Drainage Report

High Point West Addition

to

Wichita, Kansas

Date: October 9, 2007

POE & ASSOCIATES OF KANSAS, INC.
CONSULTING ENGINEERS
5940 E. Central, Suite 200 ■ Wichita, KS 67208-4242
Phone 316/685-4114 ■ FAX 316/685-4444

CITY OF WICHITA

Public Works, Engineering Division
Final Drainage Plan Submittal Checklist

Reviewer:_____ Date: October 9, 2007

Subdivision Name: High Point West Addition Location: NW 1/4, Sec 26-T27S-R2W

Total Land Area Of Ownership: 6.38 Acres

Type: ✔ Residential ____ Commercial ____ Industrial ____ Recreation ____ Municipal ____ Other

Applicant: T.D. Development, LLC Contact: Tim Abbott, Managing Member Phone #: (316) 312-0331

Engineer: Poe & Associates, Inc. Contact: Kenny E. Hill, P.E. Phone # (316) 685-4114

Please check the appropriate box: I = Included; NA = Non-Applicable; R= Required prior to development
(If "NA" is checked, an explanation must be entered)

	Applicant			Engr	
Tab 1. Project Narrative	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Site Location Map, using USGS Map	✔			✔	
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain	✔			✔	
C. Discussion of offsite conditions	✔			✔	
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series	✔			✔	
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design	✔			✔	
F. Copy of the plat	✔			✔	
G. Preliminary grading plan (The final grading plan shall be sealed, signed and dated prior to Engineering receiving the final sanitary sewer plans. One plan sheet and PDF shall be submitted to the Subdivision Engineer.)	✔			✔	
H. Professional Engineer seal, signature and date on cover of report	✔			✔	
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover	✔			✔	

	Applicant			Engr	
Tab 2. Existing Conditions Runoff Calculations	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Copy of applicable orthophoto showing proposed project boundaries (preferable in color)	✔			✔	
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)	✔			✔	
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)	✔			✔	
D. Total Site Area and Total Impervious Area (acres)	✔			✔	
E. Benchmarks used for site control	✔			✔	
F. Streams, creeks, and waterway labeled		✔	None on this site		✔
G. Predominant soils from USDA soil surveys, and/or on site soil borings	✔			✔	
H. Location and boundaries of natural features such as wetlands, lakes, and ponds with the normal water elevation noted	✔			✔	
I. Location of existing roads, buildings, parking lots and other impervious areas.	✔			✔	

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J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements	✔			✔	
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	✔			✔	
L. Flow paths	✔			✔	
M. Location and dimensions of existing channels, bridges or culvert crossings		✔	None existing		✔
N. Existing conditions hydrologic analysis for runoff rates, volumes and velocities showing methodologies used and supporting calculations (2, 5, 10, 25 & 100 year, 24-hour storm events) or Critical Duration	✔			✔	
O. Assumed pre-developed runoff curve numbers	✔			✔	
P. Existing time of concentrations used in calculations	✔			✔	
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site	✔			✔	
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)		✔	None existing		✔
S. Cross-section data for open channels		✔	None existing		✔
T. Ground water elevations, if applicable		✔	Not a concern		✔

	Applicant			Engr	
Tab 3. Post-Development Hydrologic Analysis	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Proposed (post-development) conditions hydrologic and hydraulic analysis for runoff rates, volumes, HGL, and velocities showing the methodologies used and supporting calculations for all applicable design storms (2, 5, 10, 25 & 100 year, 24-hour storm events)	✔			✔	
B. Proposed time of concentrations used in calculations	✔			✔	
C. Assumed post-developed runoff curve numbers	✔			✔	
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)	✔			✔	
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration	✔			✔	
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities	✔			✔	
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary	✔			✔	
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)	✔			✔	
I. Design water surface elevations and normal pool elevation for ponds.	✔			✔	
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.	✔			✔	
K. Proposed limits of clearing and grading	✔			✔	
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.	✔			✔	
M. Location of existing and proposed utilities (e.g., water, sewer) and easements	✔			✔	
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	✔			✔	
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings		✔	None proposed		✔

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P. Preliminary selection and location of stormwater controls	✔			✔	
Q. Emergency overflow structure's flow path	✔			✔	
R. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)	✔			✔	
S. The 100-year 24-hour HWL delineated on the plan for detention pond	✔			✔	
T. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds	✔			✔	
U. Stormwater Management Facilities located within a Reserve	✔			✔	
V. Maintenance responsibility of stormwater management facility shall be specified in the platters text. (e.g. HOA, Lot Owners Association, or lot)	✔			✔	
W. Off-site drainage easements or agreements required, where necessary		✔	None required		✔

	Applicant			Engr	
Tab 4. Floodplain Submittal	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Provide source of flood profile		✔	No changes to floodplain or floodway limits		✔
B. Nearest base flood elevations		✔	No changes to floodplain or floodway limits		✔
C. Delineation of pre-developed regulatory floodplain/floodway limits		✔	No changes to floodplain or floodway limits		✔
D. Delineation of post-developed regulatory floodplain and floodway limits		✔	No changes to floodplain or floodway limits		✔
E. Floodplain boundary determination per elevation (project limits shown)		✔	No changes to floodplain or floodway limits		✔
F. Provide source of floodway data table and discharges		✔	No changes to floodplain or floodway limits		✔
G. Provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations and flood plain map revisions or required permits		✔	No changes to floodplain or floodway limits		✔
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions		✔	No changes to floodplain or floodway limits		✔
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)		✔	No changes to floodplain or floodway limits		✔
J. Flood plains and floodways located within a Reserve, where necessary		✔	No changes to floodplain or floodway limits		✔

	Applicant			Engr	
Tab 5. Federal, State and Local Permits (to be provided prior to construction unless otherwise specified)	**I/R**	**NA**	**Explanation / Location in Plan**	**I/R**	**NA**
A. US Army Corps of Engineers - Regulatory program permits (404 water quality certification)		✔	Not Required		✔
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)		✔	Not Required		✔
C. Federal Emergency Management Agency (FEMA) Letter of Map Changes (LOMA, LOMR, LOMR-f, CLOMR, etc.) Shall be included and approved when project modifies the limits of the floodway.		✔	Not Required		✔
D. Kansas Department of Transportation		✔	Not Required		✔
E. Sedgwick County Right-of-way Permit		✔	Not Required		✔

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Tab 1. Project Narrative

A. Site location map, using USGS Map

High Point West Addition is located in the northwest quarter of Section 26-T27S-R2W in the City of Wichita, Sedgwick County, Kansas. The site is south of Maple and east of 151st Street West. See Exhibit 1-1 for USGS Map.

B. Discussion of development, existing conditions, and proposed impacts

The property is currently zoned SF-5 which will allow residential single-family usage. Typically, this type of development will increase the impervious area of the property over the existing land use. Such would be true with this addition. The increased storm water flows due to the additional impervious area within this addition is reflected in the "C" factors used for calculating runoff.

Developed conditions will take advantage of the natural grades over the majority of the site. A detention pond located in the southeast corner of the project will ensure that developed flows are at or below current flows exiting the site. Off-site drainage enters this development from the north and bypasses the proposed detention pond.

Presently, the site is a made up of vacant land. The majority of the site drains southeasterly to the existing pond, which drains east into Auburn Hills Addition. The drainage plan for Auburn Hills Addition is included in this report and indicates that 23cfs was the design discharge from this property. The land has natural slopes ranging from less than 1% to roughly 3%. According to the Soil Survey, the predominant soil type is a Milan (Ma), which is from hydrologic soil group B. See Exhibit 2-3 for Soil Survey Map and information showing existing soil types and descriptions.

This site is not near nor is a part of any current FEMA floodway mapping. Refer to Exhibit 4-1. No wetlands are within this area as shown on the Wetland Delineation Map (Exhibit 4-1).

C. Discussion of off-site conditions

Large tract undeveloped areas, each with a single family home lie north and south of this site. Single family residential lots in Auburn Hills 16th Addition lie to the east of this site. Two acres from the adjacent property north drain into this site. See the Drainage Plan in Exhibit 1-3 for delineation of the entire drainage basin. Land use within the drainage basin is for urban lawn areas to the north and 1/8 acre single family lots within the addition.

D. Summary of runoff calculations

7.12 Acre Site Existing Conditions (24-Hour Storm)					
Design Storm	2-Year	5-Year	10-Year	25-Year	100-Year
Peak Flow	5.41	7.22	10.35	15.05	21.49

2.95 Acre Pond By-Pass (24-Hour Storm)					
Design Storm	2-Year	5-Year	10-Year	25-Year	100-Year
Total By-Pass	3.40	4.39	5.82	7.83	10.72

4.17 Acre Developed Area to Pond (24-Hour Storm)					
Design Storm	2-Year	5-Year	10-Year	25-Year	100-Year
Peak Flow	8.25	10.50	13.00	16.20	21.05
Pond Outflow	0.8	1.42	2.34	3.71	6.09
Total Discharge from Site	4.20	5.81	8.16	11.54	16.81
Pond Water Surface	1407.95	1408.06	1408.17	1408.31	1408.49

The design of the storm water detention pond will reduce flows from the entire drainage basin after complete development of the site, as shown in the above table

E. Narrative description of permanent best management practices

The contractor shall provide stabilized construction entrance prior to any street paving. A buffer of 10 feet of undisturbed native vegetation shall be maintained around perimeter of site where possible. Earthwork stockpiles shall be maintained away from any ponds. Fuel storage and refueling of equipment shall not be allowed around any ponds, drainage channels, or other waterways. Sediment barriers will be placed at storm sewer inlets and rock riprap at outlets. Sediment barriers (type determined by owner or contractor) shall be used to prevent sediment from flowing off site. Disturbed earth shall be stabilized where construction activity ceases for at least 21 days with owner's choice of mulch, temporary seed (Rye grass) during the planting season or other suitable BMP device. BMP devices shall be in place until there is a good stand of grass. Disturbed portions of the site where construction activities permanently cease shall be stabilized with permanent seed no later than 21 days after the last construction activity in that area (during the planting season only). The permanent seed shall consist of fescue or grass chosen by the owner. BMP devices shall be used at back of curb/edge of pavement until vegetation is 75% established.

F. Copy of Preliminary Plat

A copy of the plat is attached as Exhibit 1-2.

G. Preliminary Drainage Plans

A Preliminary Lot Grading Plan and the Drainage Plan are both found in Exhibit 1-3. The topography survey is also included as with these Exhibits, which shows all existing features.

H. Professional Engineer Seal

A signed and dated Professional Engineer's seal is located on the cover of this report.

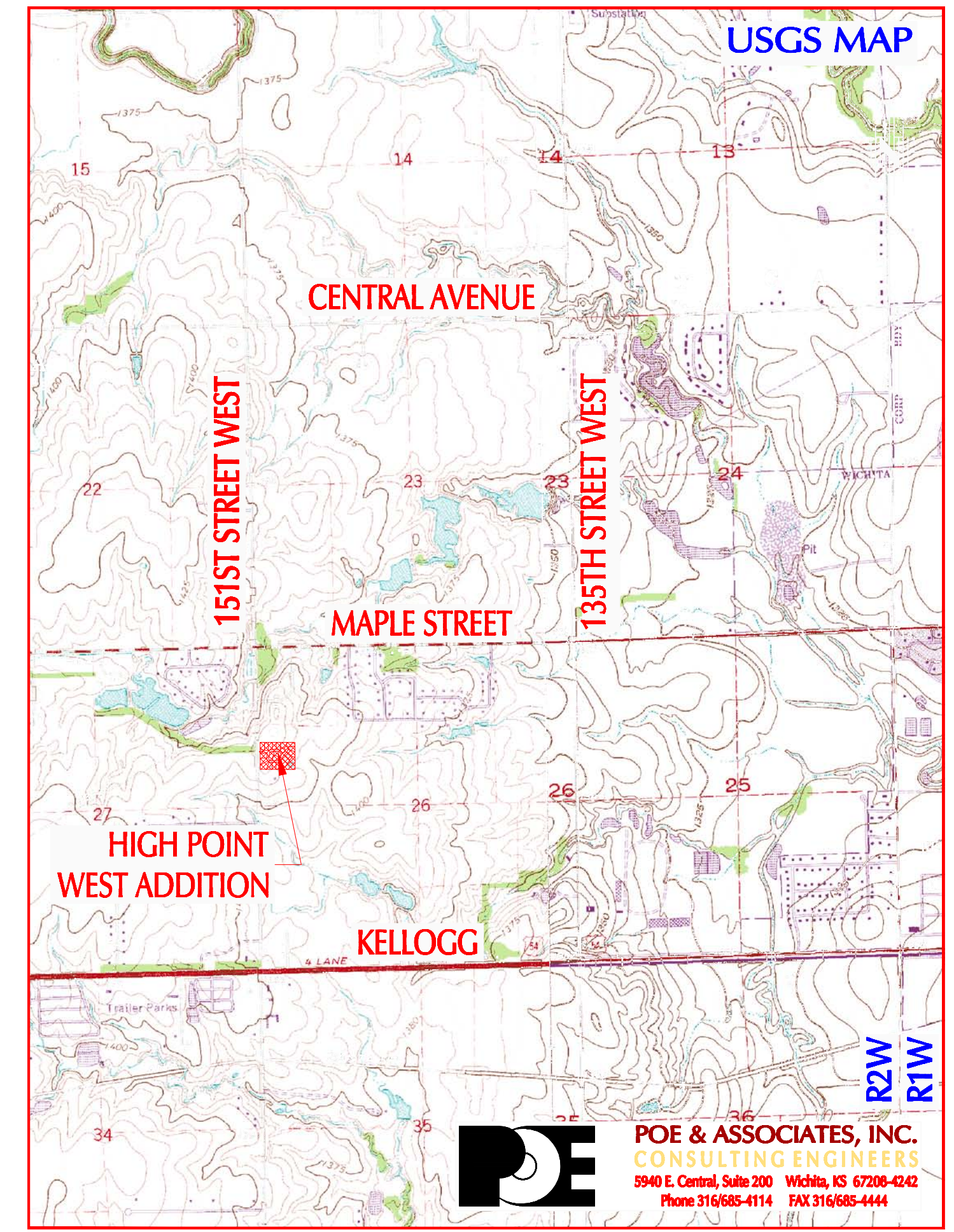
I. CD of drainage plan

A CD of this report in full is attached herewith.

High Point West Addition

EXHIBIT 1-1

USGS AREA MAP


USGS MAP
CENTRAL AVENUE
151ST STREET WEST
135TH STREET WEST
MAPLE STREET
HIGH POINT
WEST ADDITION
KELLOGG
4 LANE
Trailer Parks
Pit
WICHITA
R2W
R1W
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Phone 316/685-4114 FAX 316/685-4444

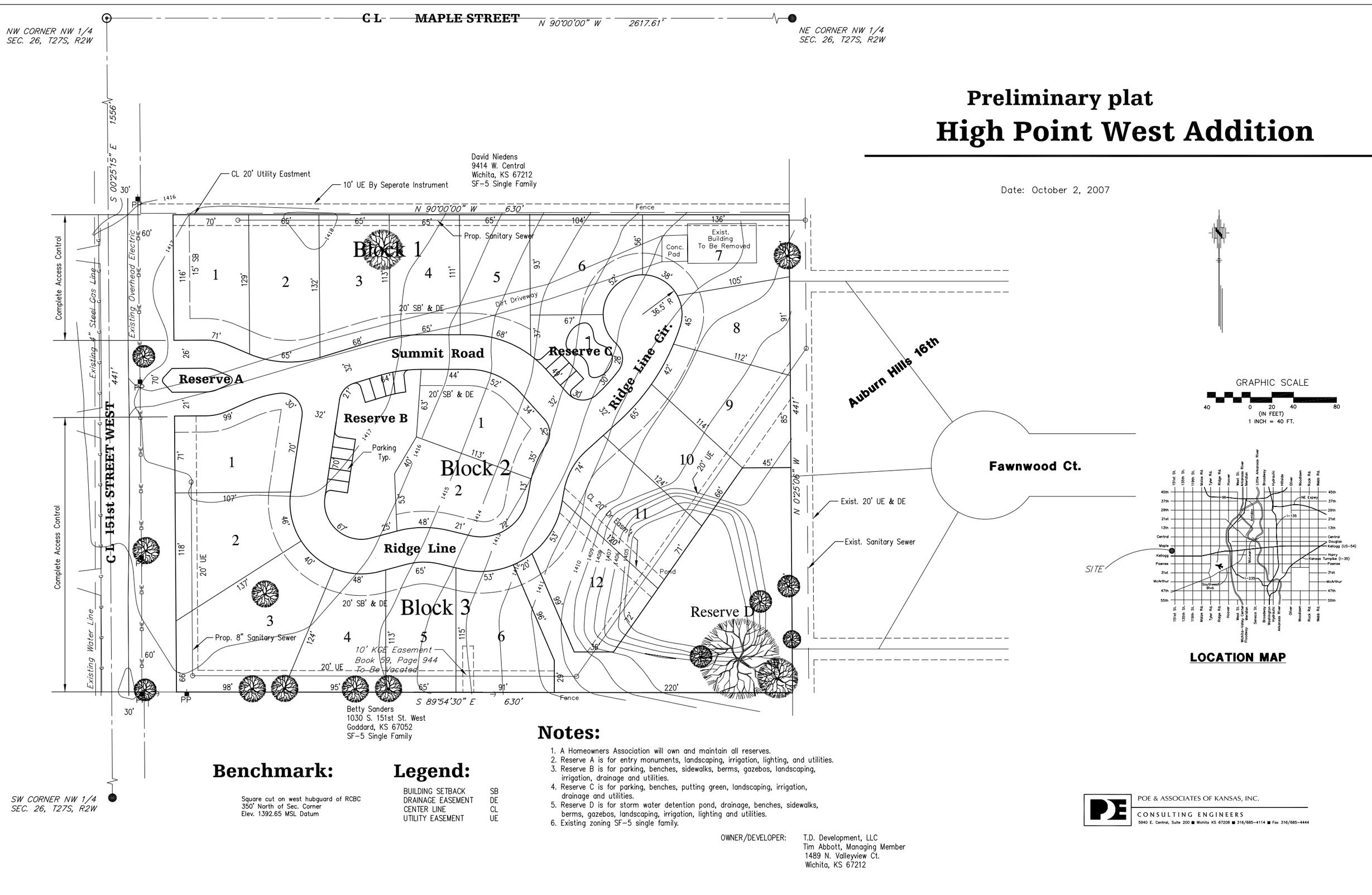
High Point West Addition

EXHIBIT 1-2

PRELIMINARY PLAT

Preliminary plat
High Point West Addition

Date: October 2, 2007



GRAPHIC SCALE
40 0 20 40 80
(IN FEET)
1 INCH = 40 FT.

Benchmark:

Square cut on west hubguard of RCBC
350' North of Sec. Corner
Elev. 1392.65 MSL Datum

Legend:

BUILDING SETBACK	SB
DRAINAGE EASEMENT	DE
CENTER LINE	CL
UTILITY EASEMENT	UE

Notes:

1. A Homeowners Association will own and maintain all reserves.
2. Reserve A is for entry monuments, landscaping, irrigation, lighting, and utilities.
3. Reserve B is for parking, benches, sidewalks, berms, gazebos, landscaping, irrigation, drainage and utilities.
4. Reserve C is for parking, benches, putting green, landscaping, irrigation, drainage and utilities.
5. Reserve D is for storm water detention pond, drainage, benches, sidewalks, berms, gazebos, landscaping, irrigation, lighting and utilities.
6. Existing zoning SF-5 single family.

OWNER/DEVELOPER: T.D. Development, LLC
Tim Abbott, Managing Member
1489 N. Valleyview Ct.
Wichita, KS 67212

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High Point West Addition

EXHIBIT 1-3

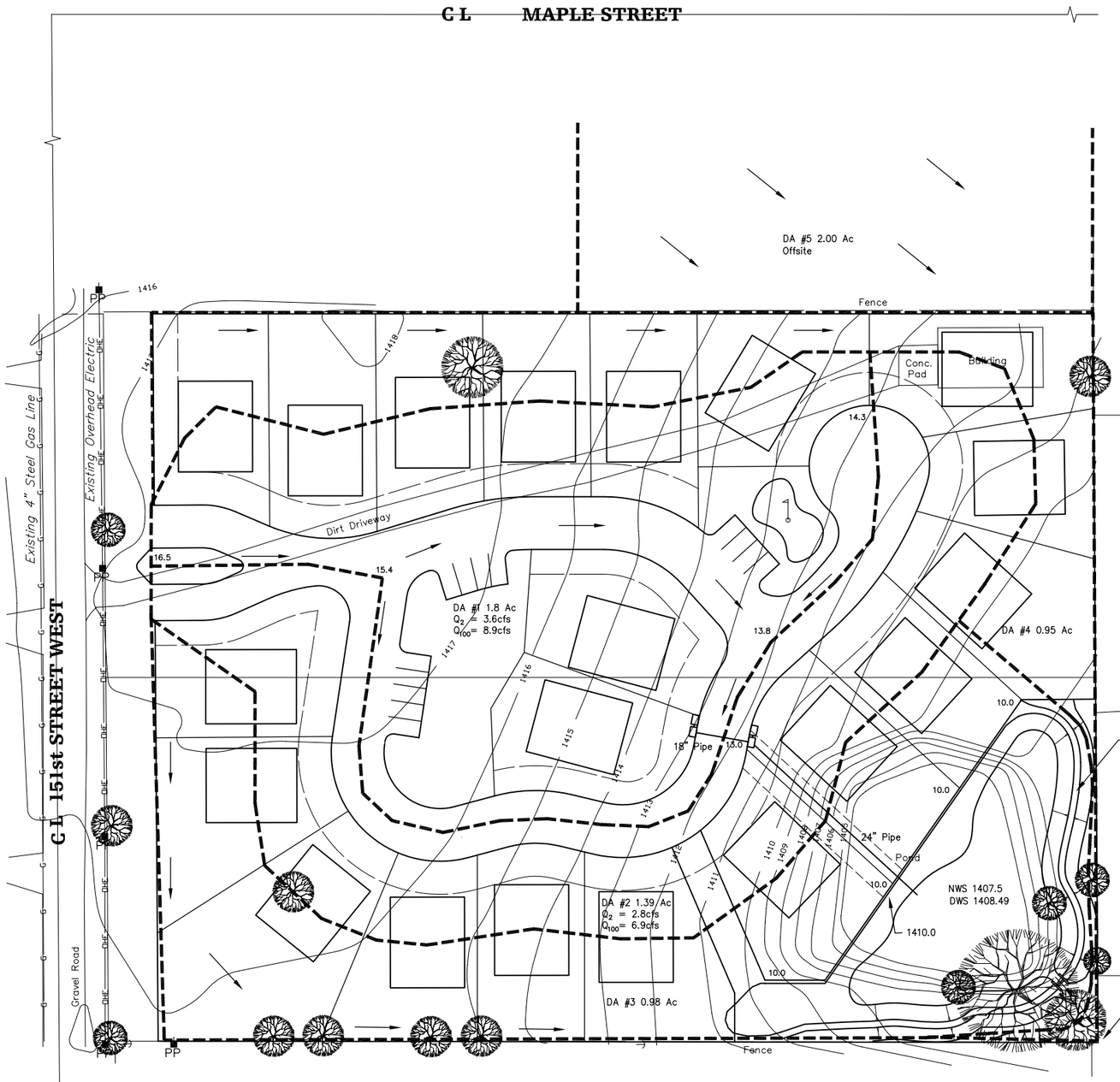
DRAINAGE PLAN

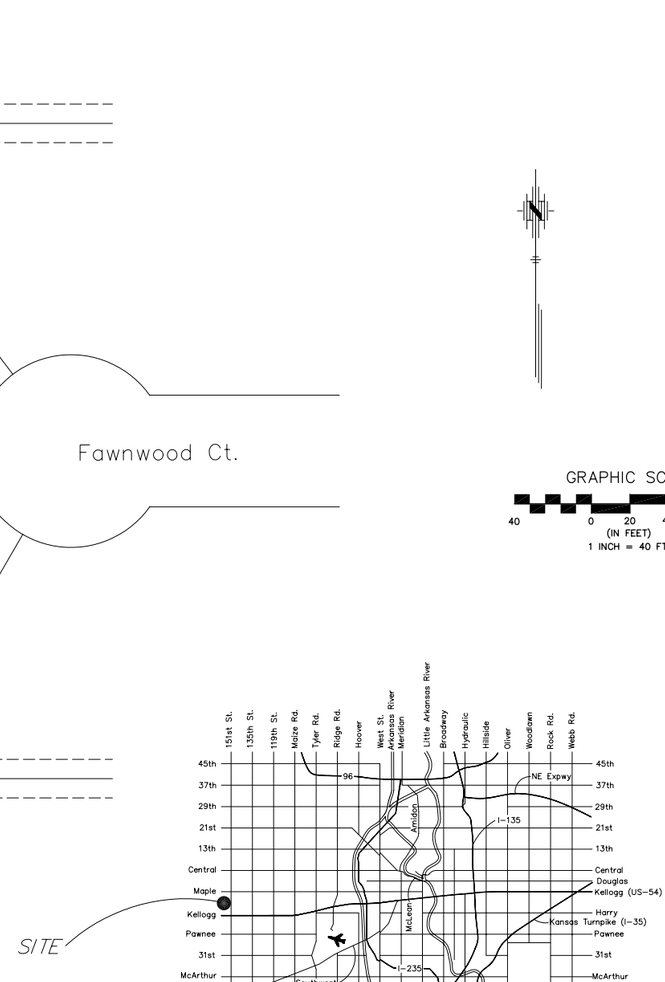
and

LOT GRADING PLAN

Drainage Plan
High Point West Addition

Date: September 25, 2007





GRAPHIC SCALE

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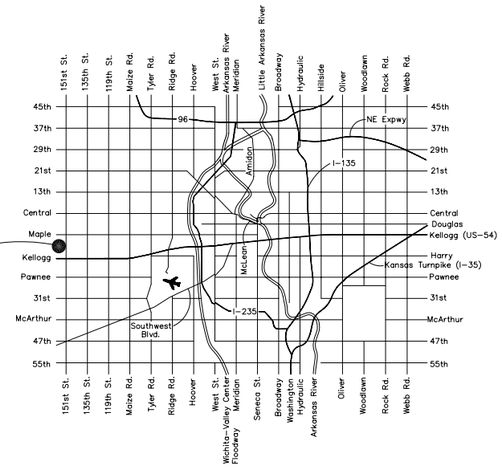
(IN FEET)

1 INCH = 40 FT.



LOCATION MAP

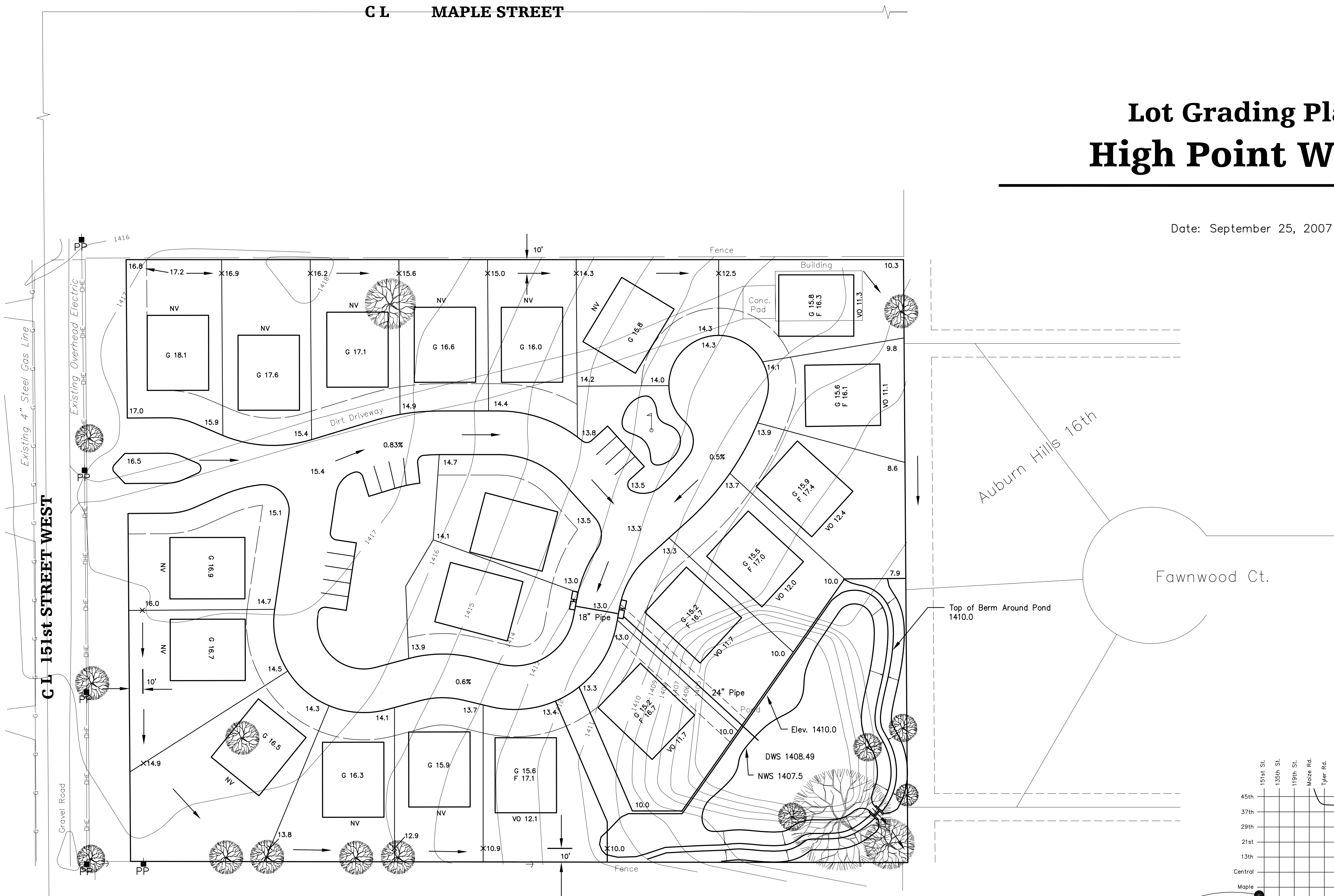
Benchmark:

Square cut on west hubguard of RCBC
350' North of Sec. Corner
Elev. 1392.65 MSL Datum

Lot Grading Plan

High Point West Addition

Date: September 25, 2007



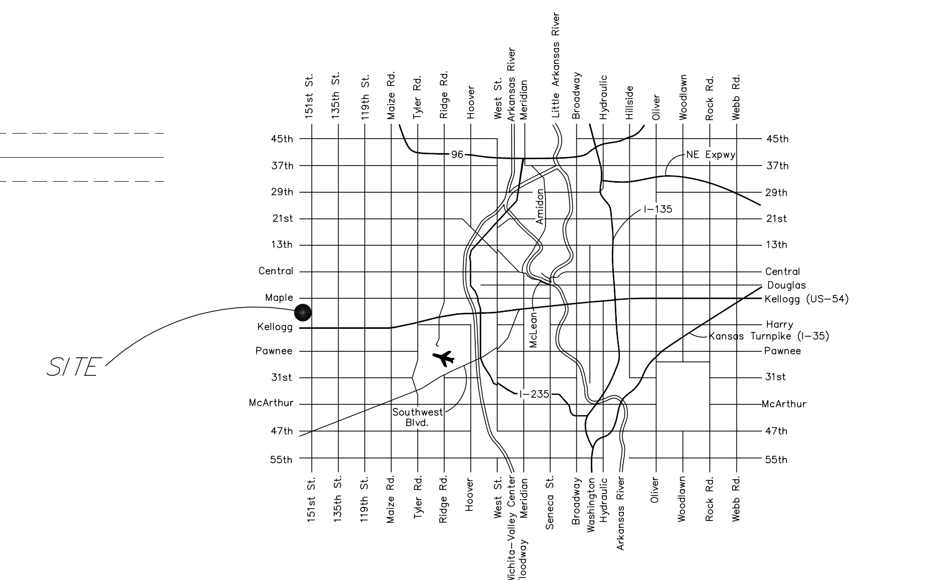
GRAPHIC SCALE

40 0 20 40 80

(IN FEET)
1 INCH = 40 FT.

Benchmark:

Square cut on west hubguard of RCBC
350' North of Sec. Corner
Elev. 1392.65 MSL Datum



LOCATION MAP

Tab 2. Existing Conditions Runoff Calculations

A. Copy of orthophotograph showing proposed boundaries

See Exhibit 2-1 for aerial photograph showing proposed site boundaries.

B. Runoff method

The runoff method used to determine storm water flows was the Rational method. Supporting data and calculation results are shown on Exhibit 2-2.

C. Existing topography

The existing topography is shown on the drainage plan as seen on Exhibit 1-3.

D. Total site area and total impervious area

The total drainage area of High Point West encompasses 5.12 acres. The total impervious area for the developed condition, based on single-family 1/8 acre residential land use, is estimated at 65% of the total site area. Therefore, the total impervious area on this site is estimated at just over 3.3 acres.

E. Benchmarks used for site control

The benchmarks used for site control are listed on the drainage plan, which is Exhibit 1-3.

F. Streams, creeks, and waterways labeled

There are no streams, creeks or waterways within this site.

G. Predominate soils from USDA soil surveys

The soil type for this drainage basin is a Milan (ma). See Exhibit 2-3 for Soil Survey map and information showing existing soil types and descriptions. The Milan soil is classified as Hydrologic Group B soil. This Hydrologic Group was used to select curve "C" factors for the run-off calculations in both the existing and developed conditions.

H. Location and boundaries of natural features

An existing pond is located at the southeast corner of the property

I. Location of existing roads, buildings, parking lots, and other impervious areas

The existing building (which will be removed), driveway and other existing features are shown on the Drainage Plan and Lot Grading Plan included herewith.

J. Location of existing utilities

The existing water and sewer lines are shown on (Exhibit 2-4) and other utilities are on the Preliminary Plat (Exhibit 1-2)

K. Location of existing conveyance systems

The Auburn Hills Drainage Plan shows the downstream drainage from this site. (Exhibit 2-5)

L. Flow paths

Flow paths are shown on the Drainage Plans, Lot Grading Plan. (Exhibit 1-3)

M. Location and dimensions of existing channels, bridges or culvert crossings

There are no existing structures on this site.

N. Existing conditions hydrologic analysis

The analysis was completed using the Rational Method. The 2, 5, 10, 25, & 100 year, 24-hour storm events were evaluated and the information appears in Exhibit 2-2. The results are summarized in the following table. A 15 minute minimum time of concentration was used for all of the sub areas of this drainage basin. The "C' factors were taken from the City of Wichita Table included in Exhibit 2-6.

7.12 Acre Site Existing Conditions (24-Hour Storm)					
Design Storm	2-Year	5-Year	10-Year	25-Year	100-Year
"C" Factor	0.20	0.22	0.28	0.35	0.41
Peak Flow	5.41	7.22	10.35	15.05	21.49

O. Assumed pre-developed runoff "C" Factors

For the existing condition, the "C" factors were taken from the City of Wichita Table included in Exhibit 2-6. These "C" factors were selected based on average basin slopes being between 1% and 4% and the from hydrologic soil group B. The results are shown in the table above.

P. Existing times of concentration used in calculations

A 15 minute time of concentration was used for all calculations.

Q. Evaluation of immediate downstream drainage capacity

The downstream capacity is shown to be 23cfs on the Auburn Hills Drainage Plan.

R. Existing structural elevations

There are no existing structures.

S. Cross-section data for open channels

No open channels appear within this site.

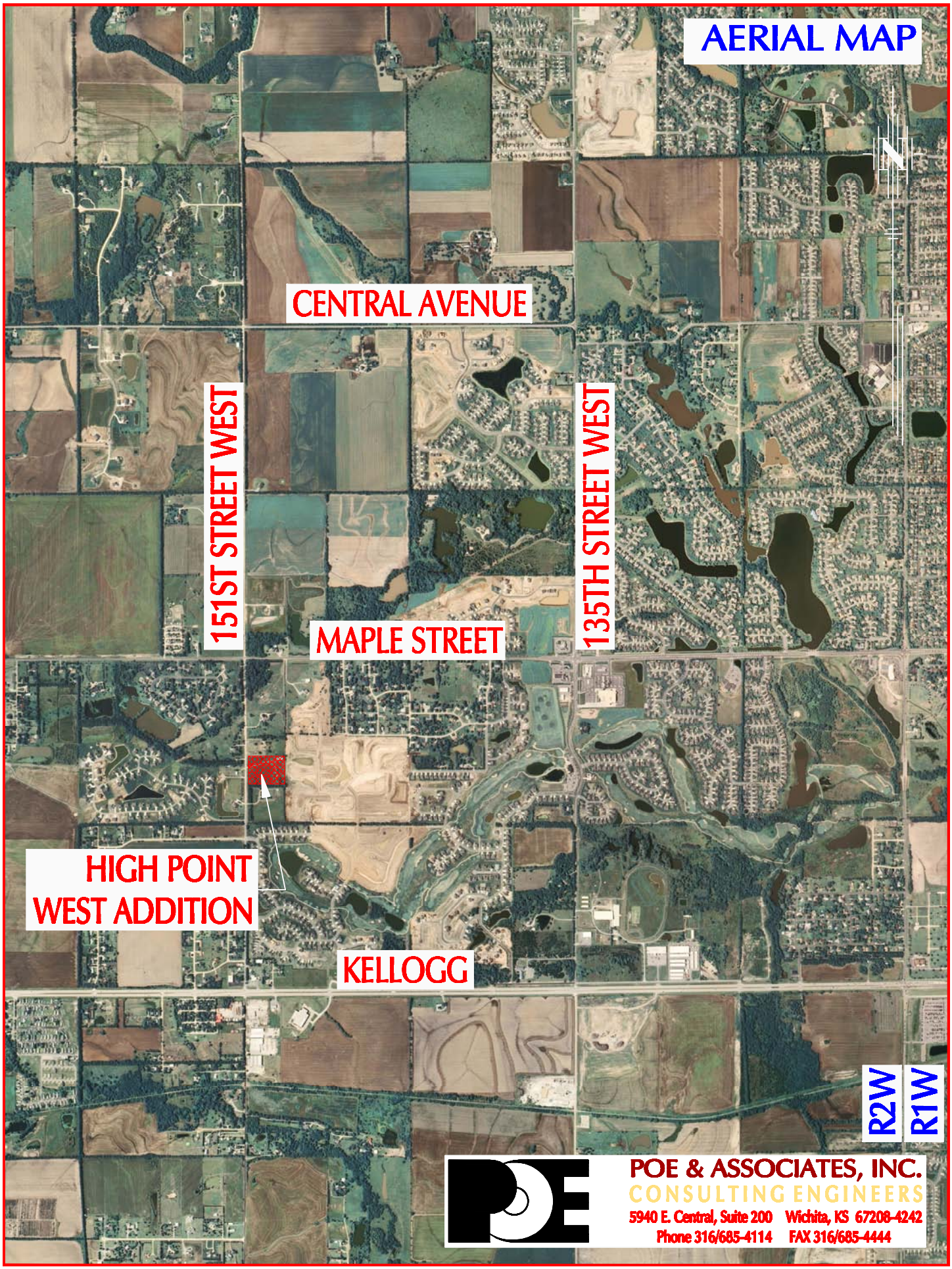
T. Ground water elevations

The ground water elevation is not a concern for this area.

High Point West Addition

EXHIBIT 2-1

AERIAL PHOTOGRAPH



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Phone 316/685-4114 FAX 316/685-4444

High Point West Addition

EXHIBIT 2-2

EXISTING CONDITION - HYDROGRAPHS

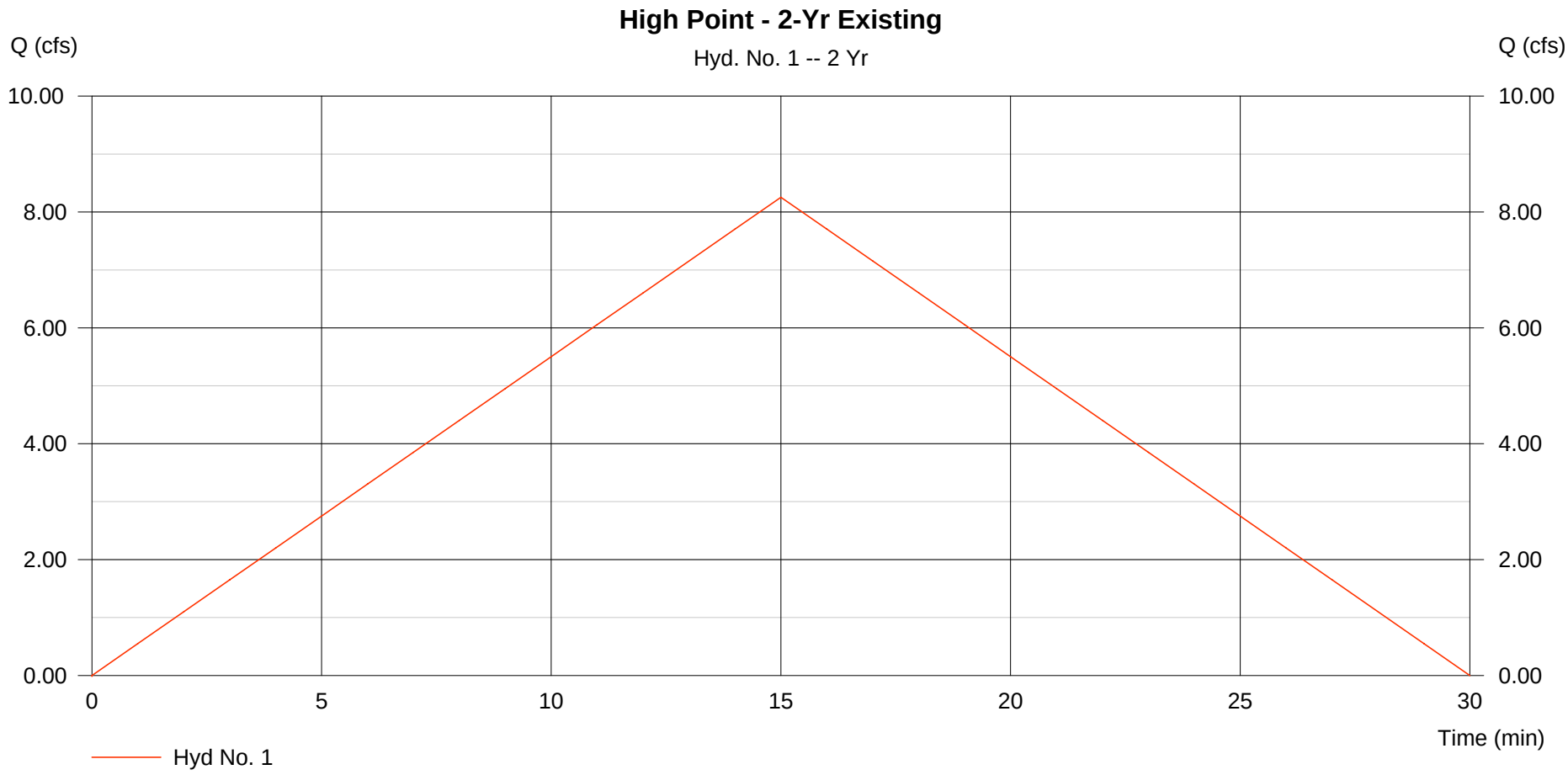
Hydrograph Plot

Hyd. No. 1

High Point - 2-Yr Existing

Hydrograph type	= Rational	Peak discharge	= 8.254 cfs
Storm frequency	= 2 yrs	Time interval	= 1 min
Drainage area	= 4.170 ac	Runoff coeff.	= 0.52
Intensity	= 3.807 in/hr	Tc by User	= 15.00 min
IDF Curve	= SedgwickCo.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 0.171 acft



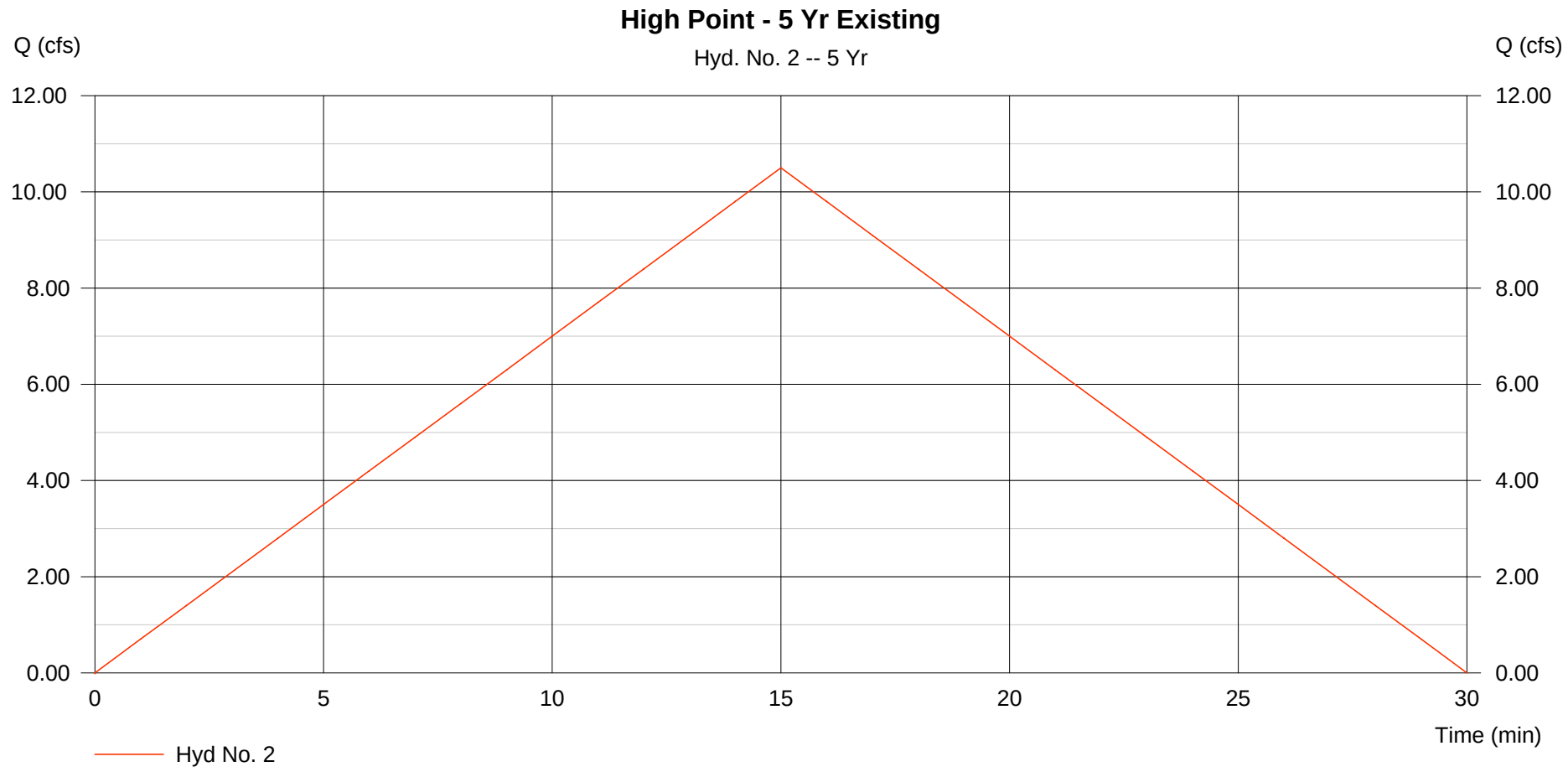
Hydrograph Plot

Hyd. No. 2

High Point - 5 Yr Existing

Hydrograph type	= Rational	Peak discharge	= 10.50 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Drainage area	= 4.170 ac	Runoff coeff.	= 0.54
Intensity	= 4.663 in/hr	Tc by User	= 15.00 min
IDF Curve	= SedgwickCo.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 0.217 acft



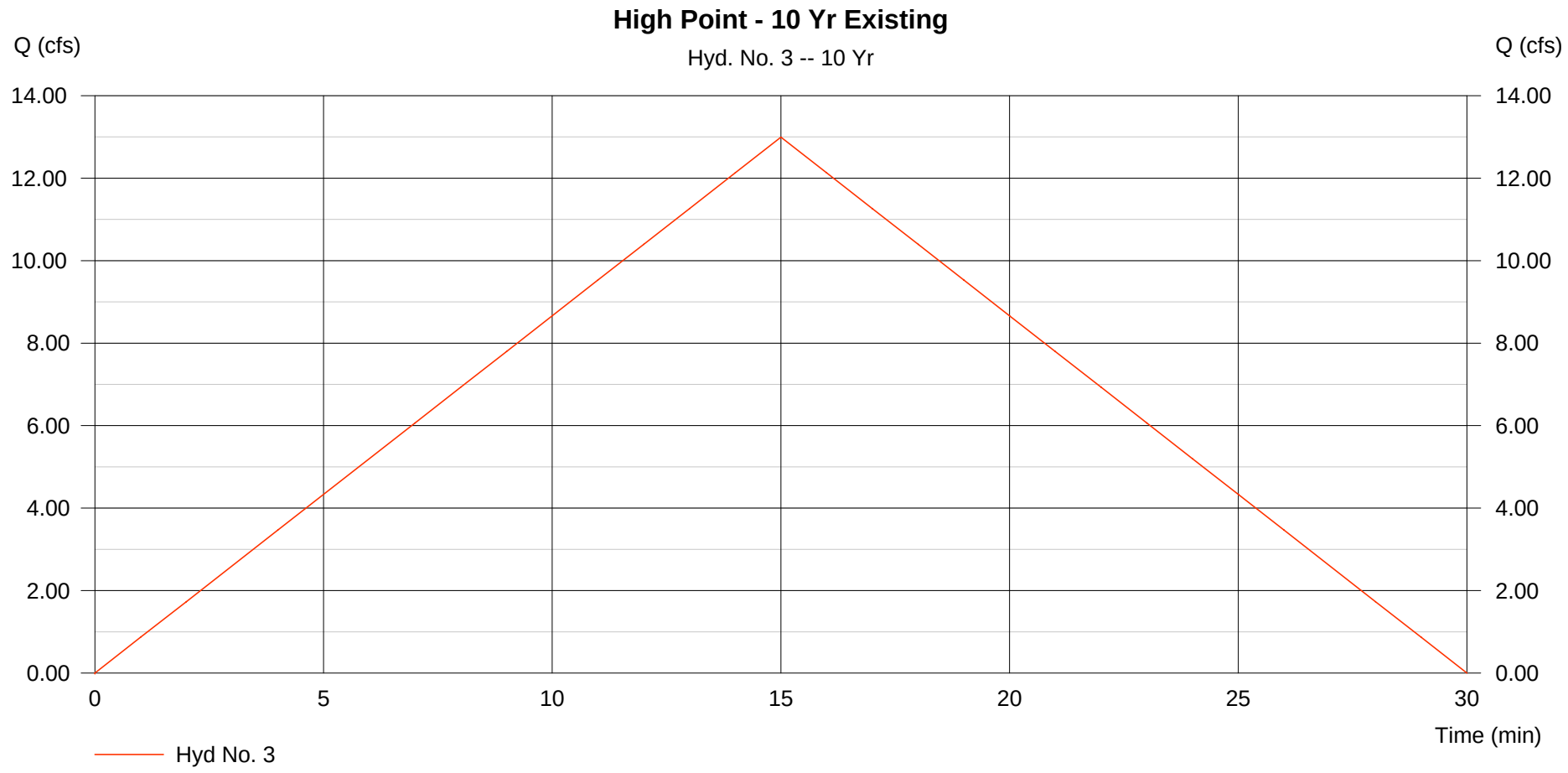
Hydrograph Plot

Hyd. No. 3

High Point - 10 Yr Existing

Hydrograph type	= Rational	Peak discharge	= 13.00 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 4.170 ac	Runoff coeff.	= 0.59
Intensity	= 5.282 in/hr	Tc by User	= 15.00 min
IDF Curve	= SedgwickCo.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 0.268 acft



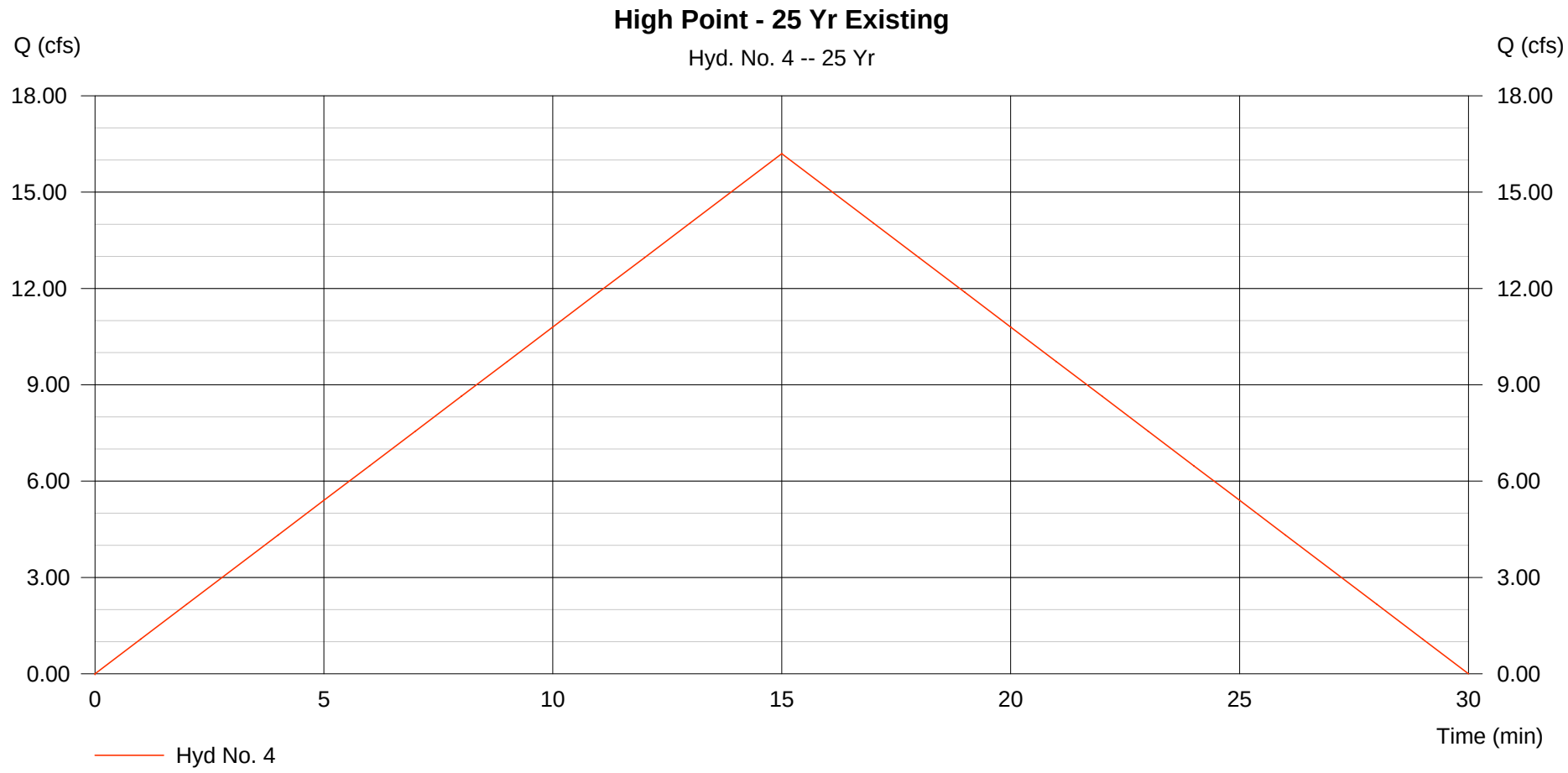
Hydrograph Plot

Hyd. No. 4

High Point - 25 Yr Existing

Hydrograph type	= Rational	Peak discharge	= 16.20 cfs
Storm frequency	= 25 yrs	Time interval	= 1 min
Drainage area	= 4.170 ac	Runoff coeff.	= 0.63
Intensity	= 6.166 in/hr	Tc by User	= 15.00 min
IDF Curve	= SedgwickCo.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 0.335 acft



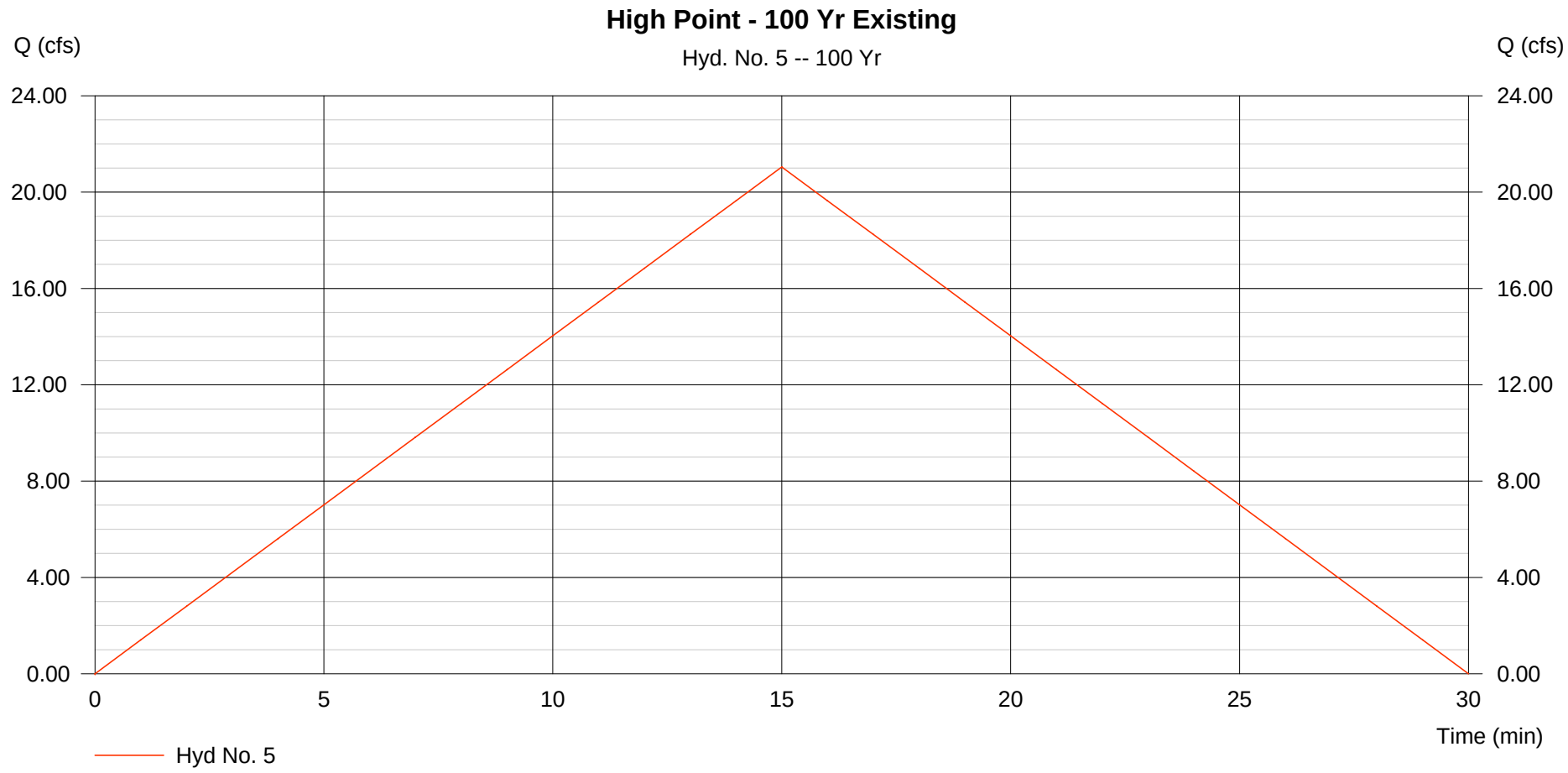
Hydrograph Plot

Hyd. No. 5

High Point - 100 Yr Existing

Hydrograph type	= Rational	Peak discharge	= 21.05 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 4.170 ac	Runoff coeff.	= 0.67
Intensity	= 7.533 in/hr	Tc by User	= 15.00 min
IDF Curve	= SedgwickCo.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 0.435 acft



High Point West Addition

EXHIBIT 2-3

SOIL SURVEY INFORMATION

SEDGWICK COUNTY, KANSAS — SHEET NUMBER 40

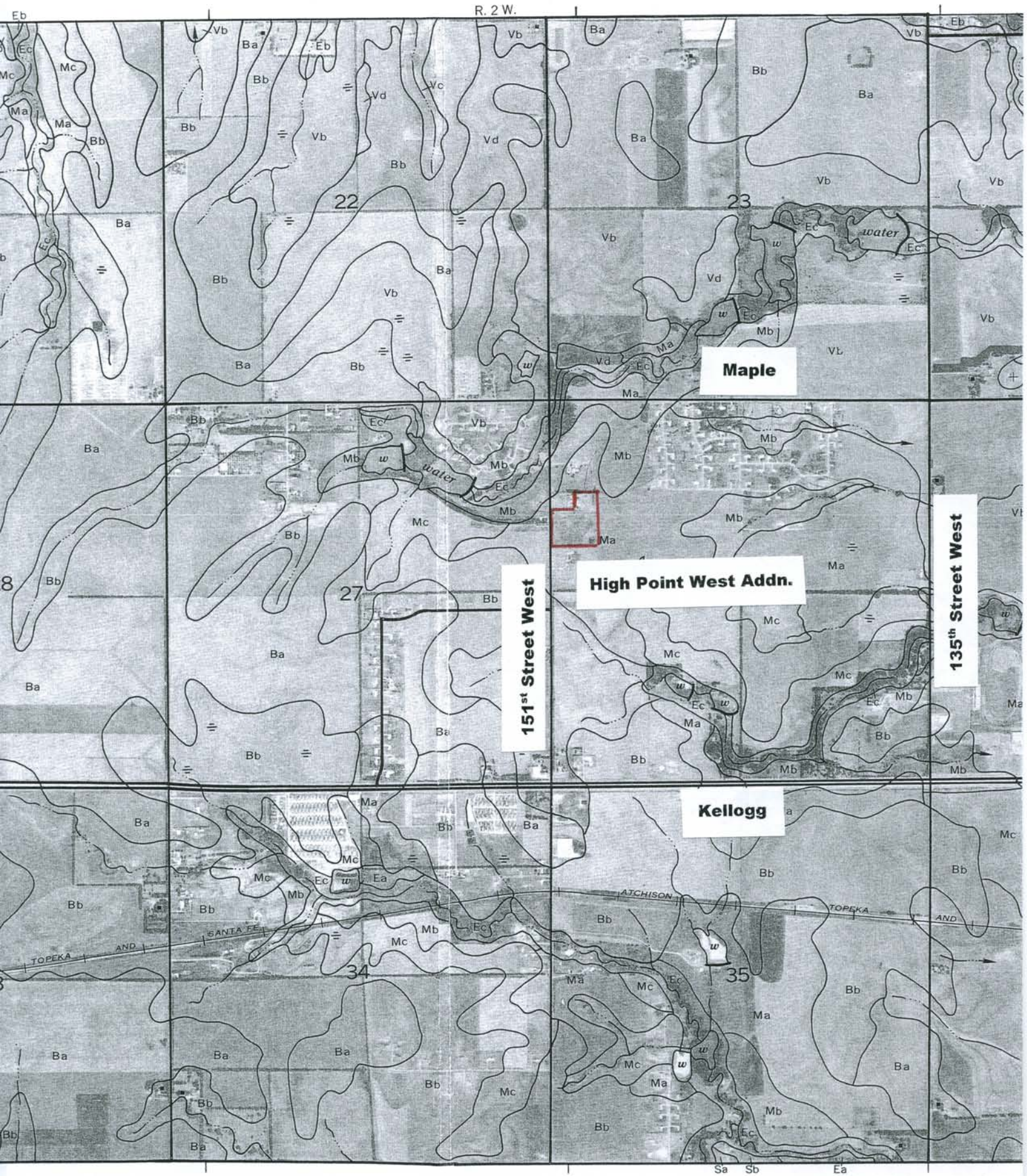


TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. The definitions of "flooding" and "water table" in the Glossary explain such terms as "rare," "brief," and "perched." The symbol > means greater than]

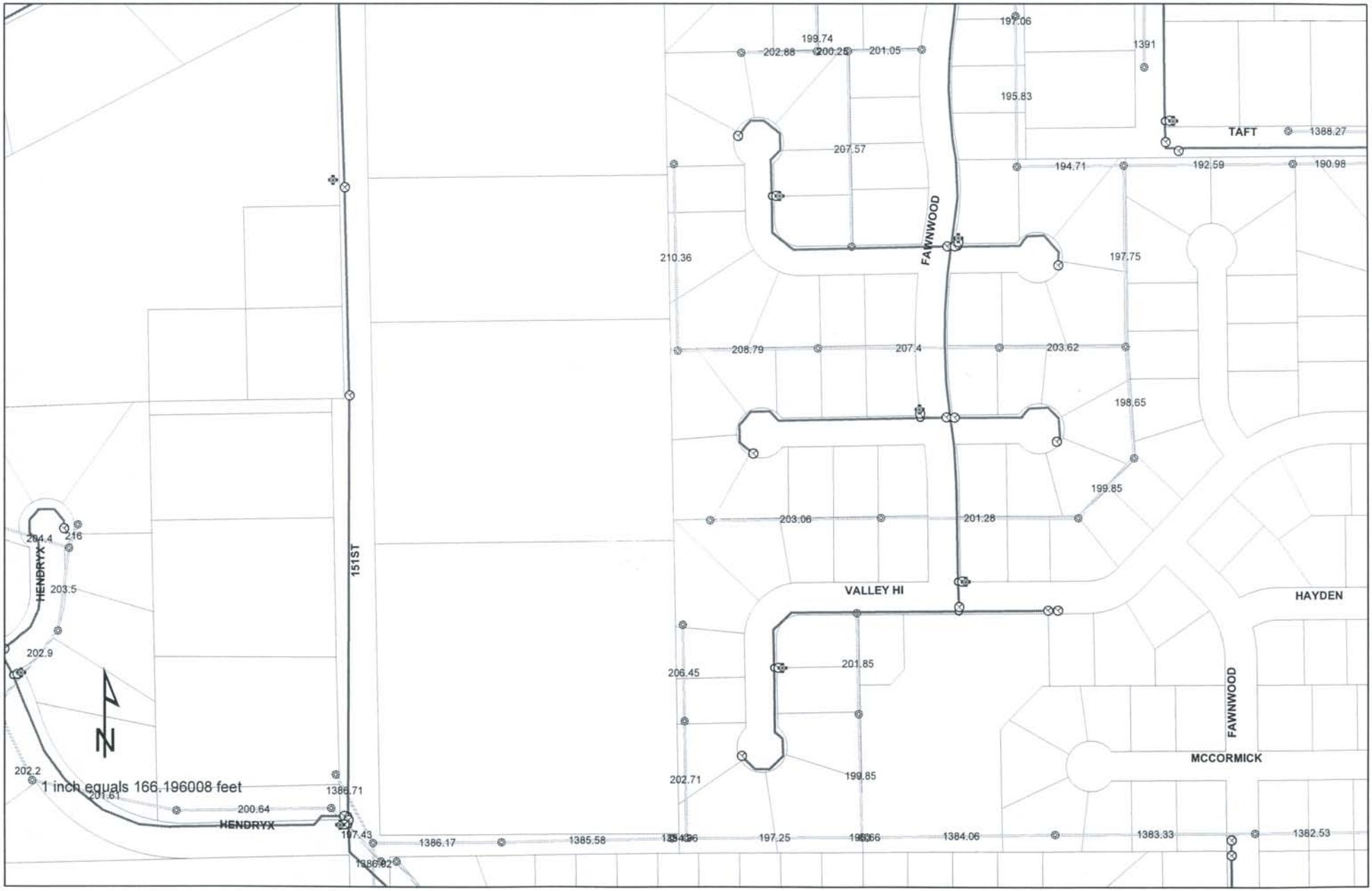
Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					Ft			In	
Albion:									
[1]Aa:									
Albion part	B	None	---	---	>6.0	---	---	>60	---
Shellabarger part	B	None	---	---	>6.0	---	---	>60	---
[1]Ab:									
Albion part	B	None	---	---	>6.0	---	---	>60	---
Shellabarger part	B	None	---	---	>6.0	---	---	>60	---
Blanket: Ba, Bb	C	None	---	---	>6.0	---	---	>60	---
Canadian: Ca	B	Rare	---	---	>6.0	---	---	>60	---
[1]Cb:									
Canadian part	B	Rare	---	---	>6.0	---	---	>60	---
Waldeck part	C	Occasional	Brief	Mar-Oct	2.0-6.0	Apparent	Oct-Apr	>60	---
Carwile: Cc	D	Occasional	Brief to very long.	Apr-Oct	2.0-6.0	Apparent	Oct-Apr	>60	---
Clark:									
[1]Cd:									
Clark part	B	None	---	---	>6.0	---	---	>60	---
Ost part	B	None	---	---	>6.0	---	---	>60	---
Clime: Ce	C	None	---	---	>6.0	---	---	20-40	Rippable
Elandco: Ea, Eb, Ec	B	Rare to common.	Brief	Oct-May	>6.0	---	---	>60	---
Farnum: Fa, Fb, Fc	B	None	---	---	>6.0	---	---	>60	---
Goessel: Ga, Gb	D	None	---	---	>6.0	---	---	>60	---
Irwin: Ia, Ib, Ic	D	None	---	---	>6.0	---	---	>40	Hard
Lesho: La	C	Occasional	Very brief	Mar-Jul	2.0-6.0	Apparent	Jan-Dec	>60	---
Lincoln: Lb	A	Common	Very brief to brief.	Apr-Oct	5.0-8.0	Apparent	Nov-May	>60	---
Milan: Ma, Mb, Mc	B	None	---	---	>6.0	---	---	>60	---

See footnote at end of table.

High Point West Addition

EXHIBIT 2-4

EXISTING UTILITIES


199.74
202.88
200.25
201.05
197.06
1391
195.83
TAFT
1388.27
207.57
194.71
192.59
190.98
FAWNWOOD
210.36
197.75
208.79
207.4
203.62
198.65
199.85
203.06
201.28
151ST
HENDRYX
284.4
216
203.5
202.9
VALLEY HI
HAYDEN
206.45
201.85
FAWNWOOD
MCCORMICK
202.71
199.85
202.2
201.61
200.64
1386.71
HENDRYX
197.43
1386.17
1385.58
197.25
1384.06
1383.33
1382.53
1386.82
1 inch equals 166.196008 feet

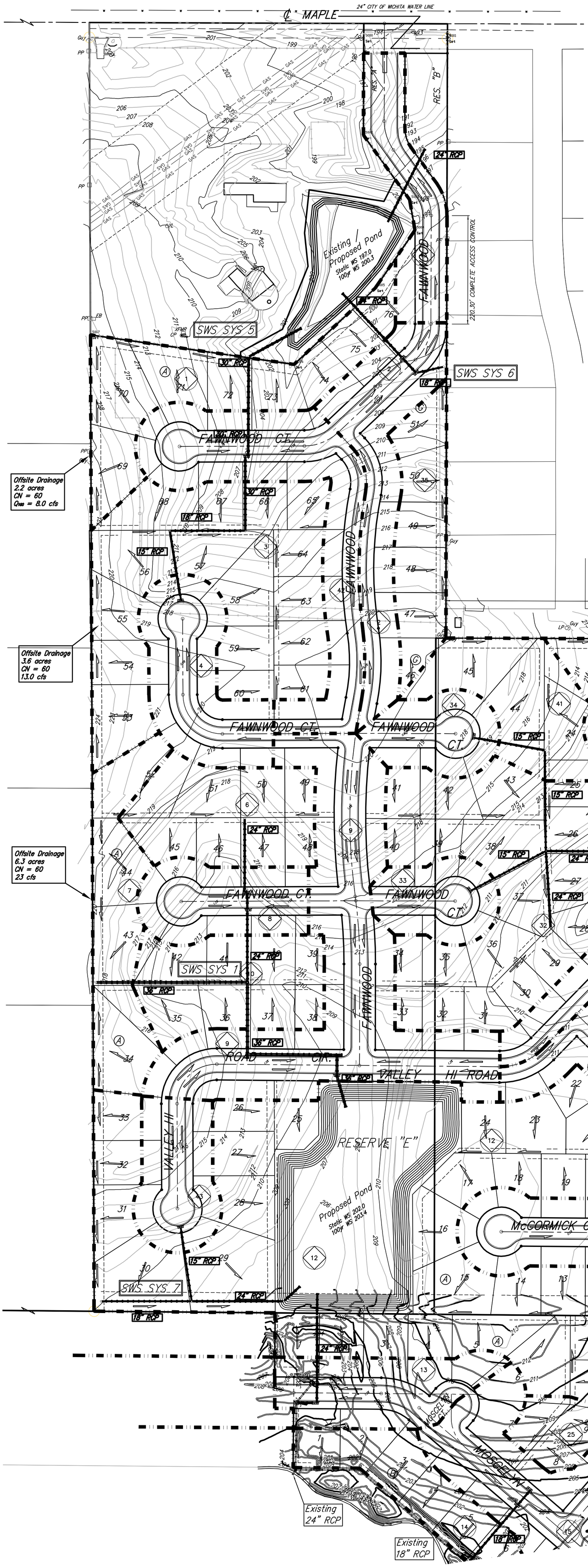
High Point West Addition

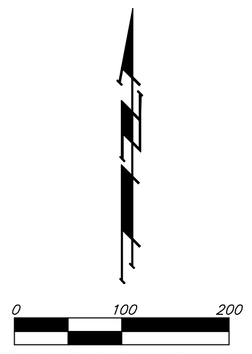
EXHIBIT 2-5

AUBURN HILLS 16TH ADDITION

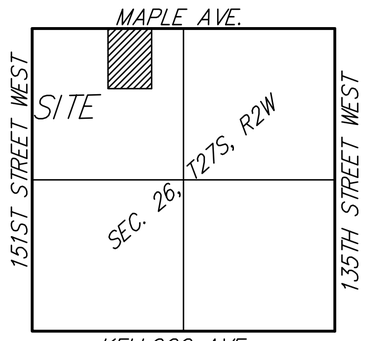
DRAINAGE PLAN

DRAINAGE PLAN
AUBURN HILLS 16TH ADDITION
WICHITA, SEDGWICK COUNTY, KANSAS





DATE OF PREPARATION: 05 AUG 2005
CONTOUR INTERVALS = 1 FOOT
REVISED: 17 AUGUST 2005



VICINITY MAP

Existing	2yr	5yr	100yr	Developed	2yr	5yr	100yr
Intensity	3.83	4.56	7.37	Intensity	3.83	4.56	7.37
Rational C	0.4	0.45	0.57	Rational C	0.52	0.54	0.67

Basin ID	Area	Existing Flowrates			Developed Flowrates		
	acres	2-yr cfs	5-yr cfs	100-yr cfs	2-yr cfs	5-yr cfs	100-yr cfs
1	2.2	3.4	4.5	9.2	4.4	5.4	11
2	2.0	3.1	4	8	4	5	10
3	4.0	6.1	8.2	17	8.0	9.8	20
4	1.5	2.3	3.1	6.3	3.0	3.7	7.4
5		-	-	-	-	-	-
6	1.7	2.6	3.5	7.1	3.4	4.2	8.4
7	1.4	2.1	2.9	5.9	2.8	3.4	6.9
8	1	1.7	2.3	4.6	2.2	2.7	5.4
9	3.8	5.8	8	16	7.6	9	19
10	1.9	2.9	3.9	8.0	3.8	4.7	9.4
11	0.0	-	-	-	-	-	-
12	11	16	22	45	21	26	52
13	1.4	2.1	2.9	5.9	2.8	3.4	6.9
14	2.0	3.1	4.1	8.4	4.0	4.9	9.9
15	3.5	5.4	7.2	15	7.0	8.6	17
16	0.9	1.4	1.8	3.8	1.8	2.2	4.4
17	4.5	6.9	9.2	19	9.0	11	22
18	2.7	4.1	5.5	11	5.4	6.6	13
19	1.1	1.7	2.3	4.6	2.2	2.7	5.4
20	1.7	2.6	3.5	7.1	3.4	4.2	8.4
21	1.0	1.5	2.1	4.2	2.0	2.5	4.9
22	3.3	5.1	6.8	14	6.6	8.1	16
23	3.8	5.8	7.8	16	7.6	9.4	19
24	1.9	2.9	3.9	8.0	3.8	4.7	9.4
25	0.5	0.8	1.0	2.1	1.0	1.2	2.5
26	2.4	3.7	4.9	10	4.8	5.9	12
27	4.3	6.6	8.8	18	8.6	11	21
28	5.6	8.6	11	24	11	14	28
29	4.9	7.5	10	21	9.8	12	24
30	1.7	2.6	3.5	7.1	3.4	4.2	8.4
31	2.2	3.4	4.5	9.2	4.4	5.4	11
32	3.9	6.0	8.0	16	7.8	9.6	19
33	0.8	1.3	1.7	3.5	1.7	2.0	4.1
34	0.9	1.3	1.7	3.6	1.7	2.1	4.2
35	1.2	1.8	2.5	5.0	2.4	3.0	5.9
36	1.9	2.9	3.9	8.0	3.8	4.7	9.4
37	1.4	2.1	2.9	5.9	2.8	3.4	6.9
38	1.2	1.8	2.5	5.0	2.4	3.0	5.9
39	0.3	0.5	0.6	1.3	0.6	0.7	1.5
40	5.4	8	11	23	11	13	27
41	1.4	2.1	2.9	5.9	2.8	3.4	6.9
42	2.5	3.8	5.1	11	5.0	6.2	12
43	0.9	1.4	1.8	4	1.8	2.2	4
4.4	1.1	1.7	2.3	4.6	2.2	2.7	5.4

Baughman Company , P.A.
315 Ellis St. Wichita, KS 67211 P 316-262-7271 F 316-262-0149
Baughman ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

High Point West Addition

EXHIBIT 2-6

“C” FACTORS FOR RATIONAL FORMULA

(3 pages)

ATTACHMENT D

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

RECOMMENDED RUNOFF COEFFICIENTS FOR RATIONAL METHOD
AND PERCENT IMPERVIOUS FOR UNIT HYDROGRAPH METHOD

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
1. Business:					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
2. Residential:					
Single Family (Soil Group D)					
1/8 Acre	50	0.57	0.61	0.66	0.79
1/4 Acre	38	0.50	0.54	0.62	0.76
1/3 Acre	30	0.46	0.50	0.59	0.73
1/2 Acre	25	0.42	0.48	0.56	0.72
3/4 Acre	22	0.42	0.46	0.55	0.71
1 Acre	20	0.41	0.45	0.54	0.71
Multi-Family (Soil Group D)					
Multi-Unit (detached)	60	0.62	0.66	0.72	0.82
Multi-Unit (attached)	65	0.64	0.68	0.73	0.83
Apartments	75	0.70	0.73	0.79	0.86
Single Family (Soil Group C)					
1/8 Acre	50	0.55	0.58	0.64	0.73
1/4 Acre	38	0.48	0.51	0.57	0.68
1/3 Acre	30	0.43	0.46	0.53	0.65
1/2 Acre	25	0.40	0.43	0.50	0.63
3/4 Acre	22	0.39	0.42	0.49	0.62
1 Acre	20	0.37	0.40	0.48	0.61
Multi-Family (Soil Group C)					
Multi-Unit (detached)	60	0.60	0.63	0.69	0.77
Multi-Unit (attached)	65	0.63	0.66	0.71	0.79
Apartments	75	0.68	0.72	0.77	0.83
Single-Family (Soil Group B)					
1/8 Acre	50	0.52	0.54	0.59	0.67
1/4 Acre	38	0.44	0.46	0.52	0.61
1/3 Acre	30	0.39	0.41	0.47	0.57
1/2 Acre	25	0.36	0.38	0.44	0.54
3/4 Acre	22	0.34	0.36	0.42	0.52
1 Acre	20	0.33	0.35	0.40	0.51
Multi-Family (Soil Group B)					
Multi-Unit (detached)	60	0.58	0.60	0.65	0.72
Multi-Unit (attached)	65	0.61	0.64	0.68	0.75
Apartments	75	0.67	0.70	0.74	0.80

Land Use or Face Characteristics	Percent Impervious	Frequency 2	5	10	100
Single Family (Soil Group A)					
1/8 Acre	50	0.47	0.50	0.54	0.60
1/4 Acre	38	0.39	0.41	0.45	0.52
1/3 Acre	30	0.33	0.35	0.39	0.47
1/2 Acre	25	0.30	0.31	0.35	0.44
3/4 Acre	22	0.28	0.29	0.33	0.42
1 Acre	20	0.26	0.28	0.32	0.40
Multi-Family (Soil Group A)					
Multi-Unit (detached)	60	0.55	0.57	0.61	0.67
Multi-Unit (attached)	65	0.58	0.60	0.64	0.70
Apartments	75	0.65	0.68	0.72	0.77
3. Industrial:					
Light Areas	70	0.68	0.69	0.73	0.80
Heavy Areas	80	0.74	0.76	0.79	0.84
4. Playgrounds:	15	0.33	0.35	0.42	0.55
5. Schools:	40	0.49	0.51	0.56	0.66
6. Railroad Yard Areas:	30	0.43	0.45	0.50	0.62
7. Undeveloped Urban Areas:					
Offsite Flow Analysis (when land use not defined)	45	0.52	0.54	0.59	0.68
8. Streets:					
Paved	99	0.87	0.88	0.90	0.93
Gravel	00	0.24	0.26	0.33	0.48
9. Drive, Parking Lots and Walks:	96	0.87	0.87	0.88	0.89
10. Roofs:	90	0.80	0.85	0.90	0.93
11. Urban Lawn Areas (See Note No. 1 below):					
Soil Group A					
Slope less than 1%	00	0.08	0.09	0.13	0.23
Slope 1% to 4%	00	0.12	0.13	0.17	0.27
Slope more than 4%	00	0.16	0.17	0.21	0.31
Soil Group B					
Slope less than 1%	00	0.16	0.18	0.24	0.37
Slope 1% to 4%	00	0.20	0.22	0.28	0.41
Slope more than 4%	00	0.24	0.26	0.32	0.45
Soil Group C					
Slope less than 1%	00	0.24	0.27	0.35	0.51
Slope 1% to 4%	00	0.26	0.29	0.37	0.53
Slope more than 4%	00	0.28	0.31	0.39	0.55

Tab 3. Post-Development Hydrologic Analysis

A. Proposed conditions hydrologic and hydraulic analysis

The analysis was completed using the Rational Method. The 2, 5, 10, 25, & 100 year, 24-hour storm events were evaluated. The information for these calculations appears in Exhibit 3-1. The results are summarized in the following table.

2.00 Acre Undeveloped Pond By-Pass (24-Hour Storm)					
Design Storm	2-Year	5-Year	10-Year	25-Year	100-Year
"C" Factor	0.20	0.22	0.28	0.35	0.41
Peak Flow	1.52	2.03	2.91	4.22	6.04
0.95 Acre Developed Pond By-Pass (24 Hour Storm)					
Design Storm	2-Year	5-Year	10-Year	25-Year	100-Year
"C" Factor	0.52	0.54	0.59	0.63	0.67
Peak Flow	1.88	2.36	2.91	3.61	4.68
Total By-Pass	3.40	4.39	5.82	7.83	10.72

4.17 Acre Developed Area to Pond (24-Hour Storm)					
Design Storm	2-Year	5-Year	10-Year	25-Year	100-Year
"C" Factor	0.52	0.54	0.59	0.63	0.67
Peak Flow	8.25	10.50	13.00	16.20	21.05
Pond Outflow	0.8	1.42	2.34	3.71	6.09
Total Discharge from Site	4.20	5.81	8.16	11.54	16.81
Pond Water Surface	1407.95	1408.06	1408.17	1408.31	1408.49

B. Proposed times of concentration used in calculations

A 15 minute time of concentration was used for all calculations.

C. Assumed post-developed runoff “C” factors

For the existing condition, the “C” factors were taken from the City of Wichita Table included in Exhibit 2-6. These “C” factors were selected based on average basin slopes being between 1% and 4% and the from hydrologic soil group B. The results are shown in the table above.

D. Proposed contours for detention facilities

Proposed detention areas are shown on the drainage plan, Exhibit 1-3.

E. Preliminary sizing calculations for storm water controls

The pond control structure is a 5 foot wide broad crested weir with a 12 " wide notch for low flows. The weir is at an elevation of 1408.0 with the 12" wide notch at 1407.5.

F. Stage-storage-discharge curve and inflow/outflow hydrographs for storage facilities

Storage facility calculations and results are found in Exhibit 3-1.

G. Final analysis of potential upstream/downstream impacts

No relevant impacts are noted from this analysis. The proposed flows will be less than the existing flows leaving the site.

H. Existing and proposed structural elevations

There are no existing structures. Preliminary storm sewer networks are evaluated in Exhibit 3-2.

I. Design water surface elevations and normal pool elevations for ponds

Design water surface elevations are shown in Tab. 3-A.

J. Typical details for structures

The control structure for the pond will be a concrete weir.

K. Proposed limits of clearing and grading

Clearing and grading shall be done throughout the site and will be established upon submittal for building construction.

L. Location of existing and proposed impervious areas

Any existing impervious areas are shown on the drainage plan. The proposed impervious areas will be delineated with final construction plans, but will not exceed 65% of the total site area as per design calculations.

M. Location of existing and proposed utilities and easements

The existing utilities are shown in Exhibit 2-4 and the proposed utilities are shown on the preliminary plat.

N. Location of existing and proposed conveyance systems

Specific storm sewer networks are shown on the Drainage Plan and in Exhibit 3-2. Any future storm sewer designs shall comply with the latest City of Wichita design criteria to convey added site runoff to any proposed on-site detention areas and through control structures with discharge rates at or below those rates existing prior to any development.

O. Preliminary location and dimensions of proposed channel modifications

This development will not require/include any channel modifications.

P. Preliminary selection and location of storm water controls

Storm water controls will include appropriate curb/drop inlets and pipe networks at locations to be finalized as part of the construction plans.

Q. Emergency overflow structure's flow path

The emergency overflow will be discharged through the pond weir structure.

R. Detention facility freeboard

All detention facilities will have a minimum of one foot of freeboard above the design-water surface elevation.

S. The 100-year, 24-hour High Water Line

The HWL elevation for the detention pond is 1408.49.

T. Lowest opening elevation table

The pad elevations for view out lots are shown on the Lot Grading Plan.

U. Storm water management facilities located within a reserve

This site contains a platted reserve as shown on the Preliminary Plat.

V. Maintenance responsibility of storm water management facilities

The maintenance of storm water management facilities shall be the responsibility of a homeowners association.

W. Off-site drainage easements or agreements

No off-site drainage easements or agreements will be required for this development.

High Point West Addition

EXHIBIT 3-1

POND DESIGN INFORMATION

INFLOW-OUTFLOW HYDROGRAPHS

for

DEVELOPED CONDITIONS

Pond Report

Pond No. 1 - Pond Outflow

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1407.50	11,357	0.000	0.000
2.50	1410.00	18,868	0.867	0.867

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 1.00	4.00	0.00	0.00
Crest El. (ft)	= 1407.50	1408.00	0.00	0.00
Weir Coeff.	= 2.60	2.60	0.00	0.00
Weir Type	= Broad	Broad	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0.000	1407.50	---	---	---	---	0.00	0.00	---	---	---	0.00
2.50	0.867	1410.00	---	---	---	---	10.28	29.42	---	---	---	39.69

Hydrograph Plot

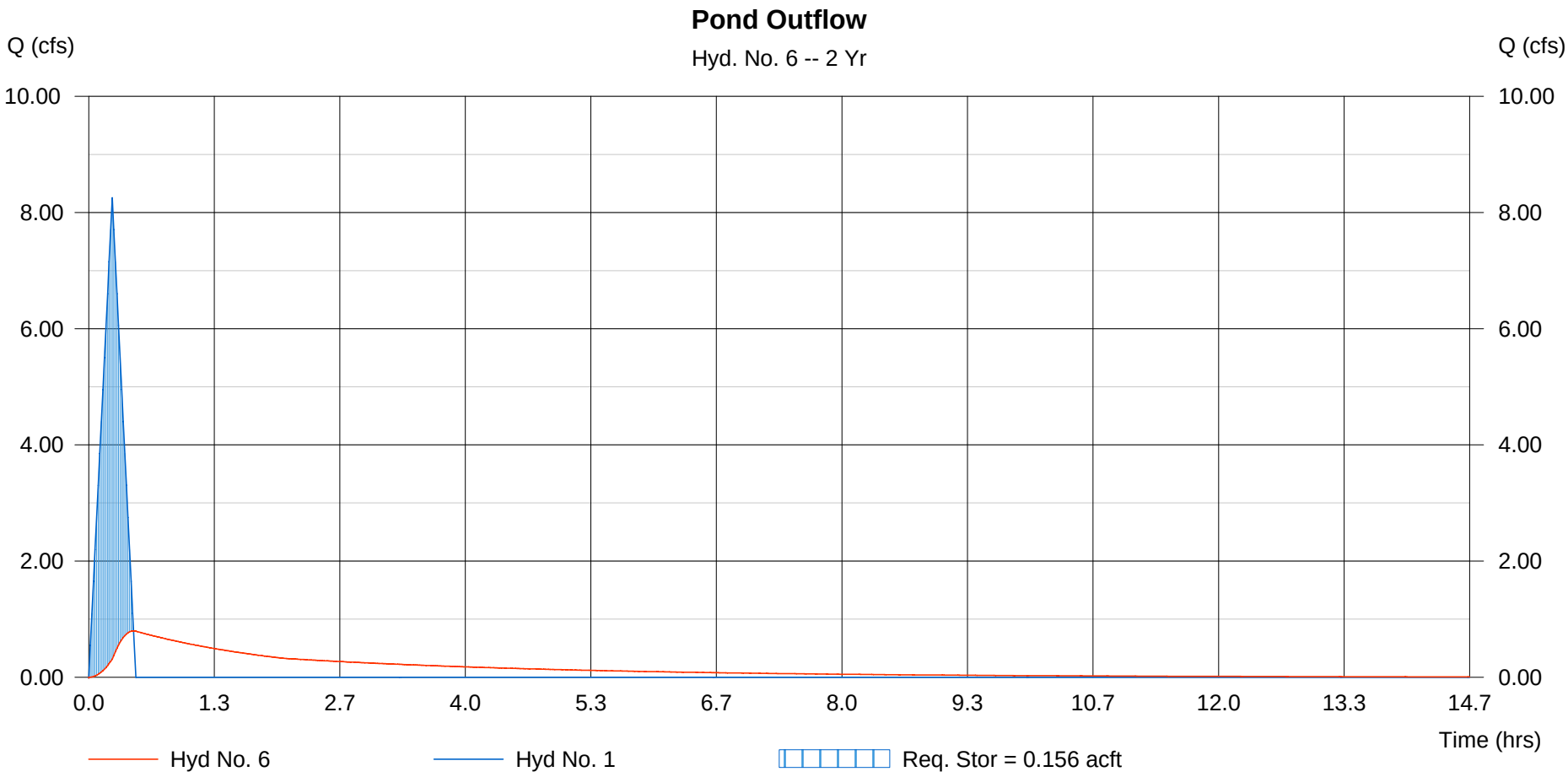
Hyd. No. 6

Pond Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	0.797 cfs
Storm frequency	=	2 yrs	Time interval	=	1 min
Inflow hyd. No.	=	1	Max. Elevation	=	1407.95 ft
Reservoir name	=	Pond Outflow	Max. Storage	=	0.156 acft

Storage Indication method used.

Hydrograph Volume = 0.170 acft



Hydrograph Plot

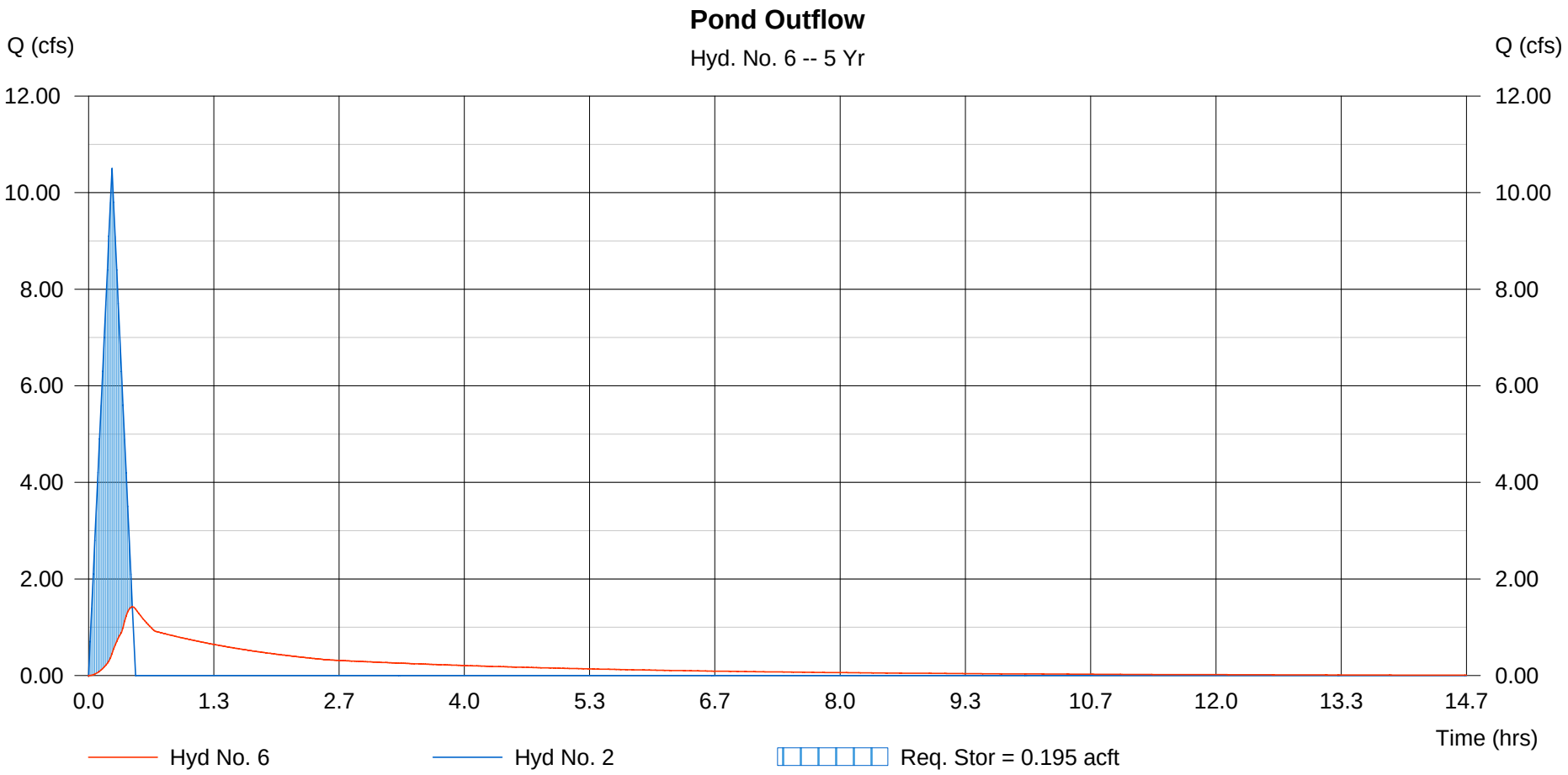
Hyd. No. 6

Pond Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	1.423 cfs
Storm frequency	=	5 yrs	Time interval	=	1 min
Inflow hyd. No.	=	2	Max. Elevation	=	1408.06 ft
Reservoir name	=	Pond Outflow	Max. Storage	=	0.195 acft

Storage Indication method used.

Hydrograph Volume = 0.217 acft



Hydrograph Plot

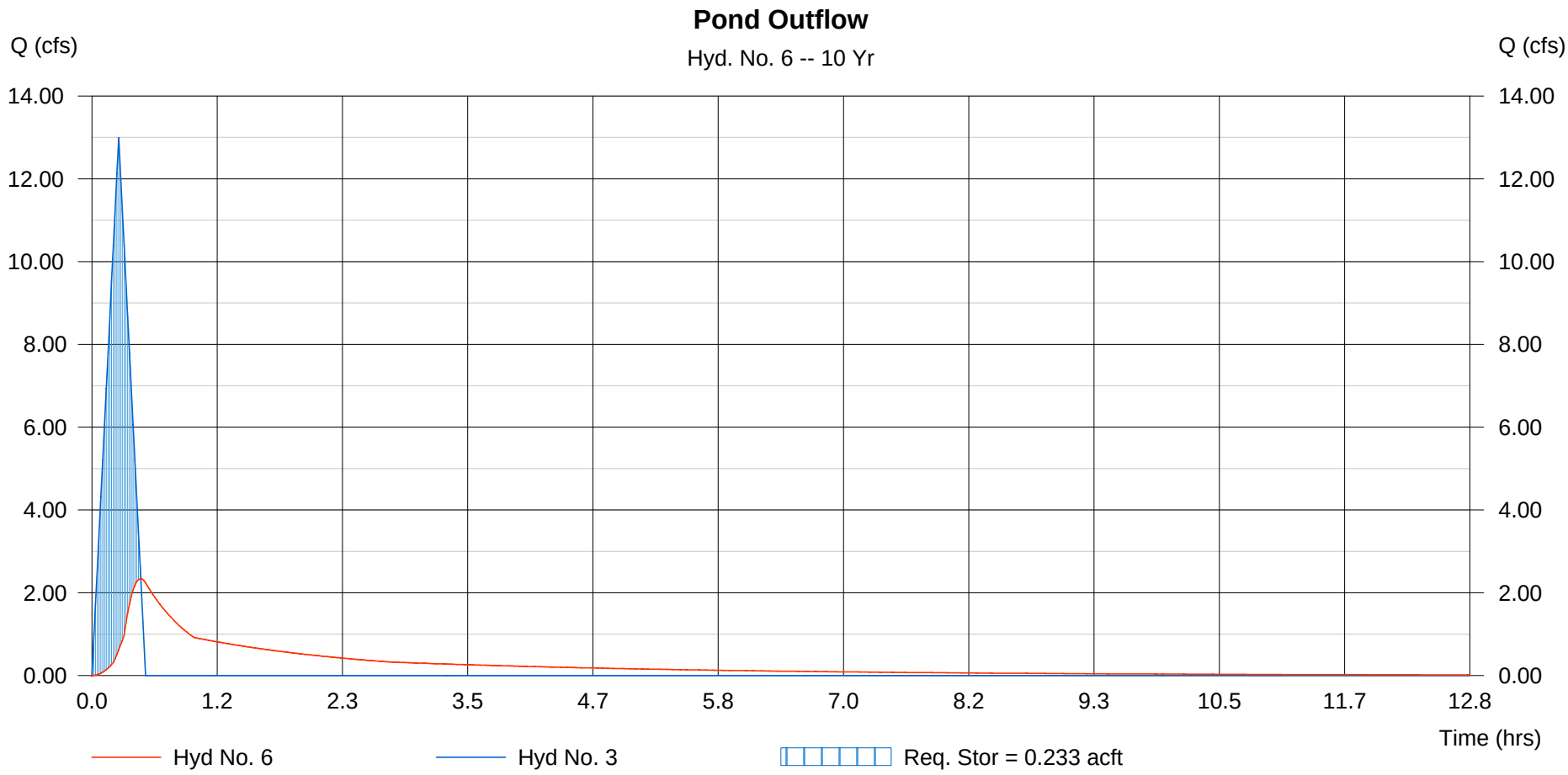
Hyd. No. 6

Pond Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	2.338 cfs
Storm frequency	=	10 yrs	Time interval	=	1 min
Inflow hyd. No.	=	3	Max. Elevation	=	1408.17 ft
Reservoir name	=	Pond Outflow	Max. Storage	=	0.233 acft

Storage Indication method used.

Hydrograph Volume = 0.268 acft



Hydrograph Plot

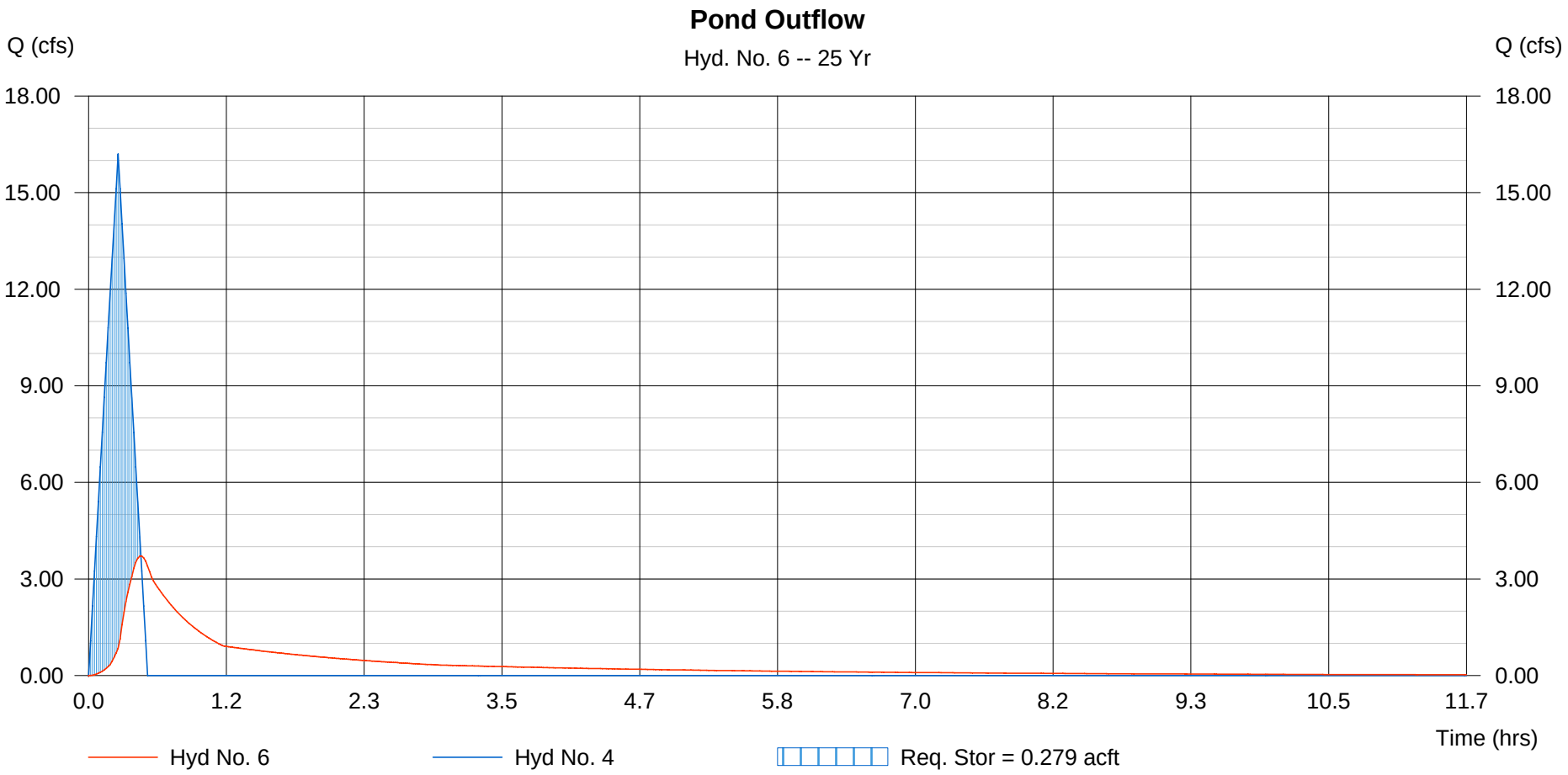
Hyd. No. 6

Pond Outflow

Hydrograph type	= Reservoir	Peak discharge	= 3.706 cfs
Storm frequency	= 25 yrs	Time interval	= 1 min
Inflow hyd. No.	= 4	Max. Elevation	= 1408.31 ft
Reservoir name	= Pond Outflow	Max. Storage	= 0.279 acft

Storage Indication method used.

Hydrograph Volume = 0.334 acft



Hydrograph Plot

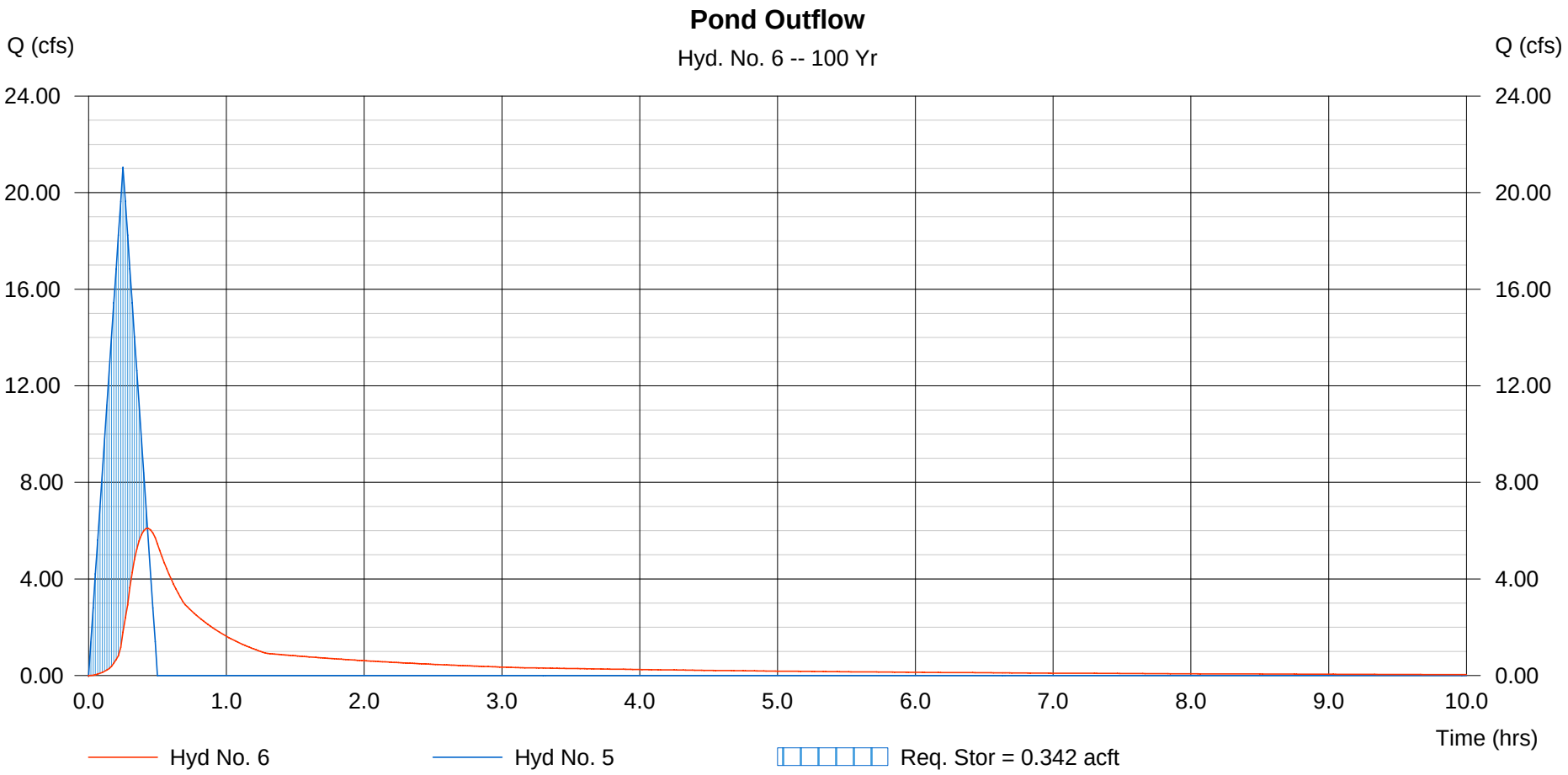
Hyd. No. 6

Pond Outflow

Hydrograph type	= Reservoir	Peak discharge	= 6.093 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyd. No.	= 5	Max. Elevation	= 1408.49 ft
Reservoir name	= Pond Outflow	Max. Storage	= 0.342 acft

Storage Indication method used.

Hydrograph Volume = 0.435 acft

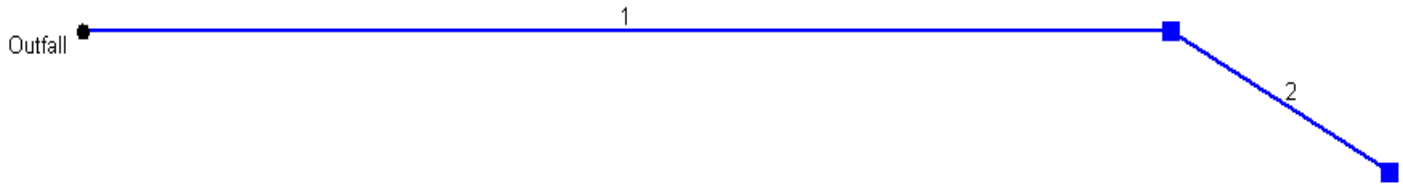


High Point West Addition

EXHIBIT 3-2

PRELIMINARY STORM SEWER DESIGN

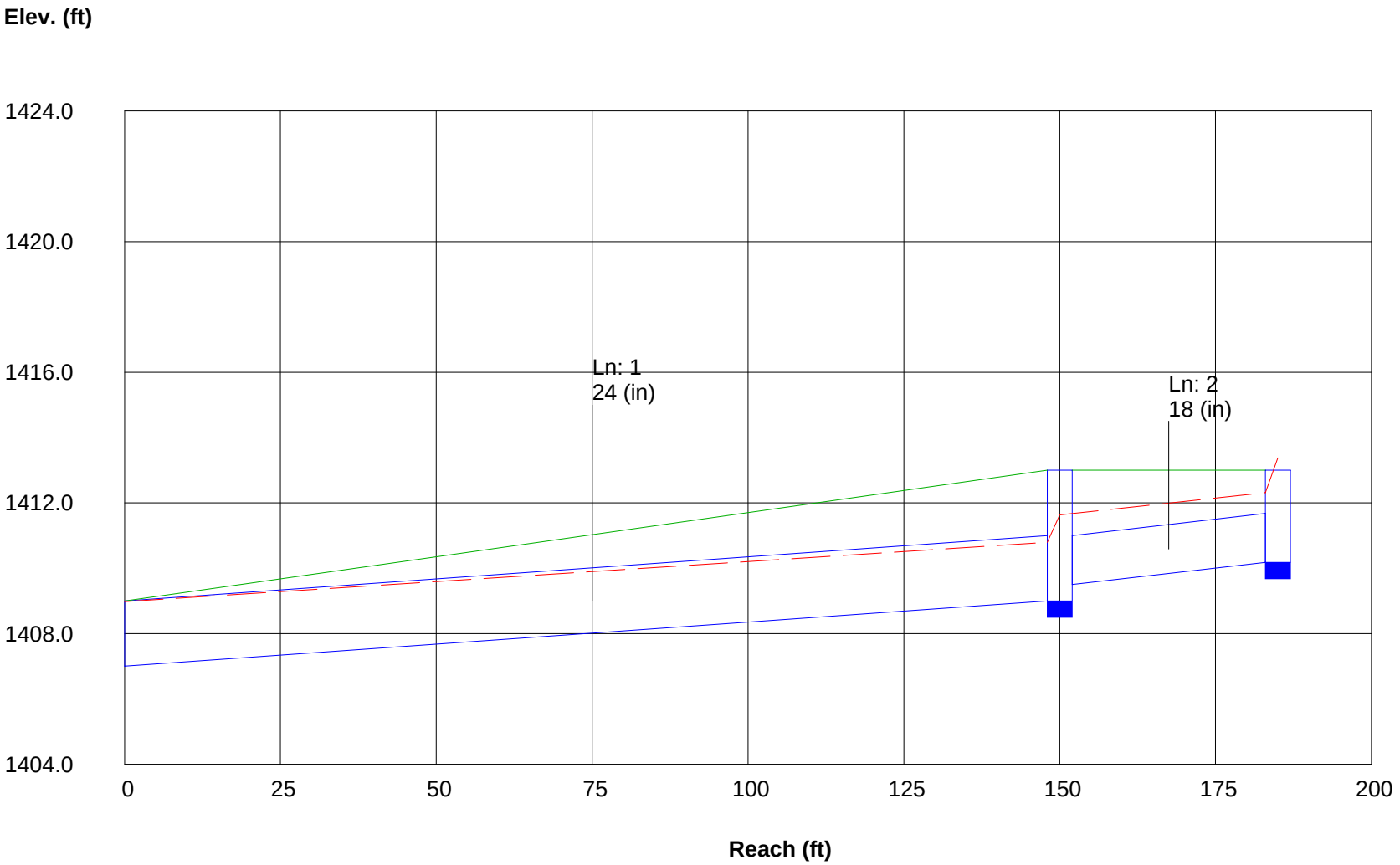
Hydraflow Plan View



Project file: High Point West.stm	IDF file: sampleFHA.IDF	No. Lines: 2	10-09-2007

Storm Sewer Profile

Proj. file: High Point West.stm



Line	To Line	Line Length	Incr. Area	Total Area	Runoff Coeff.	Incr C x A	Total C x A	Inlet Time	Time Conc	Rnfal Int	Total Runoff	Adnl Flow	Total Flow	Capac Full	Veloc	Pipe Size	Pipe Slope	Inv Elev Up	Inv Elev Dn	HGL Up	HGL Dn	Grnd/Rim Up
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)
1	End	150.0	1.39	3.19	0.67	0.93	2.14	15.0	15.1	7.5	16.08	6.85	26.12	26.12	8.56	24	1.33	1409.00	1407.00	1410.79	1408.98	1413.00
2	1	35.0	1.80	1.80	0.67	1.21	1.21	15.0	15.0	7.5	9.09	8.88	14.64	14.64	8.28	18	1.94	1410.18	1409.50	1412.32	1411.64	1413.00

Grnd/Rim Dn	Line ID
(ft)	
1409.00	
1413.00	

Tab 4. Floodplain Submittal

A. Source of flood profile

The flood profile is not applicable to this development.

B. Nearest base flood elevations

No FEMA floodplains are on this site. See FEMA Map, Exhibit 4-1.

C. Delineation of pre-developed regulatory floodplain/floodway limits

Floodway limits are off-site (see Exhibit 4-1).

D. Delineation of post-developed regulatory floodplain/floodway limits

The limits of post-developed floodplain/floodway limits are not applicable to this development.

E. Floodplain boundary determination per elevation

Not applicable to this development.

F. Provide source of floodway data table and discharges

Not applicable to this development.

G. Provide all hydrologic and hydraulic study information for site-specific floodplain studies

Not applicable to this development.

H. Provide regulatory floodway and four natural profile models (10, 50, 100, & 500-yr) for existing and future watershed conditions

Not applicable to this development.

I. Location of floodplain/floodway limits and relationship of site to upstream/ downstream properties

Not applicable to this development.

J. Floodplains and floodways located within a Reserve

Not applicable to this development.

High Point West Addition

EXHIBIT 4-1

FEMA MAP

WETLAND DELINEATION MAP

MAP SCALE 1" = 1000'

0 1000 2000 FEET

0 300 600 METERS

PANEL 0320E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY,
KANSAS
AND INCORPORATED AREAS

PANEL 320 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ODDARD, CITY OF	200500	0320	E
EDGWICK COUNTY	200321	0320	E
ICHITA, CITY OF	200328	0320	E

Notice to User: The **Map Number** shown below hould be used when placing map orders; the **Community Number** shown above should be sed on insurance applications for the subject ommunity.

MAP NUMBER
20173C0320E

EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov


151ST
151ST
MAPLE
6TH
6TH
6TH
6TH
6TH
WETLANDS
SITE
151ST
151ST
151ST
151ST
151ST
0 ft
500 ft
1000 ft
1500 ft
2000 ft
2500 ft

Tab 5. Federal, State, and Local Permits

A. US Army Corps of Engineers – Regulatory Program Permits

Not applicable to this development.

B. Kansas Department of Agriculture – Division of Water Resources Permits

Not applicable to this development.

C. Federal Emergency Management Agency (FEMA) Letter of Map Changes

Not applicable to this development.

D. Kansas Department of Transportation

Not applicable to this development

E. Sedgwick County Right-of-Way Permit

Not applicable to this development.