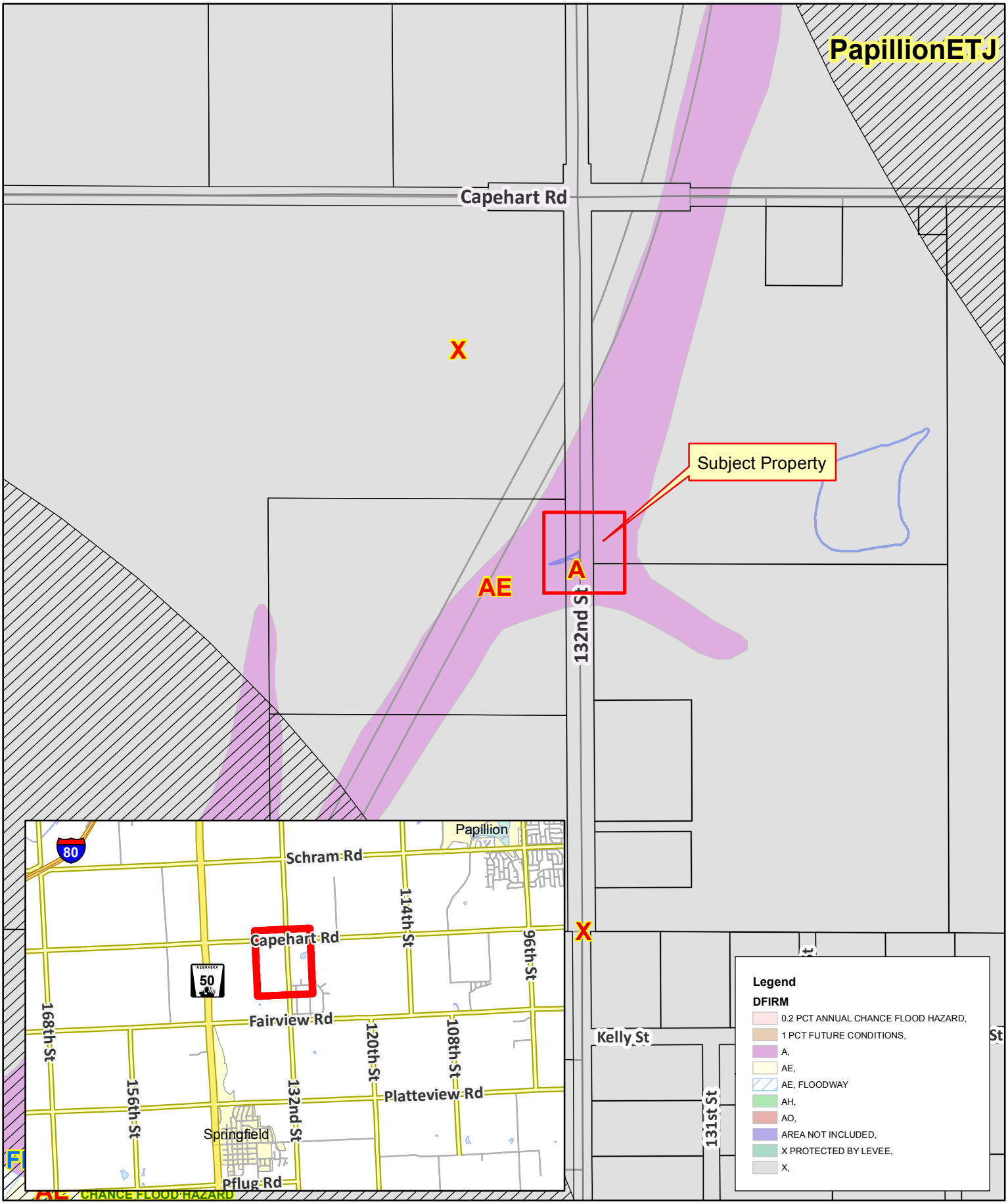
- **Zoning / Floodplain Regulations**
  - The areas surrounding this project location are AG (Agricultural Farming District)
  - According to the Digital Flood Insurance Rate Map (DFIRM) for Sarpy County, NE, Panel 31153C 0180G, effective December 2, 2005, the project is located in a Zone A flood fringe of Springfield Creek. Base Flood Elevations (BFE) are not determined in Approximate Zone A.

- **Natural Resources District**
  - Based on a review of plans, calculations, existing structure analysis, and the Zone A Compliance Certification submitted by Sarpy County's consulting engineering firm, HGM, the Papio-Missouri River Natural Resources District (PMNRD) provided the following comments (the PMNRD comment letter is attached):
    - The existing 100-year flood elevation is determined to be 1101.95 feet and the proposed project 100-year elevation is modeled at 1102.89 feet. This results in a rise of 0.94 feet and meets the criteria of the floodplain regulations.
    - The PMNRD has no objection to the culvert replacement for the 132nd Street crossing of Springfield Creek.

- **Recommendation**
  - Staff recommends the floodplain development permit be approved as it is in compliance with the Sarpy County Floodplain Regulations and the PMNRD has no objections to the project.

Respectfully submitted by:

Bruce Fountain, AICP, EDFP
Planning Director



Vicinity Map - Flood Zones

132nd St Culvert

Sarpy County Floodplain Development Permit

N
W
E
S

PAPIO-MISSOURI RIVER
NATURAL
RESOURCES
DISTRICT
8901 S. 154th Street
Omaha, NE 68138-3621
402-444-6222
www.papionrd.org

November 20, 2012

Mr. Bruce Fountain
Sarpy County Planning Director
1210 Golden Gate Drive
Papillion, NE 68046

RE: Floodplain development permit – 132nd Street Culvert Replacement

Dear Mr. Fountain:

The District received information concerning the replacement of the existing single span, steel beam bridge located on 132nd Street, ¼ mile south of Capehart Rd. The proposed structure is a Triple 12' x 12' x 56' long Reinforced Concrete Box Culvert located on the 132nd Street crossing of Springfield Creek, Sarpy County, Nebraska. According to the Digital Flood Insurance Rate Map for Sarpy County, NE, Panel 31153C 0180G, effective December 2, 2005, the project is located in a Zone A flood fringe of Springfield Creek. Base flood elevations are not determined in Approximate Zone A.

The following are comments based on the review of information provided by HGM Assoicates, Inc. The submitted information includes the floodplain development application, proposed plans (not dated), Hydrology and Hydraulic Design Calculations dated November 2011, existing structure analysis and Zone A Compliance Certification sent via email on 11/15/12.

- The existing 100-year flood elevation is determined to be 1101.95 ft and the proposed project 100-year elevation is modeled at 1102.89 ft. This results in a rise of 0.94 ft and meets the criteria of the floodplain regulations.

The District has no objection to the culvert replacement for the 132nd Street crossing of Springfield Creek.

If you have any questions or concerns, please contact me at 402-315-1722 or agrint@papionrd.org.

Sincerely,

Amanda Grint, PE, CFM
Water Resources Engineer

Cc: Marlin Petermann and Lori Laster, PMRNRD

Z:\agrint\534\121031-Fountain-132nd St culvert.doc File: Reach 10-4

Engineering Certification – SFH Zone A Compliance

(for projects located in a mapped Special Flood Hazard Zone A)

This is to certify that I am a duly qualified engineer licensed to practice in the State of NEBRASKA.
(Name of State)

This further certifies that the attached data supports the fact that the proposed 132nd STREET CULVERT located within the
(Name of Development)

Special Flood Hazard Zone A on SPRINGFIELD CREEK
(Name of Stream)

as published in the Flood Insurance Study for SARPY COUNTY
(Name of Community)

dated DECEMBER 2, 2005 will not increase the 100-year
(Study Date)

event water surface elevation by greater than one foot within the vicinity of the proposed development.

11-15-12
(Date)

(Signature)

STEPHEN MOFFITT, P.E.
(Printed Name)

Seal:

PROFESSIONAL CIVIL ENGINEER
STEPHEN W. MOFFITT
E-8075
STATE OF NEBRASKA

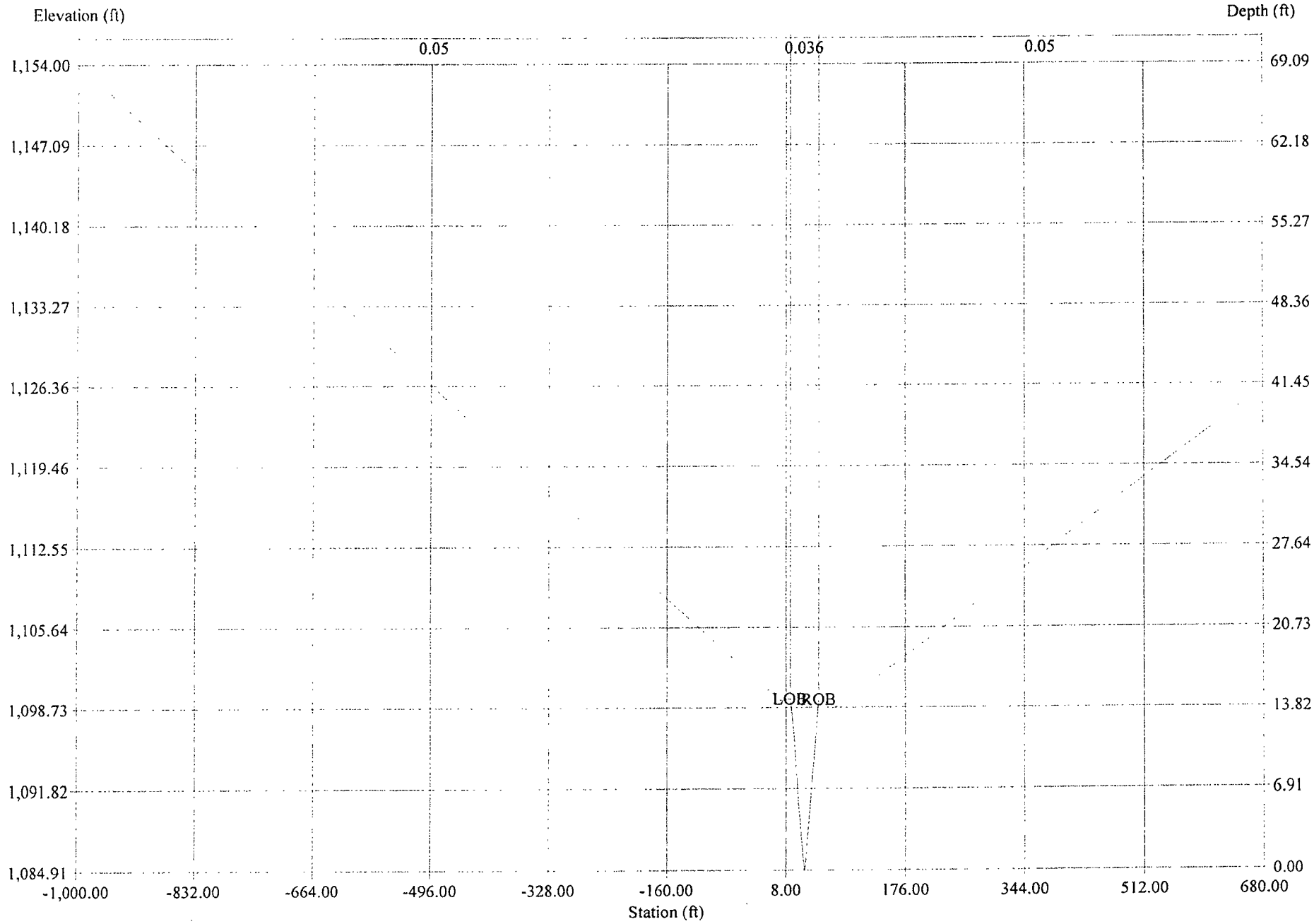
PROJECT MANAGER
(Title)

HGM ASSOCIATES INC.
(Organization)

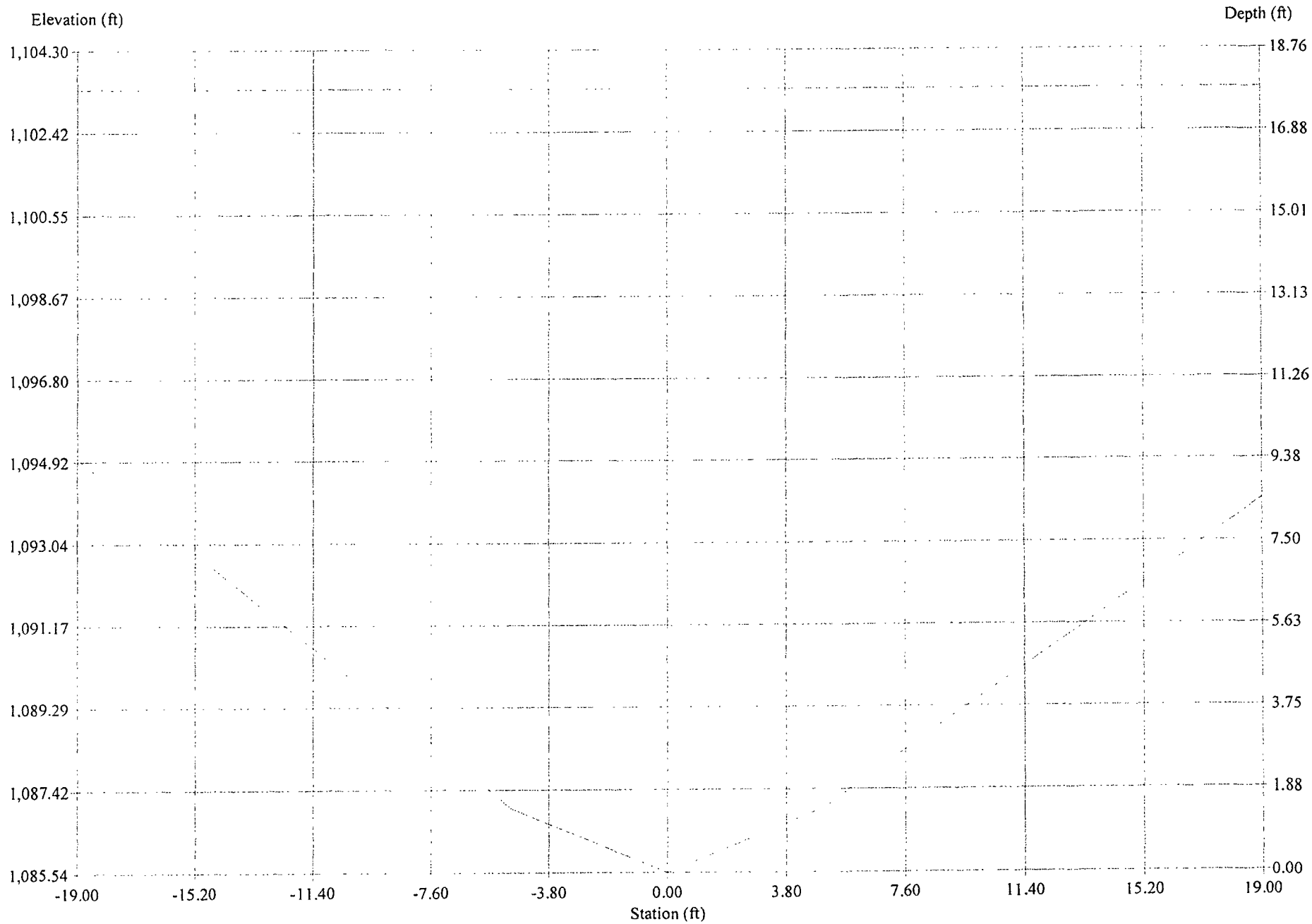
5022 S. 114th ST.
(Address)

OMAHA NE 68149

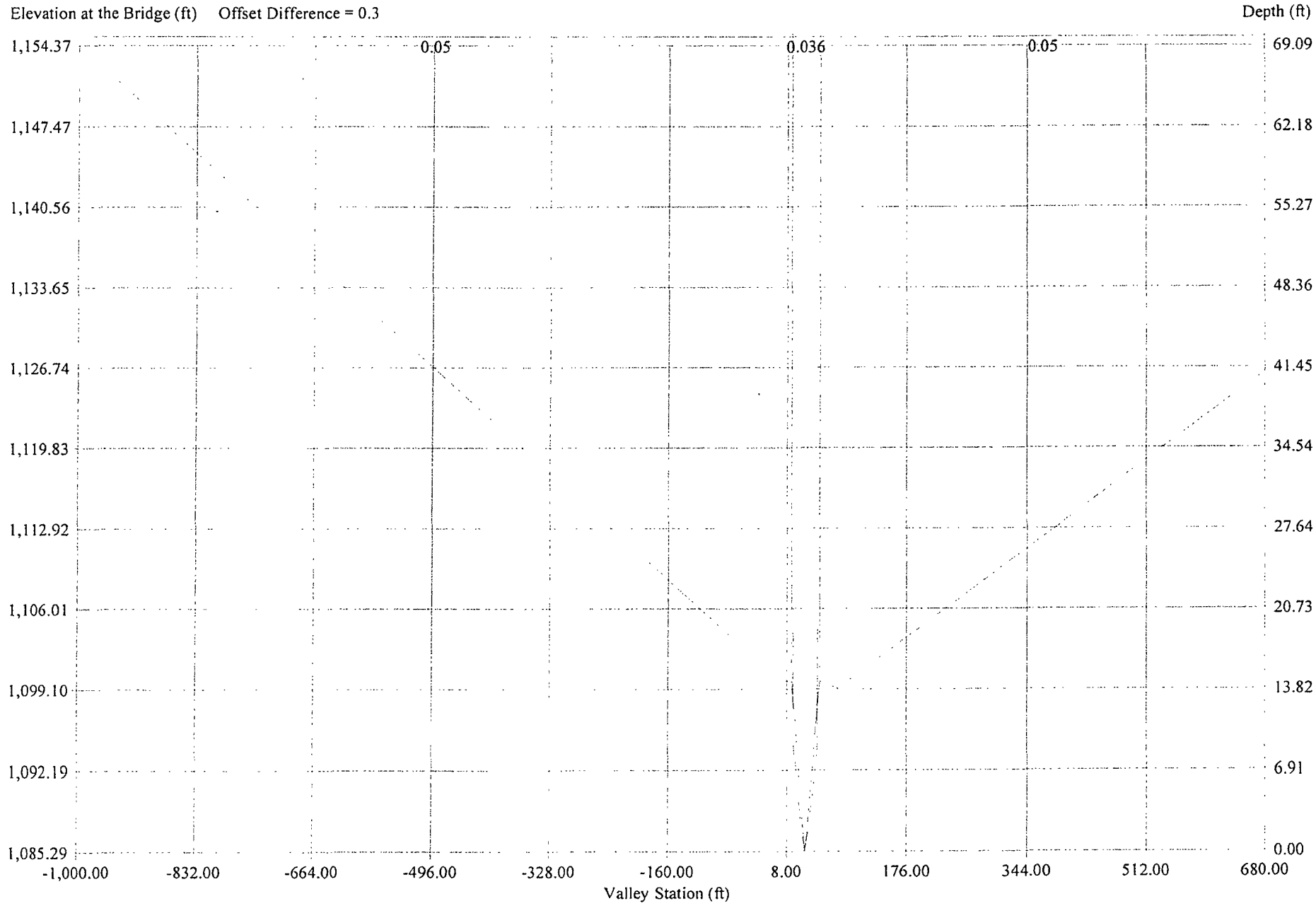
VALLEY CROSS-SECTION 11/15/2012, 761311, , Springfield Creek



BRIDGE CROSS-SECTION Date: 11/15/2012 County: Design No.: Project: 761311 By: JEP Over: Springfield Creek



VALLEY-BRIDGE CROSS-SECTIONS 11/15/2012, 761311, , Springfield Creek



BRIDGE - RIVER - VALLEY

11/15/2012, 761311, , Springfield Creek

STATIONING

A Bridge station of: 0

is equal to a Valley station of: 33.8

DATUMS

A Bridge elevation of:

is equal to a Valley elevation of:

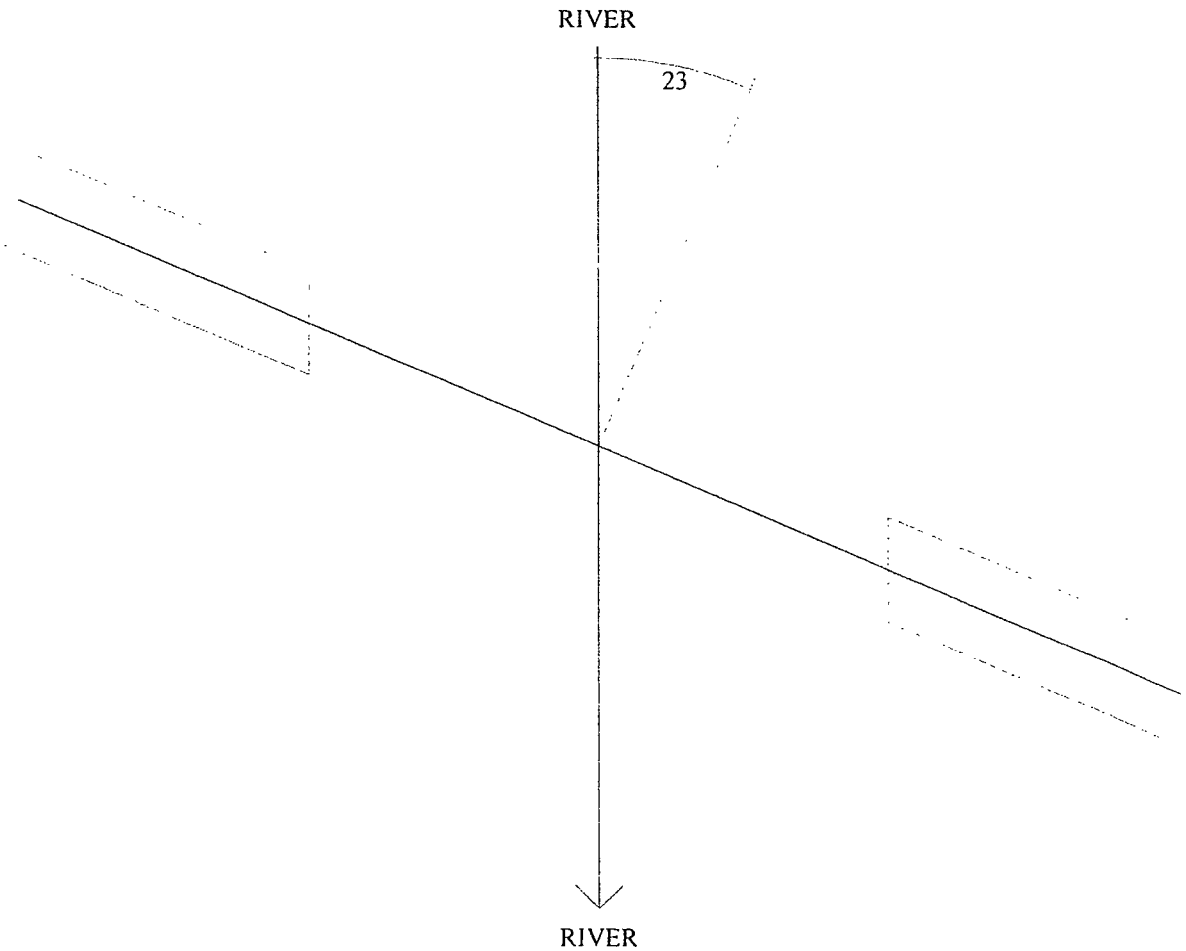
ELEVATION DIFFERENCE - VALLEY TO BRIDGE

Channel Slope: 0.005

Distance from Valley to Bridge: 75

Elevation Difference: 0.375

Bridge Skew: 23



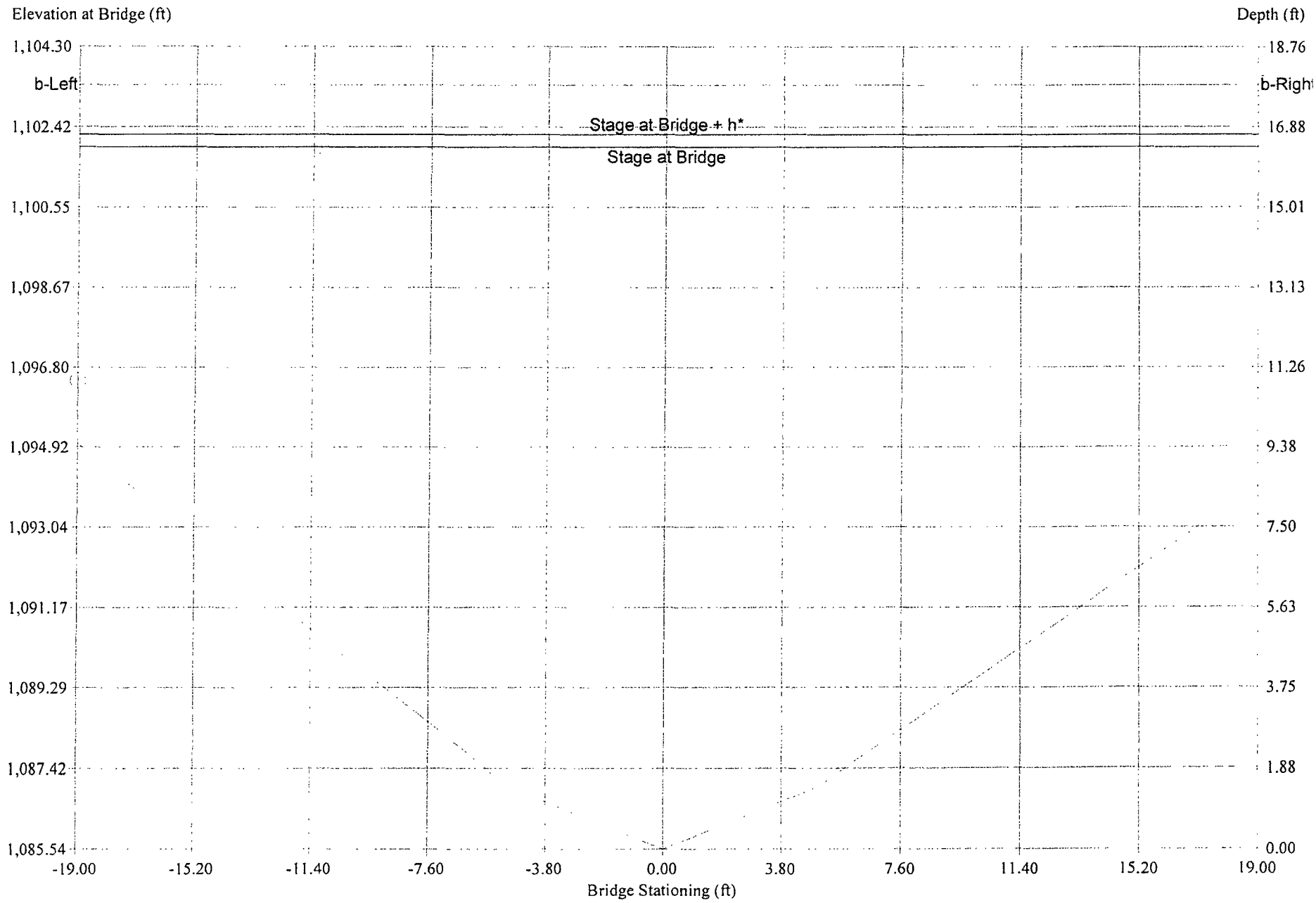
IOWA BRIDGE BACKWATER RESULTS (No Overtopping)

11/15/2012, 761311, , Springfield Creek

Return Period	2	10	25	50	100	500
Design Q	276	1,352	2,266	3,375	4,636	8,772
Backwater (h*)	0.00	0.00	0.00	0.03	0.29	3.86
Freeboard	12.04	6.99	4.51	2.65	1.45	-1.02
Valley Stage	1,090.73	1,095.78	1,098.26	1,100.12	1,101.32	1,103.79
Valley Depth	5.82	10.87	13.35	15.21	16.41	18.88
Bridge Stage	1,091.36	1,096.41	1,098.89	1,100.75	1,101.95	1,104.42
An2	86.7	259.8	354.1	424.9	470.5	525.5
Projected An2	79.8	239.2	326.0	391.1	433.1	483.7
Vn2	3.46	5.65	6.95	8.63	10.71	18.13
Bridge b-Width Elev.	1,089.42	1,092.79	1,094.44	1,095.68	1,096.48	1,098.13
Bridge b-Width Left Station	-9.24	-15.12	-18.02	-19.00	-19.00	-19.00
Bridge b-Width Right Station	9.85	16.57	19.00	19.00	19.00	19.00
Valley b-Width Left Station	25.29	19.88	17.21	16.31	16.31	16.31
Valley b-Width Right Station	42.86	49.05	51.29	51.29	51.29	51.29
b-Width	17.57	29.18	34.08	34.98	34.98	34.98
Qa	0	0	0	31	180	1,038
Qb	276	1,352	2,264	3,241	4,051	5,916
Qc	0	0	1	103	405	1,818
Q-chk	276	1,352	2,266	3,375	4,636	8,772
M	1.000	1.000	0.999	0.960	0.874	0.674
Kb	0.000	0.000	0.000	0.019	0.123	0.555
e	0.000	1.000	0.589	0.697	0.554	0.429
Ke	0.000	0.000	0.000	0.000	0.000	0.000
A-Piers	0.0	0.0	0.0	0.0	0.0	0.0
J	0.000	0.000	0.000	0.000	0.000	0.000
Kp	0.000	0.000	0.000	0.000	0.000	0.000
Skew(Deg)	23.0	23.0	23.0	23.0	23.0	23.0
Ks	0.000	0.000	0.000	-0.004	-0.013	-0.051
K*	0.000	0.000	0.000	0.015	0.110	0.504

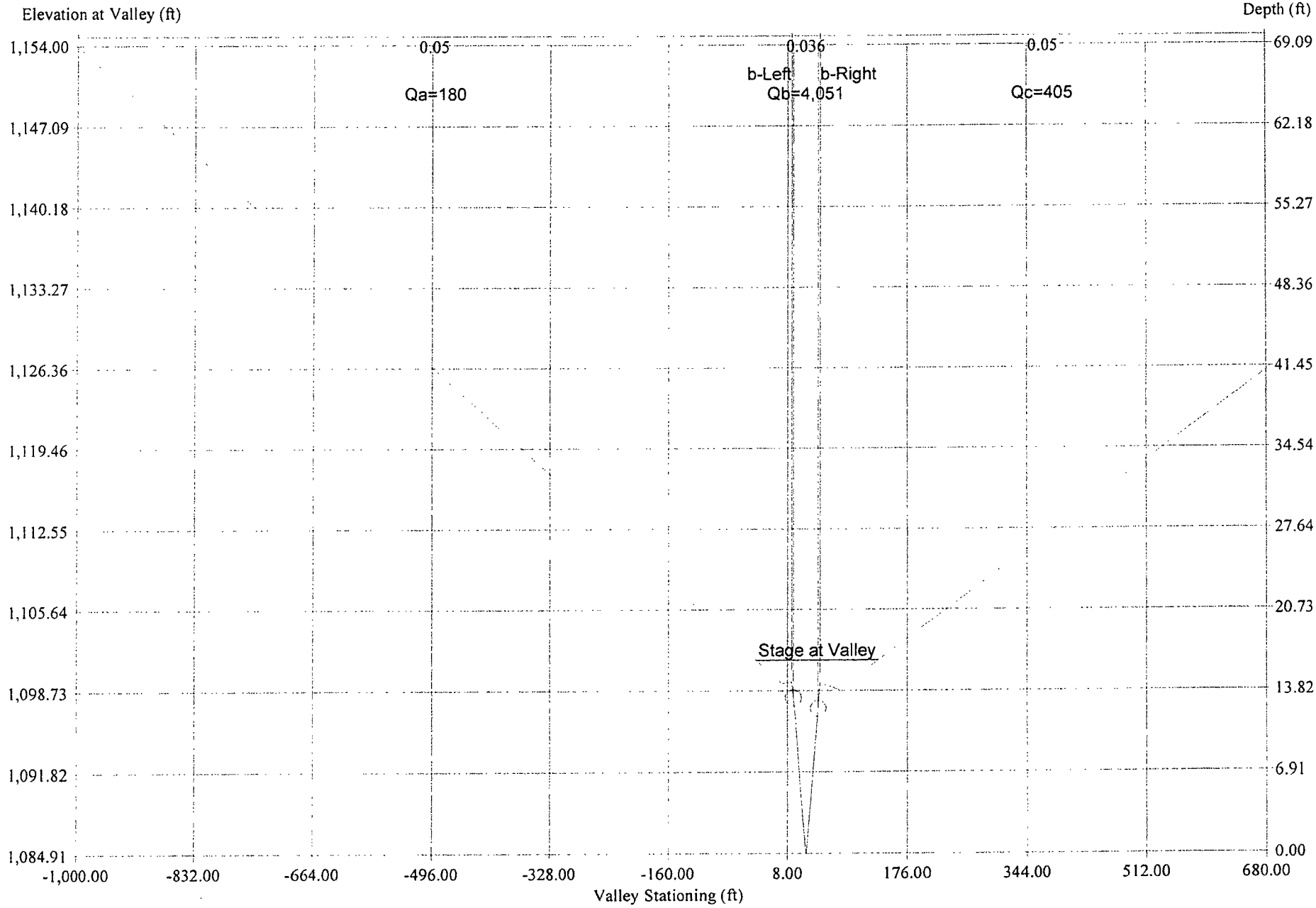
BACKWATER: BRIDGE 11/15/2012, 761311, , Springfield Creek

RP = 100, Q = 4,636, h* = 0.29, Freeboard = 1.45, Bridge Stage = 1,101.95, An2 = 470.5, Skewed An2 = 433.1, Vn2 = 10.71



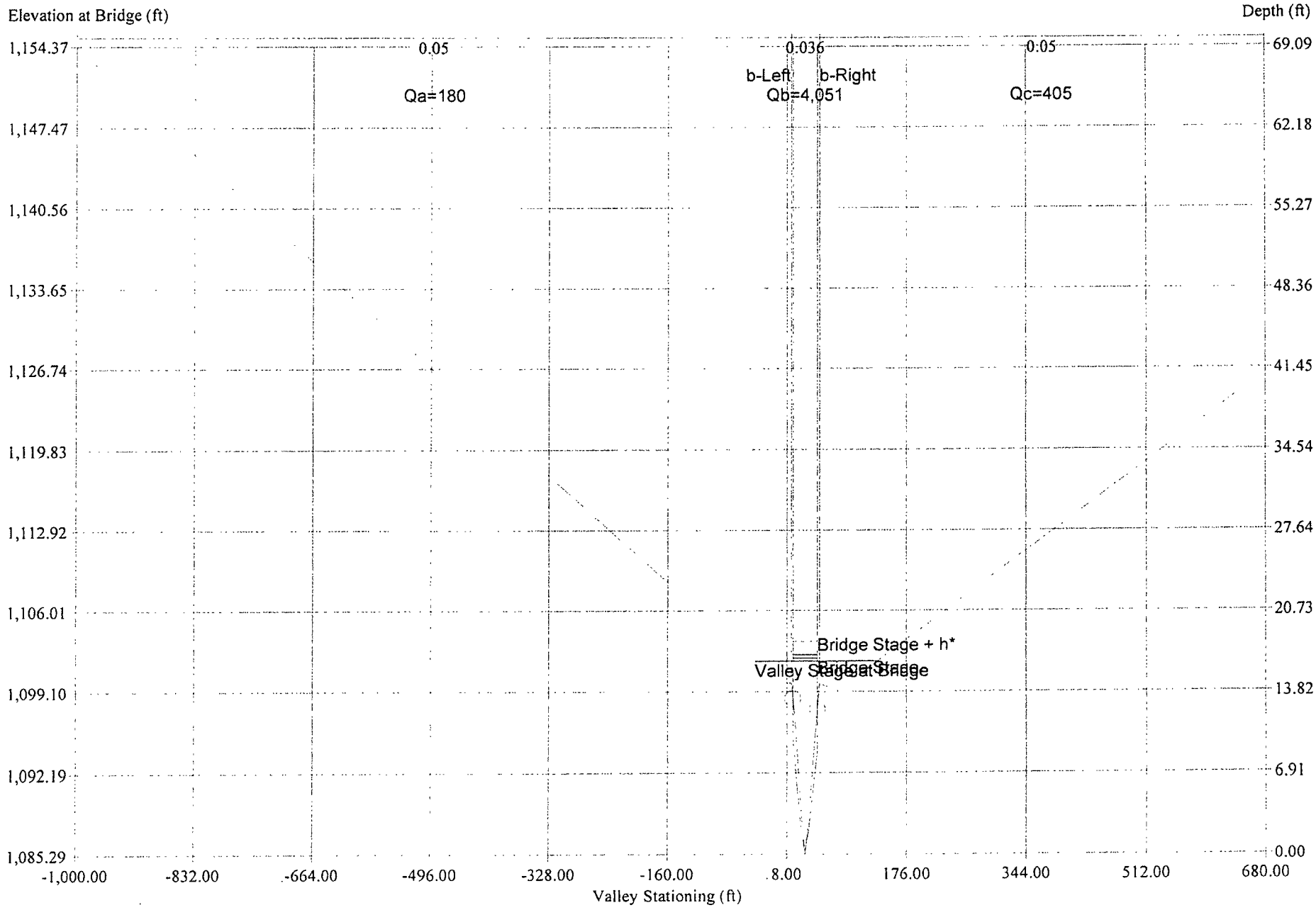
BACKWATER: VALLEY 11/15/2012, 761311, , Springfield Creek

RP = 100, Q = 4,636, h* = 0.29, Valley Stage = 1,101.32, Qa = 180, Qb = 4,051, Qc = 405, M = 0.874, Kb = 0.123



BACKWATER: BRIDGE & VALLEY 11/15/2012, 761311, , Springfield Creek

RP = 100, Q = 4,636, h* = 0.29, Freeboard = 1.45, Valley Stage = 1,101.32, Bridge Stage = 1,101.95



SARPY COUNTY PLANNING

• 1210 GOLDEN GATE DRIVE PAPILLION, NE 68046
•PHONE: 402-593-1555 •FAX: 402-593-1558 • E-MAIL: PLANNING@SARPY.COM

FLOOD PLAIN DEVELOPMENT PERMIT APPLICATION

In order for your application to be considered **COMPLETE**, please answer all applicable questions and provide the following:	**PLANNING STAFF USE ONLY:**
1. Submit complete Flood Plain Development Permit Application 2. Submit Non-Refundable Fee of $100.00 made payable to Sarpy County Treasurer 3. 2 full size site/construction plan drawing 4. 6 reduced size site/construction plan drawings (8.5 x 11) 5. A Construction Drawing Elevation Certificate (From registered professional engineer or architect.)	**APPLICATION NO.:** _____ ____-_____ **DATE RECEIVED:** _____ **CP DESIGNATION:** _____ **ZONING DESIGNATION:** _____ **FEE: $** _____ **RECEIPT NO.** _____ **RECEIVED BY:** _____ **NOTES:** _____

PROPERTY OWNER INFORMATION: **(If multiple owners, attach separate sheet)**

☐ **Please check box if attaching separate sheet with owner information.**

NAME: SARPY COUNTY E-MAIL: _____

ADDRESS: _____ CITY/STATE/ZIP: _____

MAILING (IF DIFFERENT)
ADDRESS: _____ CITY/STATE/ZIP: SARPY CO., NE

PHONE: _____ FAX: _____

ENGINEER INFORMATION:

NAME: STEVE MOFFITT P.E. / HGM ASSOC. E-MAIL: SMOFFITT@hgmonline.com

ADDRESS: 5022 S. 114th ST., SUITE 200 CITY/STATE/ZIP: OMAHA, NE 68137

MAILING (IF DIFFERENT)
ADDRESS: _____ CITY/STATE/ZIP: _____

PHONE: _____ FAX: _____

CONSTRUCTION INFORMATION: *This individual/company is responsible for meeting construction standards.*

NAME: SARPY COUNTY PUBLIC WORKS E-MAIL: _____

ADDRESS: 15100 SOUTH 84th STREET CITY/STATE/ZIP: PAPILLION, NE 68046

PHONE: 402.537.6900 FAX: 402.537.6955

PROPOSED DEVELOPMENT INFORMATION: *(Describe the project in detail, including physical features of the site, proposed improvements, proposed uses or business, operating hours, number of employees, anticipated customers, etc. – Attach additional sheets if necessary.)* ***PLEASE NOTE:*** *A detailed project description is essential to the reviewing process of this request.*

SEE ATTACHED

PROJECT SITE INFORMATION: *Complete each section in its entirety. If a question is not applicable to your project, please indicate this to show that each question has been carefully considered.*

PROPERTY ADDRESS: NA
ASSESSORS PARCEL NUMBER(S) NA
SUB DIVISION: NA **LOT:** NA
NAME OF WATERWAY: SPRINGFIELD CREEK
PROPERTY LIES WITHIN: **FLOODWAY:** _____ **FLOOD FRINGE:** _____
LOWEST FLOOR ELEVATION IS TO BE 1085.45 **FEET ABOVE MEAN SEA LEVEL.** (Including Basement)

LEGAL DESCRIPTION: *(Describe property to wit:)*

NA

ADDITIONAL INFORMATION: *Please use this space to provide any other information you feel is appropriate for the County to consider during review of your application. Attach extra sheets if necessary.*

HYDRAULIC ANALYSIS, ATTACHED
ADJACENT PROPERTY OWNERS, ATTACHED

PLEASE NOTE THE FOLLOWING PROCEDURES:

1. **County Board will hold a public hearing and make a final decision on the Flood Plain Development Permit.**
2. **After the Flood Plain Permit Approval please provide a signed resolution to the Building Department to begin the Building Permit Process.** ***PLEASE NOTE*** **prior to the final inspection a Finished Construction Elevation Certificate will be required by the Building Department.**

I, the undersigned, understand a sign will be posted on my property and will remain until the public hearing process at the Planning Commission and County Board is complete. I further understand the Special Use Permit process as stated above and I authorize County Staff to enter the property for inspection related to the specific request during this process.

Owner Signature (or authorized agent) — Date: 10-4-12

Owner Signature (or authorized agent) — Date: 10/9/12

PROPOSED DEVELOPMENT INFORMATION

This project is for the replacement of the existing single span, steel beam bridge located on 132nd Street, ¼ mile south of Capehart Rd.

The proposed structure is a Triple 12' x 12' x 56' long Reinforced Concrete Box Culvert.

The construction of this project will be in conjunction with the proposed roadway improvements of 132nd Street, south of Capehart Rd.

See design plans for additional details of the proposed structure and roadway improvement plans.

Hydrology and Hydraulic Design Calculations

For

12'x12' Triple Reinforced Concrete Box Culvert on
132nd Street over Springfield Creek
Project # C-77(12-3)
Section 7-T13N-R12E
Nebraska Str. No. C007702310

Prepared for: **Sarpy County**
Prepared by: **HGM Associates Inc.**
Date: **November, 2011**

CALCULATION OF FLOW RATES OVER VARIOUS REGIONS
(Per NDOR Drainage Manual)

Job:	Sarpy Co.- 132nd St. over Drainage	Page :	1 of 1
By:	JEP	Checked:	
Date:	11/10/11	Date :	

Areas (By Region) Used for Flow Calculation, and Cumulative Flows

Region No.	Area (Sq Mi)	Q (cfs) Event	USE FOR DESIGN
Region 1	0.00	Q 2	280
Region 2	0.00	Q 10	1355
Region 3	2.64	Q 50	3380
Region 4	0.00	Q 100	4640
Region 5	0.00	Q 200	6205
		Q 500	8785
Tot Area=	2.64 Sq Mi		

S=	58.40 ft/mi	Main Channel Slope
L=	1.85 mi	Length from Station to basin divide.
P=	27 in	Mean Annual Precipitation
$I_{24,2}$=	3.1 in	Rainfall for a 2-year, 24 hour event
SN10=	1.9 in	Equiv. moisture content of snow as of March 15
T_3=	46 °F	Normal daily March temperature

Flow calculations, Three-variable equations

Q (cfs) Event	Region 1	Region 2	Region 3	Region 4	Region 5	TOTAL Q (cfs)	USE FOR DESIGN
Q 2	0.00	0.00	276.72	0.00	0.00	276.72	280
Q 10	0.00	0.00	1353.83	0.00	0.00	1353.83	1355
Q 50	0.00	0.00	3380.02	0.00	0.00	3380.02	3380
Q 100	0.00	0.00	4641.71	0.00	0.00	4641.71	4640
Q 200	0.00	0.00	6204.77	0.00	0.00	6204.77	6205
Q 500	0.00	0.00	8783.36	0.00	0.00	8783.36	8785

REGIONAL REGRESSION EQUATIONS for NDOR (640 Ac or Greater)

Site : C007702310 County : Sarpy HYDROLOGIC REGION: 3

Input : $A := 1689$ ac $A_c := A \cdot 0.00156$ mi^2 Stream Slope (85/10): $S := 58.4$ ft./mi.

$P := 27$ in

Return Period:

2 yrs: $Q_2 := 7.57 \cdot 10^{-10} \cdot A_c^{0.815} \cdot S^{0.599} \cdot P^{7.099}$

$Q_2 = 276$ cfs

10 yrs: $Q_{10} := 2.55 \cdot 10^{-8} \cdot A_c^{0.722} \cdot S^{0.505} \cdot P^{6.657}$

$Q_{10} = 1352$ cfs

50 yrs: $Q_{50} := 8.19 \cdot 10^{-7} \cdot A_c^{0.688} \cdot S^{0.492} \cdot P^{5.908}$

$Q_{50} = 3375$ cfs

100 yrs: $Q_{100} := 3.26 \cdot 10^{-6} \cdot A_c^{0.681} \cdot S^{0.497} \cdot P^{5.581}$

$Q_{100} = 4636$ cfs

200 yrs: $Q_{200} := 1.37 \cdot 10^{-5} \cdot A_c^{0.677} \cdot S^{0.504} \cdot P^{5.226}$

$Q_{200} = 6197$ cfs

500 yrs: $Q_{500} := 9.20 \cdot 10^{-5} \cdot A_c^{0.673} \cdot S^{0.516} \cdot P^{4.740}$

$Q_{500} = 8772$ cfs

$$vx := \begin{pmatrix} 2 \\ 10 \\ 50 \\ 100 \\ 200 \\ 500 \end{pmatrix} \qquad vy := \begin{pmatrix} Q_2 \\ Q_{10} \\ Q_{50} \\ Q_{100} \\ Q_{200} \\ Q_{500} \end{pmatrix} \qquad u := \begin{pmatrix} 2 \\ 10 \\ 100 \\ 500 \end{pmatrix}$$

$Q_5 := \text{interp}(\text{bspline}(vx, vy, u, 3), vx, vy, 5)$

$Q_5 = 877$ cfs

$Q_{25} := \text{interp}(\text{bspline}(vx, vy, u, 3), vx, vy, 25)$

$Q_{25} = 2266$ cfs

Design Location	Interstate	Expressways & Over 7500 ADT	2000 – 7499 ADT	1999 ADT & Under
Culverts	50 year	50 year	50 year	25 year
Storm Sewers*	50 year	50 year	10 year	10 year
Storm Sewer on Depressed Roadways	50 year	50 year	50 year	25 year
Roadway Gutters	50 year	50 year	10 year	10 year
Median Pipe	50 year	50 year	10 year	10 year
Ditch Grade Control Drop	50 year	50 year	25 year	25 year
Intercepting Dike / Backslope Drop Pipe	25 year	25 year	25 year	25 year
Temporary Facilities** (Duration ≤ Two Years)	2 year	2 year	2 year	2 year

* The 10 year design storm for storm sewers does not include cross-drainage culverts.

** These frequencies are used for facilities to remain in place for less than two years. If a facility will be in use for more than two years, other appropriate storm frequencies should be considered.

Exhibit 1.3 Design Storm Frequencies

6.C.2 Storm Sewer Design Storm

Urban storm sewers are generally designed for the 10-year storm. However, adjacent land uses and structures should be considered in low lying areas to see if the 100-year storm will cause water to back up into structures or critical areas. When designing new storm sewer systems the Designer must determine where surface water not collected by the system will be carried. This uncollected surface flow cannot be allowed to impact / directed toward structures or other critical areas.

Occasionally a 10-year frequency for storm sewers in cities or villages located in extremely flat terrain, such as the Platte River Valley, may be virtually impossible or impractical to obtain. In such instances, special consideration may be in order for frequencies as low as two years.

When connecting a proposed storm sewer to an existing municipal system, the designer should make sure the proposed storm sewer does not overload the existing system. If the desired 10-year storm design puts the existing system over capacity, the following alternatives should be investigated on a project-by-project basis:

- **NDOR** will notify the municipality that it should upgrade its municipal drainage facilities. **NDOR** will request, for safety and liability reasons, that the municipality commit to one of the following plans for upgrading their municipal drainage facilities:
    a) The municipality provides the state with reasonable written assurances of a present plan for a future upgrade of its municipal facilities. The municipality shall provide the state with the details of its proposed improvements that will convey the design event determined by the state.
    b) The municipality requests that the project include an upgrade of its municipal drainage facilities to be paid for solely by the municipality, and the municipality shall enter into an agreement with the state concerning this upgrade of its facilities prior to **NDOR** beginning the final design of the project.
- Design for a 10-year frequency, connect to the existing municipal system, and assume the municipality will upgrade their system in the future (this alternative must not increase flood liability downstream).
- Consider detention using 10-year frequency design.

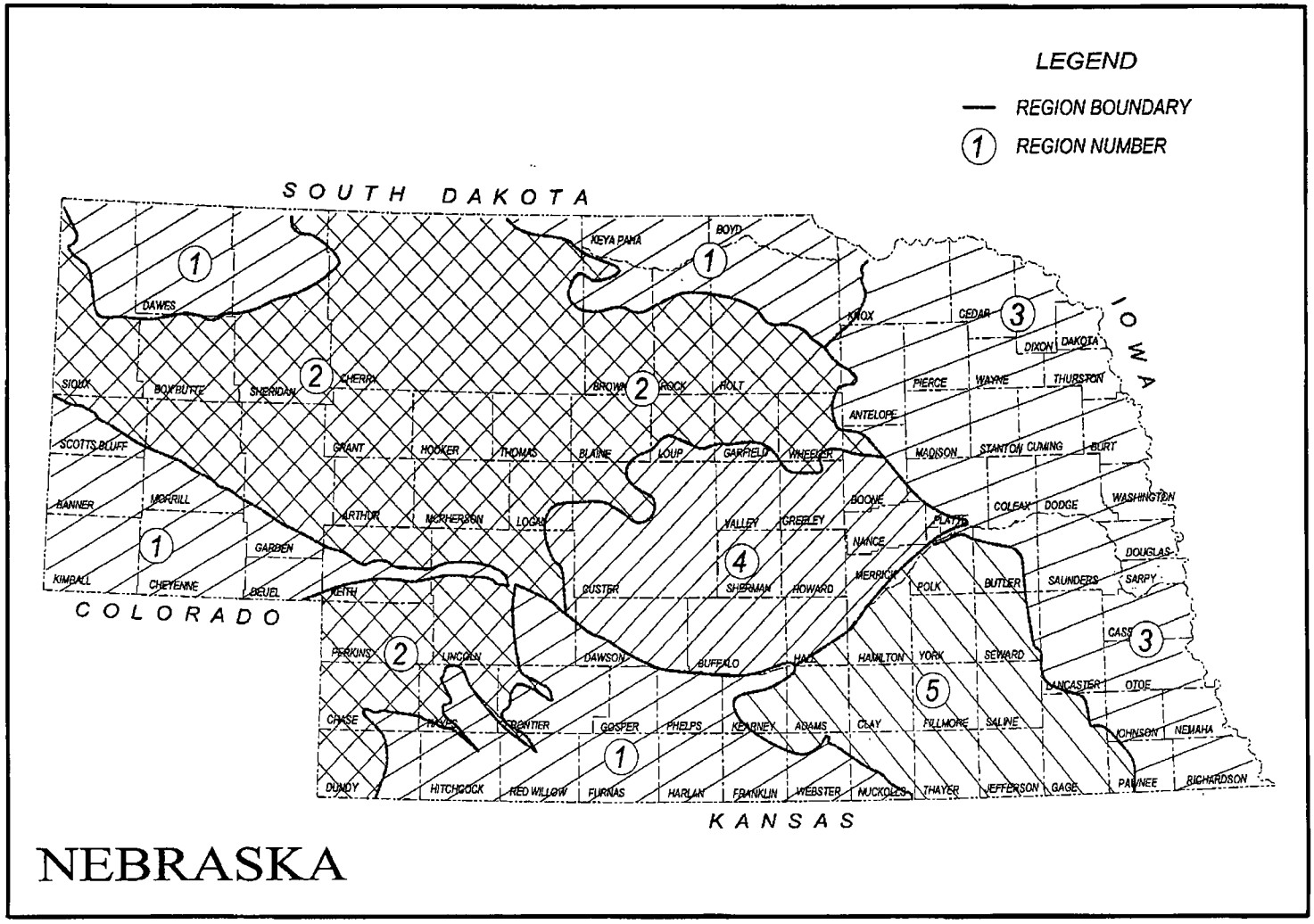


Exhibit 1.12 USGS Hydrologic Regions of Nebraska for Use with Regression Equation Method (640 Ac. or Greater) (Reference 1.7)

hgm
ASSOCIATES INC.
COUNCIL BLUFFS • OMAHA

Job: SARPY CO. 132nd ST. 761311
Sheet No. 1 Of
Calculated by JEP Date 11/10/11
Checked by Date
Scale

MAIN CHANNEL SLOPE CALCULATIONS

MAIN CHANNEL LENGTH = MCL
MAIN CHANNEL SLOPE = MCS

AREA = 1,689 ACRES
= 2.64 mi²

HYDRAULIC REGION 3

$$MCS = \frac{(E85 - E10)}{(0.75)(MCL)}$$

A

MCL = 10,075' = 1.91 mi

E85 = 1164'
E10 = 1104'

$$MCS = \frac{(1164 - 1104)}{(0.75)(1.91)} = 41.9 \text{ ft/mi}$$

B

MCL = 10,426' = 1.97 mi

E85 = 1171'
E10 = 1104'

$$MCS = \frac{(1171 - 1104)}{(0.75)(1.97)} = 45.3 \text{ ft/mi}$$

C

MCL = 9,758' = 1.85 mi

E85 = 1185'
E10 = 1104'

$$MCS = \frac{(1185 - 1104)}{(0.75)(1.85)} = 58.4 \text{ ft/mi}$$

D

MCL = 8,255' = 1.56 mi

E85 = 1186'
E10 = 1103'

$$MCS = \frac{(1186 - 1103)}{(0.75)(1.56)} = 70.9 \text{ ft/mi}$$

USE 58.4 ft/mi

8.G Headwater Elevation

Any culvert which constricts the natural stream flow will cause a rise in the upstream water depth to some extent. The depth of water in the stream measured from the culvert inlet invert (flowline) is termed headwater.

The minimization of potential damage to adjacent property should be of primary concern in the design of all culverts. Additional areas of concern in the design of culverts are:

- The potential for damage to adjacent property is greater in urban areas because of the number and value of properties that can be affected.
- If roadway embankments are low, flooding of the roadway and delay to traffic are usually of concern, especially on highly traveled routes.
- If roadway embankments are high, the potential for flooding upstream of the roadway must be considered.

The desirable maximum allowable headwater for New and Reconstructed Projects will be the lower of the following, (known as the D + 1 policy):

- One foot above the top of the culvert (See **EXHIBIT 1.26**, Condition A).
- One foot below the top of the outside edge of the shoulder (See **EXHIBIT 1.26**, Condition B).

If headwater depth lower than the D + 1 policy maximum cannot be achieved, the designer should obtain approval from the **Roadway Design Unit Head** and document the decision in the project file. Risk assessment should be considered at all times.

Culvert installations under high fills may allow the designer an opportunity to use a high headwater or ponding to attenuate flood peaks. If high headwater is necessary, the designer should investigate the need to acquire additional right-of-way. If deep ponding is considered the possibility of catastrophic failure should be investigated because a breach in the highway fill could be quite similar to a dam failure. Whenever the design of a detention pond is considered, the roadway designer shall consult with the **Roadway Design Hydraulic Engineer**.

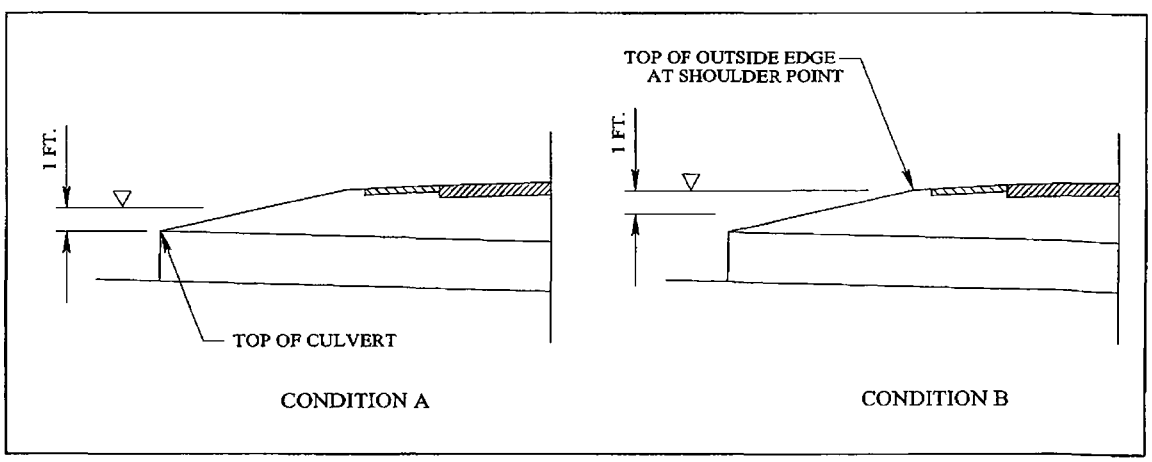


Exhibit 1.26 Maximum Allowable Headwater

HY-8 Culvert Analysis Report

Table 1 - Summary of Culvert Flows at Crossing: 132nd Street

Headwater Elevation (ft)	Total Discharge (cfs)	C007702310 Triple Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1095.02	1355.00	1355.00	0.00	1
1095.64	1557.50	1557.50	0.00	1
1096.21	1760.00	1760.00	0.00	1
1096.75	1962.50	1962.50	0.00	1
1097.27	2165.00	2165.00	0.00	1
1097.52	2266.00	2266.00	0.00	1
1098.21	2570.00	2570.00	0.00	1
1098.70	2772.50	2772.50	0.00	1
1099.19	2975.00	2975.00	0.00	1
1099.69	3177.50	3177.50	0.00	1
1100.17	3380.00	3380.00	0.00	1

Rating Curve Plot for Crossing: 132nd Street

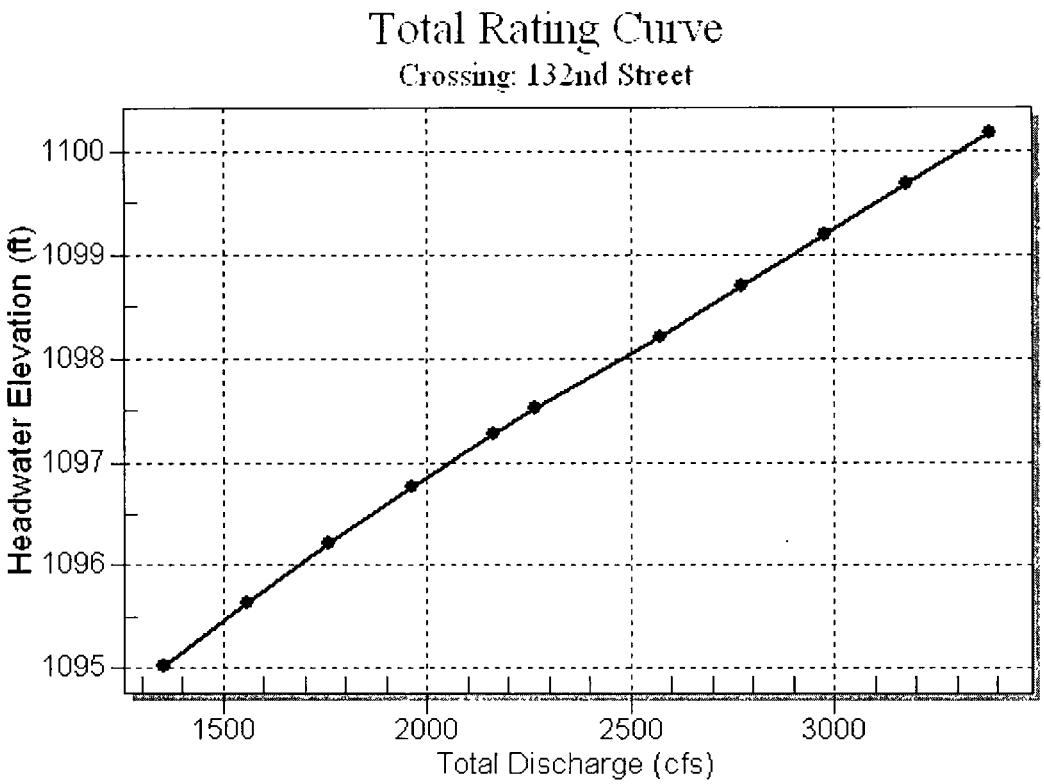


Table 2 - Culvert Summary Table: C007702310 Triple

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
1355.00	1355.00	1095.02	5.389	9.133	1-S1t	2.446	3.538	9.181	9.721	4.100	9.971
1557.50	1557.50	1095.64	5.914	9.748	1-S1t	2.677	3.882	9.729	10.269	4.447	10.331
1760.00	1760.00	1096.21	6.432	10.325	1-S1t	2.909	4.212	10.236	10.776	4.776	10.654
1962.50	1962.50	1096.75	6.930	10.865	1-S1t	3.140	4.529	10.705	11.245	5.092	10.956
2165.00	2165.00	1097 27	7.409	11.382	1-S1t	3.372	4.835	11.140	11.680	5.398	11.242
2266.00	2266.00	1097.52	7.641	11.627	1-S1t	3.487	4.984	11.348	11.888	5.547	11.374
2570.00	2570.00	1098.21	8.317	12.322	5-S1t	3.811	5.421	11.941	12.481	5.978	11.740
2772.50	2772.50	1098.70	8.752	12.806	4-FFf	4.020	5.702	12.000	12.854	6.418	11.962
2975.00	2975.00	1099.19	9.177	13.303	4-FFf	4.228	5.976	12.000	13.209	6.887	12.170
3177.50	3177.50	1099.69	9.594	13.795	4-FFf	4.436	6.245	12.000	13.550	7.355	12.364
3380.00	3380.00	1100.17	10.005	14.284	4-FFf	4.645	6.507	12.000	13.878	7.824	12.549

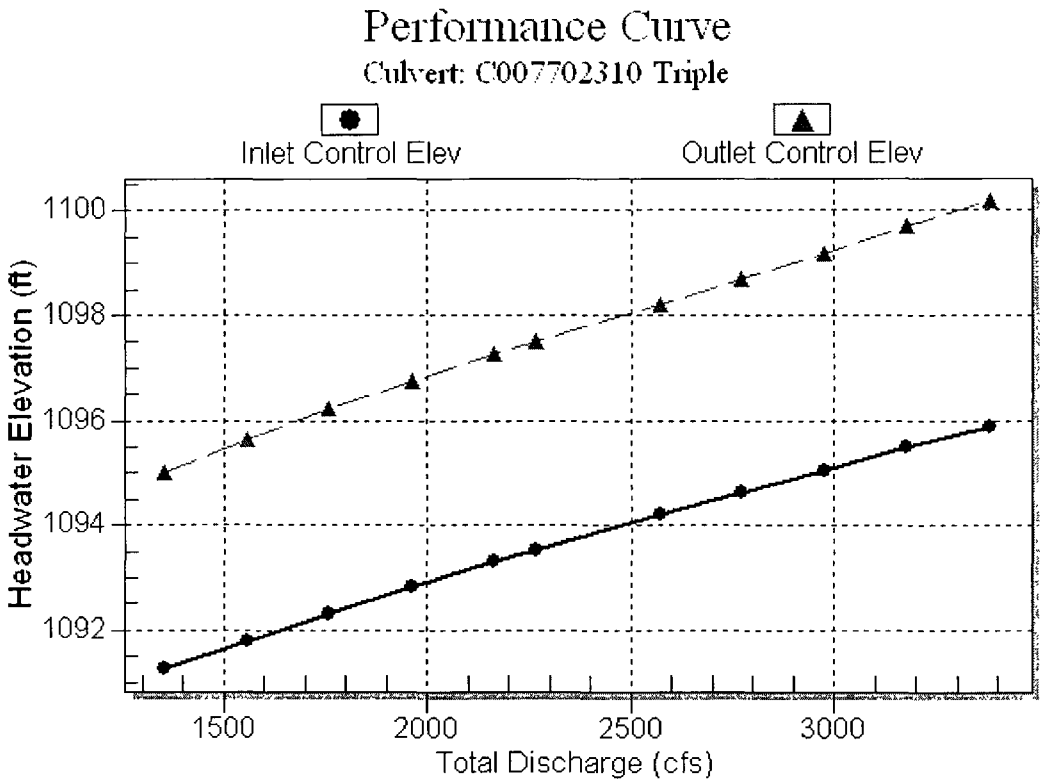
****

Inlet Elevation (invert): 1085.89 ft, Outlet Elevation (invert): 1085.45 ft

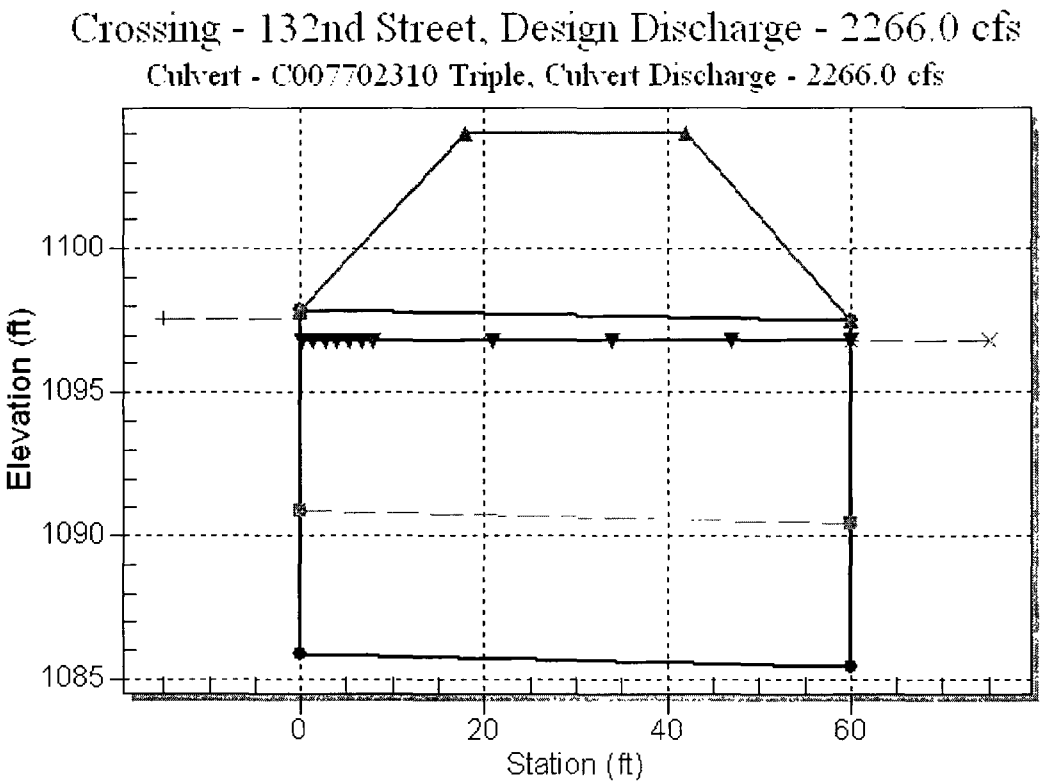
Culvert Length: 60.00 ft, Culvert Slope: 0.0073

****

Culvert Performance Curve Plot: C007702310 Triple



Water Surface Profile Plot for Culvert: C007702310 Triple



Site Data - C007702310 Triple

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1085.89 ft

Outlet Station: 60.00 ft

Outlet Elevation: 1085.45 ft

Number of Barrels: 3

Culvert Data Summary - C007702310 Triple

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 12.00 ft

Barrel Material:

Barrel Manning's n: 0.0120

Inlet Type:

Inlet Edge Condition:

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: 132nd Street)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
1355.00	1094.63	9.72	9.97	4.25	0.78
1557.50	1095.18	10.27	10.33	4.49	0.78
1760.00	1095.69	10.78	10.65	4.71	0.79
1962.50	1096.16	11.25	10.96	4.91	0.79
2165.00	1096.59	11.68	11.24	5.10	0.80
2266.00	1096.80	11.89	11.37	5.19	0.81
2570.00	1097.39	12.48	11.74	5.45	0.82
2772.50	1097.76	12.85	11.96	5.61	0.82
2975.00	1098.12	13.21	12.17	5.77	0.83
3177.50	1098.46	13.55	12.36	5.92	0.83
3380.00	1098.79	13.88	12.55	6.06	0.83

Tailwater Channel Data - 132nd Street

Tailwater Channel Option: Irregular Channel

Roadway Data for Crossing: 132nd Street

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 1104.00 ft

Roadway Surface: Paved

Roadway Top Width: 24.00 ft

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132nd Street Culvert Design - Developed
Sarpy County, Nebraska

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
3.05	3.96	4.7	5.4	6.0	6.7	2.5

Storm Data Source: Sarpy County, NE (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

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Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area C	142.00	0.287	71	Reach 2	
Area D	216.00	0.291	71	Reach 2	
Area B	348.00	0.730	71	Reach 1	
Area E	476.00	0.571	71	Reach 1	
Area A	35.00	0.162	71	Outlet	
Area F	472.00	0.492	71	Outlet	

Total Area: 1689 (ac)

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Reach Summary Table

Reach Identifier	Receiving Reach Identifier	Reach Length (ft)	Routing Method
Reach 2	Reach 1	4600	CHANNEL
Reach 1	Outlet	8395	CHANNEL

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Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area C							
SHEET	50	0.0360	0.150				0.076
SHALLOW	1100	0.0360	0.025				0.079
CHANNEL	4113	0.0170	0.050	100.00	30.00	8.655	0.132
					Time of Concentration		.287
Area D							
SHEET	50	0.0500	0.150				0.067
SHALLOW	1000	0.0500	0.025				0.061
CHANNEL	4464	0.0220	0.065	100.00	30.00	7.607	0.163
					Time of Concentration		.291
Area B							
SHEET	100	0.0310	0.150				0.140
SHALLOW	2900	0.0310	0.025				0.225
CHANNEL	4600	0.0040	0.065	150.00	40.00	3.501	0.365
					Time of Concentration		.73
Area E							
SHEET	75	0.0390	0.150				0.102
SHALLOW	1800	0.0390	0.025				0.125
CHANNEL	8395	0.0150	0.065	150.00	40.00	6.779	0.344
					Time of Concentration		.571
Area A							
SHEET	50	0.0560	0.150				0.064
SHALLOW	900	0.0560	0.025				0.052
CHANNEL	1363	0.0150	0.065	250.00	50.00	8.231	0.046
					Time of Concentration		.162
Area F							
SHEET	75	0.0330	0.150				0.109
SHALLOW	1800	0.0330	0.025				0.135
CHANNEL	8255	0.0190	0.065	250.00	50.00	9.246	0.248
					Time of Concentration		.492

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132nd Street Culvert Design - Developed
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Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Area C	Residential districts (1/4 acre)	B	36	75
	Residential districts (1/3 acre)	B	35	72
	Residential districts (1/2 acre)	B	35	70
	Residential districts (1 acre)	B	36	68
	Total Area / Weighted Curve Number		142	71
			===	==
Area D	Residential districts (1/4 acre)	B	54	75
	Residential districts (1/3 acre)	B	54	72
	Residential districts (1/2 acre)	B	54	70
	Residential districts (1 acre)	B	54	68
	Total Area / Weighted Curve Number		216	71
			===	==
Area B	Residential districts (1/4 acre)	B	87	75
	Residential districts (1/3 acre)	B	87	72
	Residential districts (1/2 acre)	B	87	70
	Residential districts (1 acre)	B	87	68
	Total Area / Weighted Curve Number		348	71
			===	==
Area E	Residential districts (1/4 acre)	B	119	75
	Residential districts (1/3 acre)	B	119	72
	Residential districts (1/2 acre)	B	119	70
	Residential districts (1 acre)	B	119	68
	Total Area / Weighted Curve Number		476	71
			===	==
Area A	Residential districts (1/4 acre)	B	9	75
	Residential districts (1/3 acre)	B	9	72
	Residential districts (1/2 acre)	B	9	70
	Residential districts (1 acre)	B	8	68
	Total Area / Weighted Curve Number		35	71
			==	==
Area F	Residential districts (1/4 acre)	B	118	75
	Residential districts (1/3 acre)	B	118	72
	Residential districts (1/2 acre)	B	118	70
	Residential districts (1 acre)	B	118	68
	Total Area / Weighted Curve Number		472	71
			===	==

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132nd Street Culvert Design - Developed
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Reach Channel Rating Details

Reach Identifier	Reach Length (ft)	Reach Manning's n	Friction Slope (ft/ft)	Bottom Width (ft)	Side Slope
Reach 2	4600	0.065	0.004	25	29 :1
Reach 1	8395	0.065	0.015	25	32 :1

Reach Identifier	Stage (ft)	Flow (cfs)	End Area (sq ft)	Top Width (ft)	Friction Slope (ft/ft)
Reach 2	0.0	0.000	0	25	0.004
	0.5	14.601	19.8	54	
	1.0	58.607	54	83	
	2.0	267.523	166	141	
	5.0	2381.231	850	315	
	10.0	13676.801	3150	605	
	20.0	82312.115	12100	1185	
Reach 1	0.0	0.000	0	25	0.015
	0.5	29.023	20.5	57	
	1.0	118.553	57	89	
	2.0	551.153	178	153	
	5.0	4997.009	925	345	
	10.0	28940.042	3450	665	
	20.0	174994.694	13300	1305	

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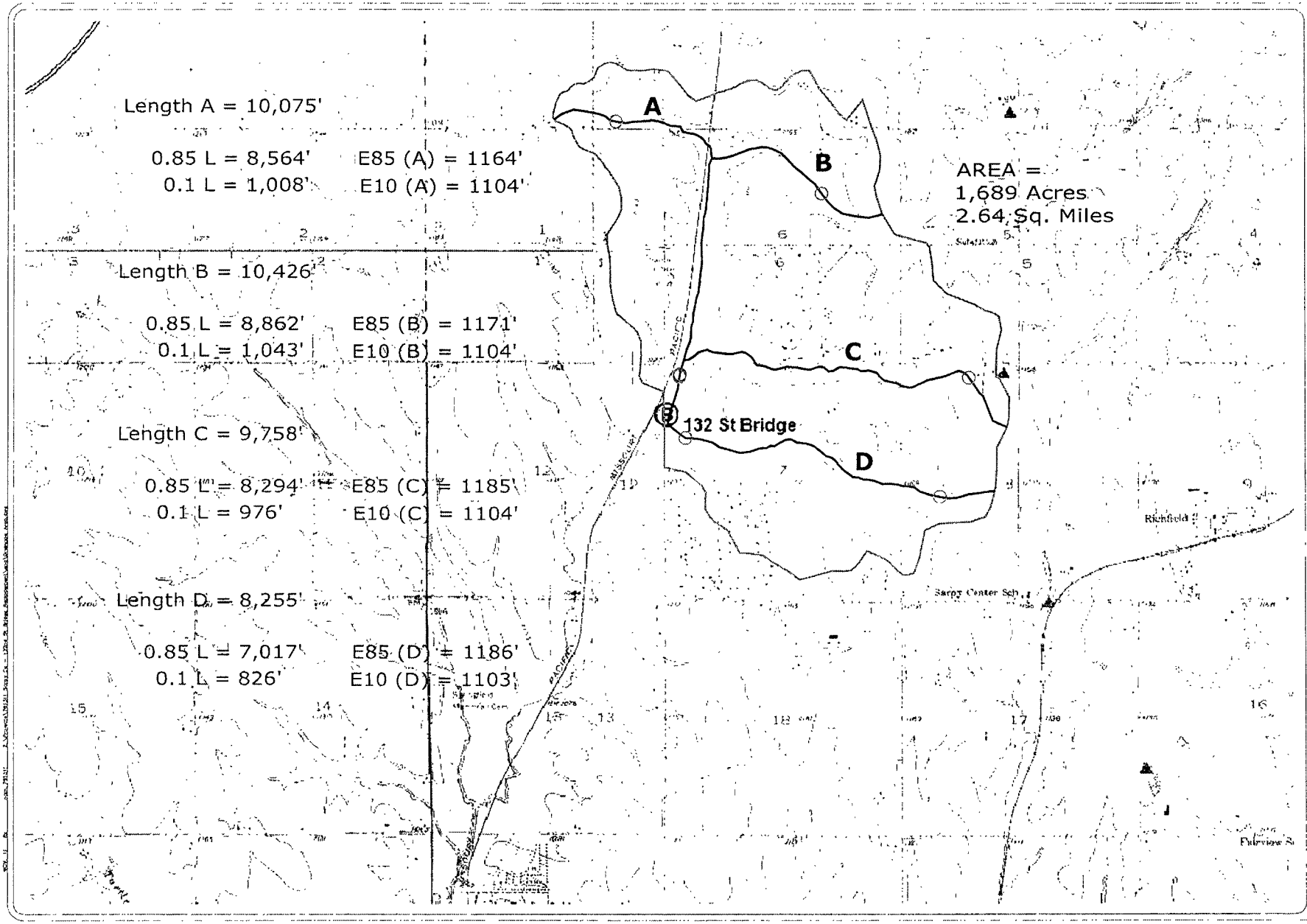
Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)	10-Yr (cfs) (hr)	25-Yr (cfs) (hr)	50-Yr (cfs) (hr)	100-Yr (cfs) (hr)
SUBAREAS					
Area C	121.29	312.35	403.90	484.19	581.00
	12.09	12.08	12.07	12.07	12.07
Area D	182.67	473.29	610.93	731.98	879.20
	12.08	12.07	12.07	12.08	12.07
Area B	164.26	440.19	572.31	691.44	833.31
	12.38	12.35	12.31	12.33	12.33
Area E	267.12	711.42	924.36	1110.83	1340.77
	12.27	12.23	12.24	12.25	12.23
Area A	36.46	91.73	118.01	141.47	169.58
	12.02	12.00	11.99	11.99	11.98
Area F	292.96	774.35	1007.09	1213.73	1460.13
	12.20	12.17	12.18	12.18	12.19
REACHES					
Reach 2	303.67	784.69	1013.74	1214.87	1460.11
	12.09	12.08	12.07	12.07	12.07
Down	226.66	628.58	816.58	980.83	1179.67
	12.67	12.48	12.45	12.43	12.42
Reach 1	485.18	1578.04	2095.76	2553.36	3102.14
	12.56	12.39	12.36	12.36	12.35
Down	482.14	1563.06	2073.60	2525.27	3066.09
	13.12	12.77	12.72	12.70	12.69
OUTLET	540.79	1775.96	2366.96	2890.19	3517.40



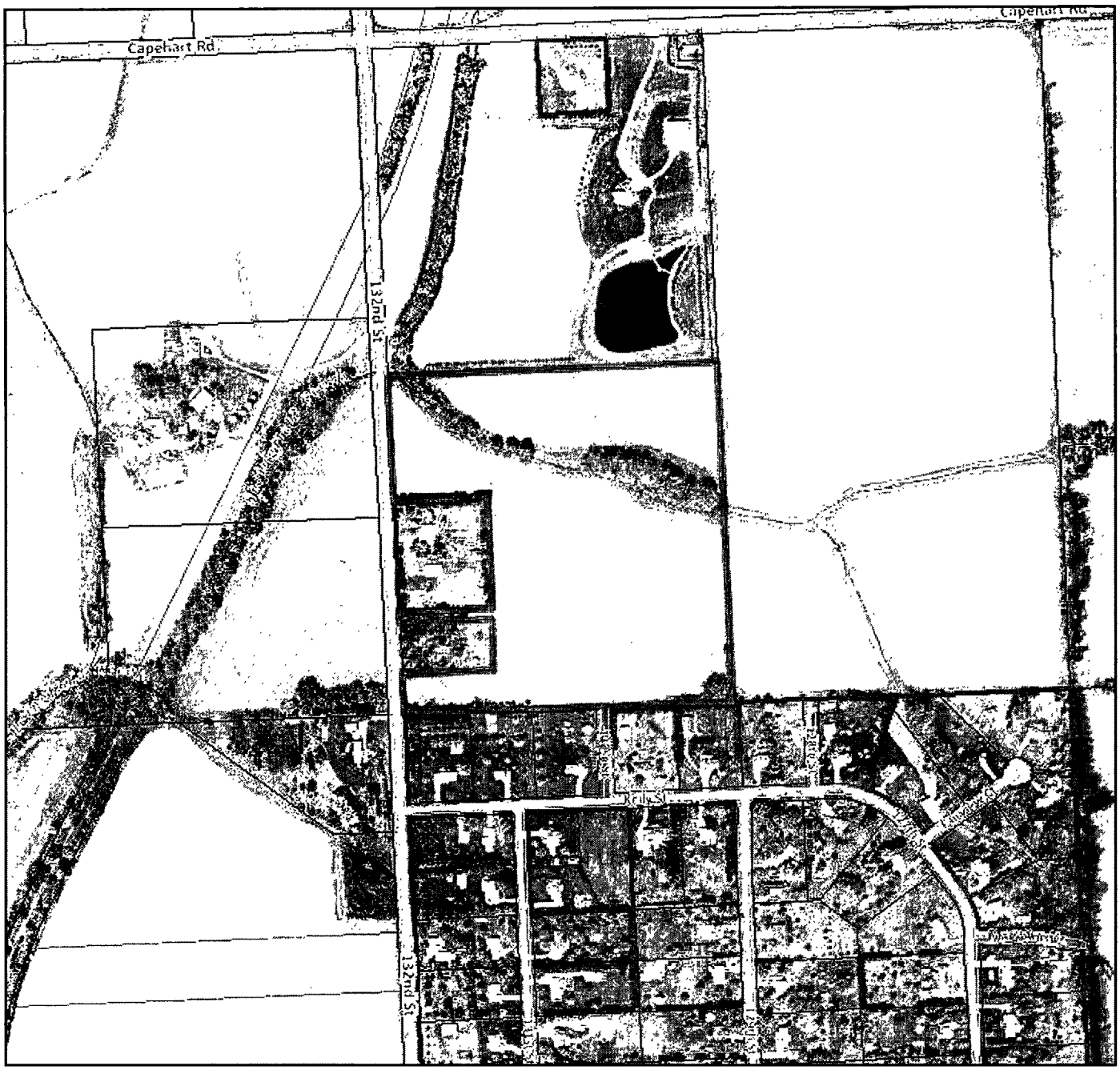
hgm ASSOCIATES INC.
ENGINEERING ARCHITECTURE SURVEYING
council bluffs omaha

project SARPY COUNTY
sheet DRAINAGE AREA

project no. 761311
sheet 1 OF 1

Adjacent Property Owners

Sarpy County, Nebraska



Parcel ID Number	010973176	***Property Type***	AG-TRUST
Owner Name	DOBBS, KENNETH W & JANET E	***Improvements Value***	$0
Mailing Address	11914 FAIRVIEW RD	***Land Value***	$71,013
City State	SPRINGFIELD NE	***Total Value***	$71,013
Zip Code	68059-	***Estimated Acres***	33.90389524
Property Address	S 132ND ST	***Tax District***	46016
Legal Description	TAX LOT 5 7-13-12 (33.91 AC)	***Snow Ordinance***	County #3-1-01
Neighborhood Code	FRM		

Disclaimer: This data is for informational purposes only, and should not be substituted for a true titles search, property appraisal, survey, or for zoning district verification. Sarpy County and the Sarpy County GIS Coalition assume no legal responsibility for the information contained in this data.

Map Scale
1 inch = 580 feet

3/6/2012

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Sarpy County, Nebraska

Parcel ID Number	010405178	***Property Type***	FARM
Owner Name	PRIBIL, KENNETH C & REBECCA A	***Improvements Value***	$543,947
Mailing Address	13001 CAPEHART RD	***Land Value***	$178,639
City State	SPRINGFIELD NE	***Total Value***	$778,772
Zip Code	68059-5294	***Estimated Acres***	36.19904822
Property Address	13001 CAPEHART RD	***Tax District***	46016
Legal Description	PT NW1/4 NW1/4 7-13-12 & ABANDONED RAILROAD 7-13-12 (36.19)	***Snow Ordinance***	County #3-1-01
Neighborhood Code	FRM		

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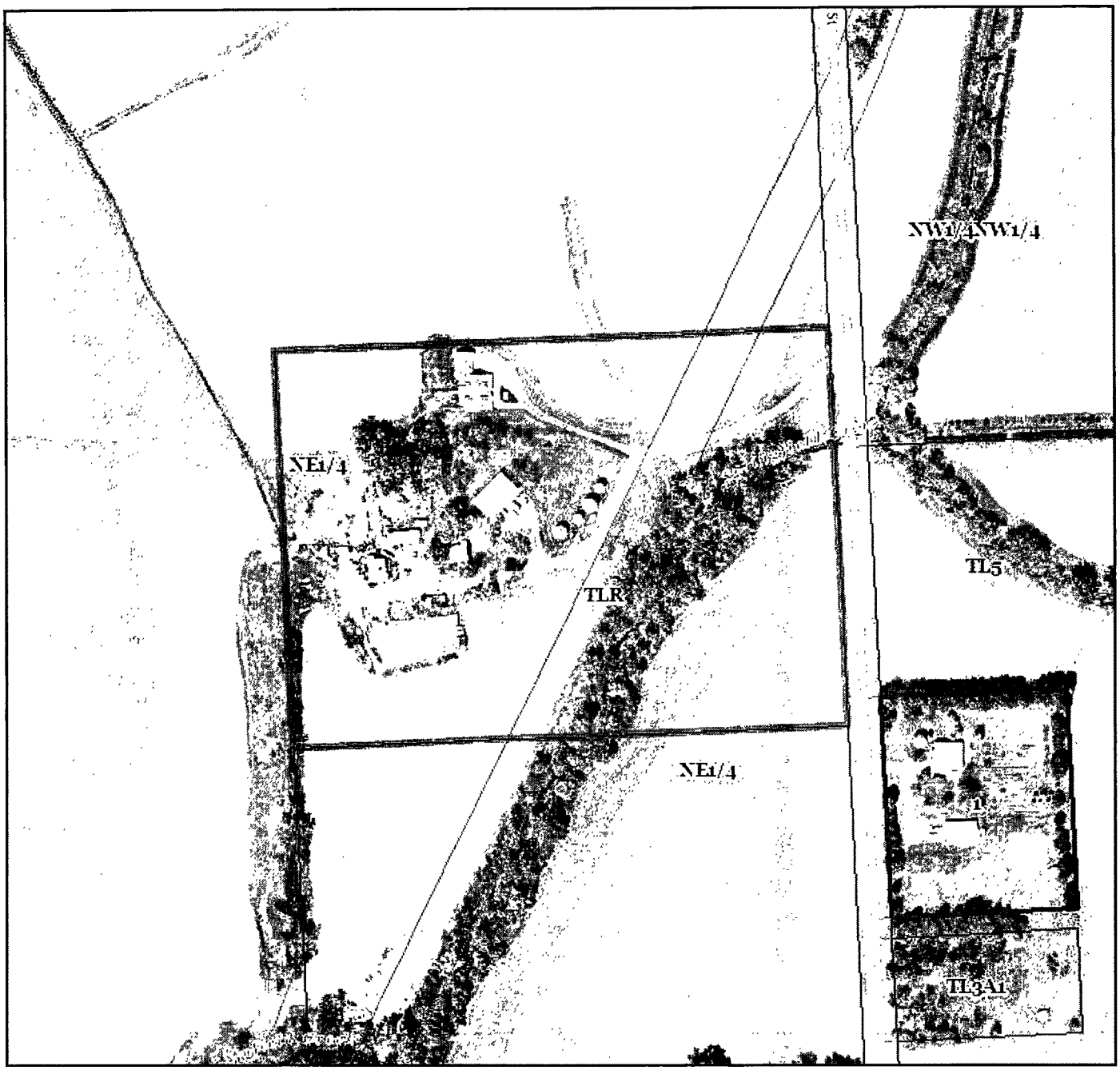

Parcel ID Number	010381058	***Property Type***	AG-TRUST
Owner Name	EURICH, RICHARD & JOANNE	***Improvements Value***	$372,196
Mailing Address	13030 S 132ND ST	***Land Value***	$133,914
City State	SPRINGFIELD NE	***Total Value***	$567,865
Zip Code	68059-	***Estimated Acres***	19.40580195
Property Address	13102 S 132ND ST	***Tax District***	46016
Legal Description	N 778.27 S 1556.55 E 1120 FT NE 1/4 12-13-11 (19.41 AC)(2 HOUSES)	***Snow Ordinance***	County #3-1-01
Neighborhood Code	FRM		

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