DRAINAGE PLAN
THE RANCH
TO
WICHITA, SEDGWICK COUNTY, KANSAS

PREPARED BY

Baughman
ENGINEERING | SURVEYING | PLANNING
LANDSCAPE ARCHITECTURE

18 JUNE 2013

ENGINEERING | SURVEYING | PLANNING
LANDSCAPE ARCHITECTURE

DRAINAGE PLAN
THE RANCH

FINAL REPORT

Prepared by Baughman Company, P.A.
18 June 2013

By Trevor R. Kurth, P.E., CFM
N. Brent Wooten, P.E., L.S.

REPORT CONTENTS

EXISTING CONDITIONS

The site is located at the south west corner of 21st Street North and 159th Street East in eastern Wichita. The site is currently a private ranch type residence with horse barns, ponds, and open space. There is a berm along 159th Street East and also a berm located along the commercial property at the intersection. The total site area is approximately 66 acres. There is offsite flow from the north and from the west that crosses this property and drains to the south. This entire property ultimately drains to the south and under the abandoned railroad property. There is no FEMA SFHA located on this property as of this report. The drainage patterns as defined above can be seen on the Aerial (Exhibit 2).

PROPOSED CONDITIONS

The property is being platted as a residential subdivision with large estate lots. The site will contain a private street, public water, sewer, and storm sewer, and detention facilities for the site's runoff. The lots will generally drain to the center of the property into the detention ponds and then south and through the existing RCBC under the abandoned railroad. The detention facilities proposed will serve the property for detention of the storm water across all storm events as well as meet the City of Wichita's water quality and channel protection requirements. For a half-scale copy of the Plat, see Exhibit 3.

OFFSITE CONDITIONS

The site currently accepts runoff from the north through a 3x4 RCBC under 21st Street. This box drains approximately 57 acres which is currently partially developed and planned for residential and commercial developments. Due to upstream ponds and channels, the capacity of the box structure before overtopping the adjacent roadway has been used for the peak flow analysis for the proposed site. There is also offsite runoff entering the property along the west line approximately 500 feet north of the south property line. Based on site visits, there does not appear to be any flow from the west entering the property (primarily due to the elevated tree row on the property line) besides the one described above.

The site, and offsite runoff, flows to the south line of the property and is conveyed offsite through a 10x10 RCBC under the abandoned roadway. This area is heavily treed and channelized at this point. There is no mapped FEMA floodplain on this property or within ½ mile of the site as of this report.

The overall site location and hydrogeodatabase can be seen with the site location plotted as Exhibit 1.

EXISTING CONDITIONS RUNOFF CALCULATIONS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in calculating the existing conditions runoff values.

- STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events Modeled
  - 2-yr Rainfall Depth = 3.5 in
  - 10-yr Rainfall Depth = 5.3 in
  - 100-yr Rainfall Depth = 7.9 in

- FLOW DATA
  - Areas per LIDAR data, USGS Quadrangle Sheet, Aerial Photos, and Site Visits
  - SCS Curve Number for Existing Flows (84 – Pre-developed or undisturbed).
  - Time of Concentration: Lag Method (minimum 15 min)

SITE CHARACTERISTICS

The site is currently undeveloped and consists of ponds, berms, trees, internal gravel roads, and horse barns and associated sheds. The site generally drains to the mid-section of the property to the ponds and then to the south and offsite to the adjacent south property. There is a ditch section from the north which drains offsite runoff from the north.
The existing site characteristics can be seen from the aerial exhibit (Exhibit 2).

EXISTING CONDITIONS HYDROLOGIC ANALYSIS

The site was analyzed for pre-developed conditions using the SCS Curve Number Method for the entire range of storm events. A Curve Number of 84 was used based on undisturbed area in Type D soils. Offsite areas had a CN of 80 based on varying soil types and large drainage areas. There is detention located to the north in a develop area which was not accounted for in this analysis (full undeveloped flow was assumed for this property as well as upstream box culvert capacities). The site was modeled using the existing ponds and their detention value as well as incorporating all offsite runoff to these respective areas. Times of concentration were figured for each basin with a minimum of 15 minutes used for the smaller basins with shorter times.

There is offsite runoff from the north that encroaches this site which enters under 21st Street in a new 3'x4' RCBC. For the purpose of this plan, the RCBC was maxed out for capacity before overtopping the roadway. This was done due to the conflicting data from north offsite platted properties' drainage plans as well as the design for the RCBC. There are currently pond systems and ditch sections in the northern partially developed properties.

There is offsite runoff from the west which encroaches this property currently. This area appears to follow the west line (the tree row is elevated separating the

properties) until the runoff encroaches the subject property approximately 500' north of the south line. The runoff currently does not flow into the south, instead bypassing it just to the south of the outfall and into the channel and then through the railroad box culvert. The pond system was routed without this flow in the existing conditions, and the peak flow was then added in for the ultimate discharge at the south discharge point.

DOWNSTREAM DRAINAGE CAPACITY

The existing site drains to the south (through the center of this site in a series of ponds) to an existing 10'x10' RCBC under the former railroad ROW. There appears to be a defined channel on the adjacent property to the south as well as another detention pond within ½ mile downstream. There is no development within a ½ mile of the south property line as it pertains to the drainage pattern. We are not aware of any drainage problems in the downstream vicinity of this property.

POST-DEVELOPMENT HYDROLOGIC ANALYSIS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in developing the drainage and grading plans.

- STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr Storm Events Modeled
  - 1.2" Water Quality Flow modeled as '3-yr event' in HydraFlow
  - Hydrograph Method utilized for Developed Flows
  - CN = varies (Soil Type D – varies based on disturbance/impervious)
  - Time of Concentration; Lag Method, minimum Tc = 15min

- GRADING CONSTRAINTS
  - One foot freeboard between 100-yr WSE and adjacent lot corner
  - Match all existing perimeter grades
  - Minimum 2% cross lot grading – Developer requirements

DEVELOPED CONDITIONS HYDROLOGIC ANALYSIS

The site is proposed to be developed into a multiple lot residential subdivision with large (5+ acres) estate lots on the east side and ¾ acre lots to the west of the ponds. The site will have all onsite utilities, curb and gutter streets, water, sewer, and detention facilities. There are currently 3 separate surface water ponds (low areas) that hold water on the site. These areas will be cleaned and over-excavated for storage of developed flows as well as for onsite amenities. The pond systems will also serve the site for water quality and channel protection requirements.

Curve Numbers were used based on the Storm Water Manual. The estates lots utilized a CN of an 84 which would correspond to undisturbed areas. These areas, although they will have a structure, will be left untouched during the mass grading process and the structure will account for less than 10% of the lot area. The smaller lots to the west have a CN of 87 based on a composite of disturbed areas on the lot and undisturbed areas on the lot. These lots are larger than typical residential lots and we expect approximately 20-25% impervious coverage.

Onsite storm water sewer will be extended to the rear of some lots with private storm sewer extended to the majority of the lots along the west line. These lots will be sized and installed by the owner to obtain the developer mandated 2% rear yard cross lot grading.

Please be aware, that the storm listed as the '3-yr event' in the Hydraflow model is actually the 1.2" rainfall water quality event. This is due to the constraints of the programs naming conventions. All the other storm events correspond to their respective years. The Channel Protection volume is generated using the 1-year event.

DETENTION FACILITIES

There are 3 detention facilities proposed for this plat. All detention ponds are proposed to be wet surface ponds and will be used for amenities as well as

quantity and quality controls to meet current City of Wichita requirements. Each facility is detailed further below.

- North Pond

  The northernmost pond will expand on the current pond and will directly accept offsite runoff from the north. This pond will have a static water surface elevation at a 1356.5 and a corresponding 100-year peak elevation at a 1360.1. This pond will discharge to the middle pond via 2-24" pipes at static elevation and a 5' concrete weir at elevation 1358.2.

- Middle Pond

  The middle pond will primarily be the same dimensions of the existing pond in this location, except will deepen the pool and re-work the banks to manageable slopes. The pond will accept developed runoff from the surrounding residential lots as well as discharge from the upper north pond. This detention facility will have a static water surface elevation of a 1354.0 and a corresponding 100-year water surface of a 1356.6. This pond will be designed and built around existing trees and hedge rows. This pond will replace existing undersized outfall pipe with a 36" RCP with an inlet drop structure at static elevation. The outfall will consist of a KDOT style inlet and grate at static with the pipe flowline 4' lower at a 1350.0. This pond will overflow the entrance road in emergency situations before entering any structures along the east and west banks.

- South Pond

  The south pond will primarily stay as it is existing. Minor re-grading and expansion is expected along the east bank and where the middle ponds outfall will discharge. The pond will have a static water surface elevation at 1348.6 and a 100-year design water surface at elevation 1351.9. This pond will also accept and detain the runoff from the offsite west agricultural property as well as onsite developed runoff. The pond will discharge via the existing 24" RCP with drop inlet. However, a 5" orifice will be cut into the side of the existing drop structure at elevation 1348.6 (or will be installed separately with as a PVC pipe). The top of the inlet/riser structure will remain at elevation 1349.14. A 16' concrete weir will also be used for larger storm events and will be at elevation 1350.2. The orifice and drop structure have been sized for the channel protection volume as well as the wide range of detention for all the storm events.

DISCHARGE POINTS SUMMARY

The site will discharge to the existing channel section just downstream of the south pond. This area will remain as existing as possible due to the already formed channel and location of the existing trees. The railroad box culvert is located just off the south property line and approximately 400' south of the southern pond. After re-configuration of the pond system, this site will detain more and discharge less than the site currently does throughout the storm series.

WATER QUALITY

Water calculations have been performed and are included. The site will treat the developed runoff within the static pool surface of the 3 ponds. The 3 pond system will provide almost 25 ac-ft of storage. The site, when fully developed, will produce only 3 ac-ft of water quality runoff needed for treatment. The pond outfalls are located at the extreme ends from the inlets and therefore should not short circuit and allow sediment to settle.

The WQ calculations can be found in the Appendix.

DOWNSTREAM CHANNEL PROTECTION

Downstream channel protection is difficult to calculate in a multiple pond system especially with offsite runoff encroaching the system. Since this issue is not directly addressed in the Manual, we have calculated the orifice using the simplified method and only using the local flow – not the offsite flows (since these, in theory, should also be utilizing the extended detention once developed). For accomplishing this, we calculated the amount of channel protection volume needed using Hydraflow by subtracting the existing channel protection events volume from the developed conditions. From here, we came up with a flow rate based on the 24 hour and 48 hour time frames. The orifice equation was used to size a pipe for each time interval using the corresponding flow rate that was needed. We feel this is a conservative approach to this as the upper ponds will display some channel protection extended detention whereas the calculations do not account for any. As was stated previously, this particular pond series is not discussed in the manual so we have hand calculated an orifice size to best fit the system and to limit the change in volume over the 24-48 hour time interval.

The CP calculations can be found in the Appendix.

POTENTIAL UPSTREAM/DOWNSTREAM IMPACTS

Due to the construction of detention ponds, and the utilization of the existing outfall elevations, we do not anticipate any downstream impacts with this development. The site will accept all offsite runoff; therefore, no upstream impacts are expected. The site will also treat the required runoff for water quality purposes and provide extended detention for the channel protection storm.

SOURCE OF FLOODPLAIN INFORMATION

The site lies within a FEMA Zone X - Unshaded. The location of the property, on FEMA FIRM Panel 385 of 700 for Sedgwick County, Kansas, effective February 2, 2007, is attached as Exhibit 6.

FEDERAL, STATE, & LOCAL PERMITTING

US ARMY CORPS OF ENGINEERS

There does not appear to be any jurisdictional waters of the US on this site.

KANSAS DEPT OF AGRICULTURE – DWR PERMITTING

There does not appear to be any DWR permitting needed on the proposed site at this time. The areas of discharge do not account for more than 640 acres (1 square mile).

FEMA

There is no mapped floodplain located upon the proposed site. Therefore, no FEMA permitting is expected at this time.

KANSAS DEPT OF TRANSPORTATION

There does not appear to be any KDOT permitting associated with this project.

SEDGWICK COUNTY PERMITTING

There does not appear to be any Sedgwick County permitting needed at this time.

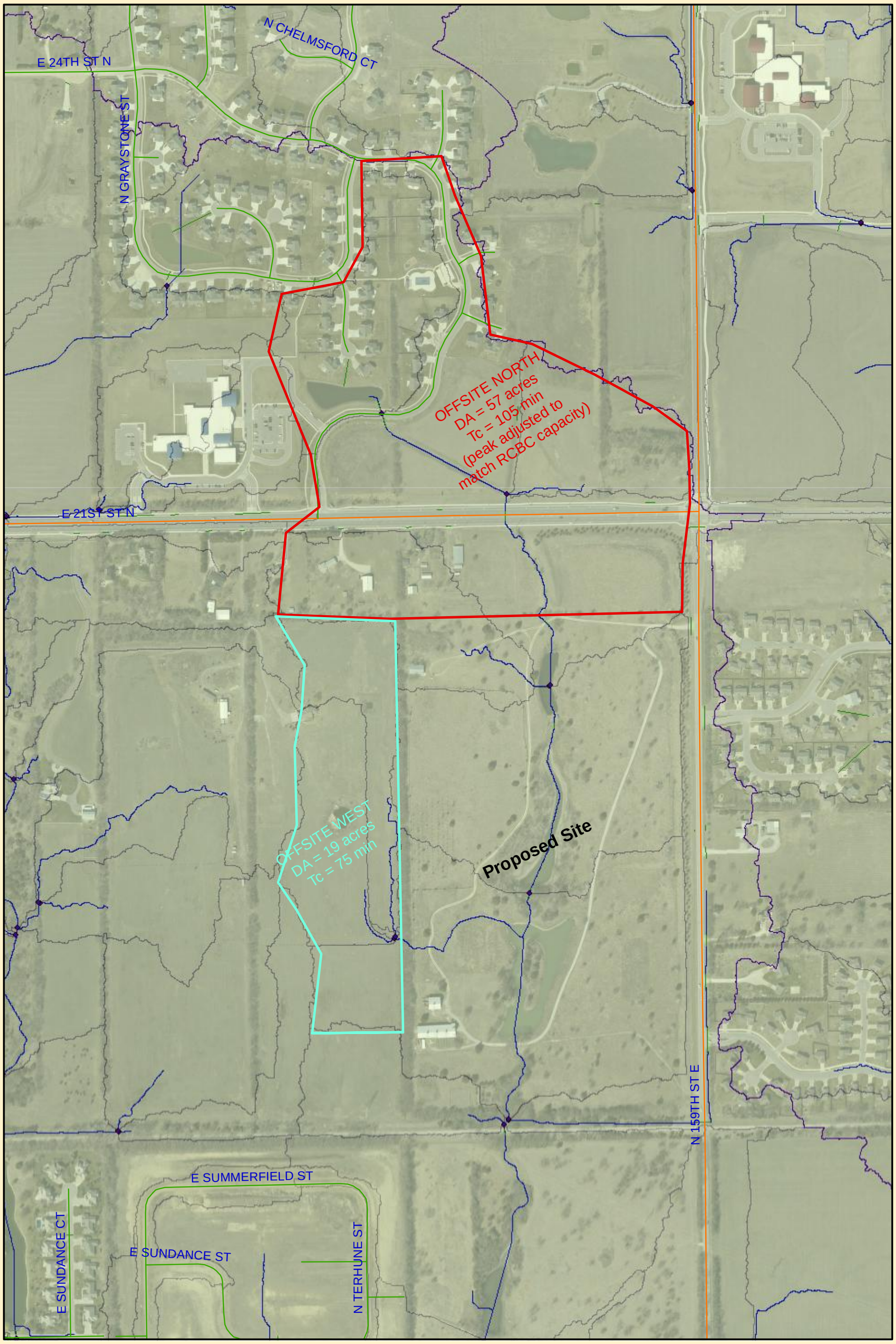
EXHIBIT 1: Site Location Map

EXHIBIT 2: Aerial Photo Exhibit with Lidar Topography

EXHIBIT 3: Plat – Half Scale

EXHIBIT 4: Drainage Plan – Half Scale

EXHIBIT 5: Floodplain Location (FIRM)



THE RANCH

0 200 400 800 Feet

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THE RANCH

0 100 200 400 Feet

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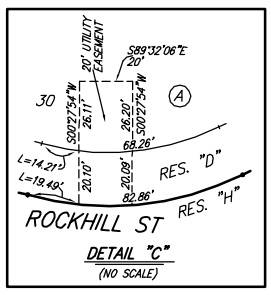
THE RANCH
AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS

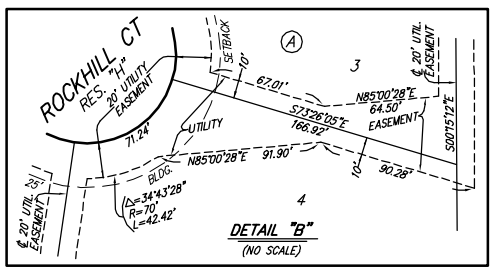
0' 100' 200'

- ● = #4 REBAR W/ "BAUGHMAN" CAP (SET)
- □ = #4 REBAR (FOUND)(ORIGIN UNKNOWN)
- △ = #4 REBAR W/ "PEC" CAP (FOUND)
- ○ = SEDGWICK COUNTY METAL CAP (FOUND)
- ◇ = 5/8" IRON PIPE IN THIMBLE (FOUND)
- ▽ = 3/4" IRON PIPE (FOUND)

(M) = MEASURED
(P) = PLATTED
(C) = CALCULATED
(D) = DESCRIBED
(CM) = CALCULATED PER MEASURED INFO.
(CD) = CALCULATED PER DESCRIBED INFO.
(QM) = QUARTER SECTION MEASUREMENT



DETAIL "C"
(NO SCALE)



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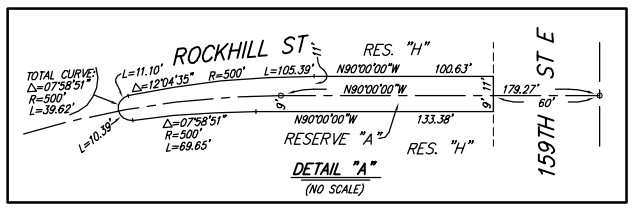


DETAIL "A"
(NO SCALE)

State of Kansas)
Sedgwick County) SS

We, Baughman Company, P.A., Surveyors in aforesaid county and state do hereby certify that we have surveyed and platted "THE RANCH", an Addition to Wichita, Sedgwick County, Kansas and that the accompanying plat is a true and correct exhibit of the property surveyed, described as follows: Commencing at the northeast corner of Section 12, Township 27 South, Range 2 East of the Sixth Principal Meridian, Sedgwick County, Kansas; thence along the east line of said Section 12 a distance of 300.00 feet; thence west, parallel with the north line of said Northeast Quarter, a distance of 52.50 feet to a point on the westerly right of way line of 159th Street East as described in Film 1668, Page 2, Sedgwick County Register of Deeds Office, said point being the point of beginning; thence west, parallel with the north line of said Northeast Quarter, a distance of 747.50 feet to a point 800.00 feet west of the east line of said Northeast Quarter; thence south, parallel with said east line, a distance of 140.00 feet to a point 440.00 feet south of the north line of said Northeast Quarter; thence west, parallel with said north line a distance of 529.00 feet; thence south deflecting left 89°44'00", a distance of 2218.14 feet to the south line of said Northeast Quarter; thence east, a distance of 1319.18 feet to the southeast corner of said Northeast Quarter; thence north 2309.84 feet to a point 350.00 feet south of the northeast corner of said Northeast Quarter; thence west, parallel with the north line of said Northeast Quarter, a distance of 30.00 feet; thence northwest along the westerly right-of-way line of said Film 1668, Page 2 to the point of beginning.

All being situated in Northeast Quarter of Section 12, Township 27 South, Range 2 East of the Sixth Principal Meridian, Sedgwick County, Kansas.

Existing public easements and dedications being vacated by virtue of K.S.A. 12-512b, as amended.

Baughman Company, P.A.

_____, Surveyor
Michael G. Conrey

Know all men by these presents that we, the undersigned, have caused the land in the surveyors certificate to be platted into Lots, a Block, a Street, and Reserves to be known as "THE RANCH", an Addition to Wichita, Sedgwick County, Kansas. The utility easements are hereby granted as indicated for the construction and maintenance of all public utilities. The emergency access and utility easement is hereby granted as indicated for emergency access purposes and for the construction and maintenance of all public utilities and no fences or any other obstructions shall be constructed or placed on or within this easement. All utilities installed or constructed within the emergency access and utility easement shall be installed or constructed at or below finished grade. The street is hereby dedicated to and for the use of the public. Reserve "A" is hereby reserved for open space, landscaping, private streets, berms, drainage purposes, sidewalks, entry monuments, and utilities. Reserve "B" is hereby reserved for open space, sidewalks, landscaping, berms, drainage purposes, entry monuments, utilities as confined to easements, and one access corridor over and across the north 548 feet of said Reserve "B" for access purposes to or from 159th Street North for the exclusive benefit of Lot 29, Block A. Reserve "C" is hereby reserved for open space, sidewalks, landscaping, berms, drainage purposes, entry monuments, utilities as confined to easements, and one access corridor over and across the south 404 feet of said Reserve "C" for access purposes to or from 159th Street North for the exclusive benefit of Lot 32, Block A. Reserve "D" is hereby reserved for open space, landscaping, sidewalks, berms, drainage purposes, utilities as confined to easements, and one access corridor over and across said Reserve "D" for access purposes to or from Reserve "H" for the exclusive benefit of Lot 30, Block A. Reserve "E" is hereby reserved for open space, sidewalks, landscaping, berms, drainage purposes, utilities as confined to easements, and one access corridor over and across said Reserve "E" for access purposes to or from Reserve "H" for the exclusive benefit of Lot 31, Block A. Reserves "F" and "G" are hereby reserved for open space, landscaping, berms, sidewalks, gazebos, lakes, drainage purposes, and utilities as confined to easements. Reserve "H" is hereby reserved for open space, entry gates and related appurtenances, landscaping, berms, drainage purposes, sidewalks, utilities, and private streets. Drainage Reserve "32" is hereby reserved for open space, landscaping, and drainage purposes. Drainage Reserve "32" shall be owned and maintained by the owner of Lot 32, Block A. Reserves "A", "B", "C", "D", "E", "F", "G", and "H" shall be owned and maintained by the homeowners association for the addition provided, however, that the undersigned, or the homeowners association, as the undersigned's successor in interest, may, in their discretion, deed a parcel of a Reserve to an owner or owners of an adjacent Lot, subject to the obligation to maintain such deeded parcel of a Reserve in compliance with the provisions hereof and in compliance with the maintenance covenants of any applicable restrictive covenants and/or regulations. Access controls shall be as depicted on the face of the plat and are hereby granted to the City of Wichita, Kansas. The Minimum Building Pad Elevations for the lowest opening to the structures shall be as indicated on the face of the plat.

Ritchie Associates, Inc.

_____, President
Kevin M. Mullen

State of Kansas)
Sedgwick County) SS

The foregoing instrument acknowledged before me, this_____day of_____, 2013, by Kevin M. Mullen, President of Ritchie Associates, Inc., on behalf of the corporation.

_____, Notary Public

My App't. Exp._____

We, the undersigned holders of a mortgage on the above described property, do hereby consent to this plat of "THE RANCH", an Addition to Wichita, Sedgwick County, Kansas.

INTRUST Bank, N.A.

_____, _____
(Title)

State of Kansas)
Sedgwick County) SS

The foregoing instrument acknowledged before me, this_____day of_____, 2013, by_____, _____ (Title) of INTRUST Bank, N.A., on behalf of the bank.

_____, Notary Public

My App't. Exp._____

This plat of "THE RANCH", an Addition to Wichita, Sedgwick County, Kansas has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this_____day of_____, 2013.
Wichita-Sedgwick County Metropolitan Area Planning Commission

_____, Chair
David Dennis

_____, Secretary
John L. Schlegel

This plat approved and all dedications shown hereon accepted by the City Council of the City of Wichita, Kansas, this_____day of_____, 2013.

_____, Mayor
Carl Brewer

_____, City Clerk
Karen Sublett

Reviewed in accordance with K.S.A. 58-2005 on this_____day of_____, 2013.

_____
Tricia L. Robello, L.S. #1246
Deputy County Surveyor
Sedgwick County, Kansas

Entered on transfer record this_____day of_____, 2013.

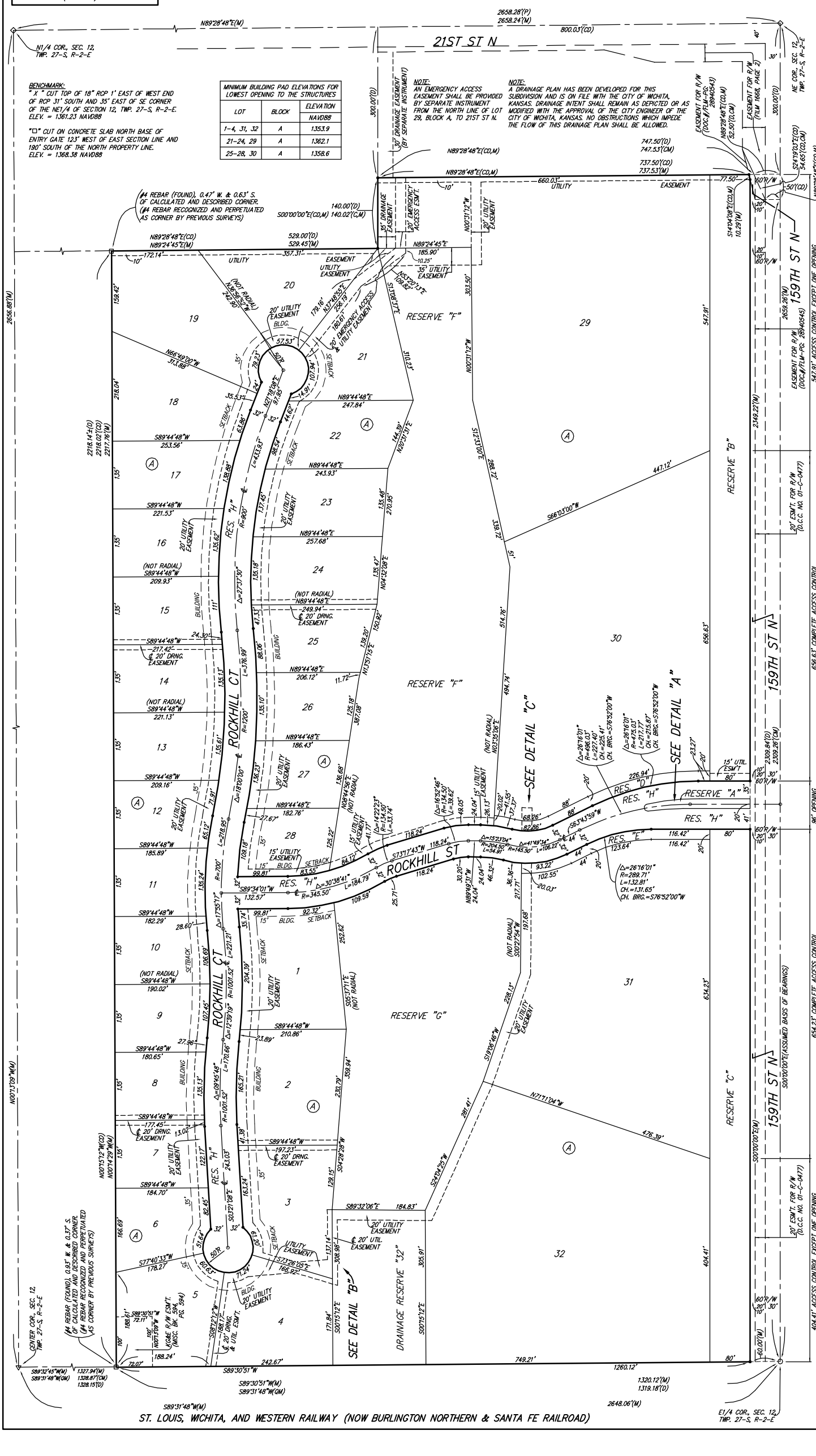
_____, County Clerk
Kelly B. Arnold

State of Kansas)
Sedgwick County) SS

This is to certify that this plat has been filed for record in the office of the Register of Deeds, this_____day of_____, 2013 at_____o'clock__M; and is duly recorded.

_____, Register of Deeds
Bill Meek

_____, Deputy
Tonya Buckingham



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

DRAINAGE PLAN

THE RANCH

AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS

Offsite from North
3x4 RCBC
Area = 57 acres
CN = 72*
Tc = 105 min
Q_2 = 22 cfs
Q_5 = 37 cfs
Q_{10} = 49 cfs
Q_{25} = 65 cfs
Q_{100} = 97 cfs

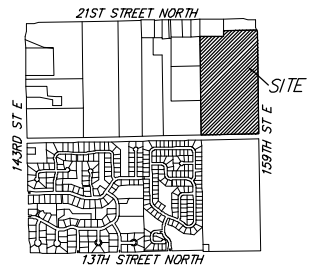
*Adjusted to closely match max capacity of 3x4 RCBC. At HW/D = 1, Q = 69 cfs. Max capacity before overtopping roadway, Q = 93 cfs.

LEGEND

- SWS — Proposed SWS
- Drainage Basin Boundary
- Proposed Flow Direction
- (A) Proposed Drainage Basin

0 100 200

DATE OF PREPARATION: 8 OCTOBER 2012
DATE OF TOPOGRAPHY: 27 SEPTEMBER 2012
CONTOUR INTERVALS = 1 FOOT



VICINITY MAP
SEC. 12, T27S, R2E

NORTH POND (Static = 1356.5)			
STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	65 cfs	20 cfs	1357.9
10 yr	118 cfs	46 cfs	1359.0
100 yr	202 cfs	92 cfs	1360.1

NORTH POND	
ELEVATION	AREA (sq ft)
1356.5	77500
1357	85400
1358	97000
1359	110310
1360	124000
1361	130000

MIDDLE POND (Static =1354.0)			
STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	35 cfs	21 cfs	1354.5
10 yr	67 cfs	47 cfs	1355.0
100 yr	121 cfs	76 cfs	1356.6

MIDDLE POND	
ELEVATION	AREA (sq ft)
1354	62300
1355	80000
1356	105900
1357	136100
1358	161500
1359	170000

SOUTH POND (Static = 1349.0)			
STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	56 cfs	23 cfs	1350.1
10 yr	108 cfs	56 cfs	1351.1
100 yr	190 cfs	104 cfs	1351.9

SOUTH POND	
ELEVATION	AREA (sq ft)
1349	134000
1350	143700
1351	153700
1352	164000
1353	174400
1354	185000

Land Use	Hydrologic Soil Group A	B	C	D	Land Use	Hydrologic Soil Group A	B	C	D
Undisturbed	0.02	0.03	0.04	**0.05**	Undisturbed	55	71	80	**84**
Turf or Disturbed Soils	0.15	0.20	0.22	**0.25**	Turf or Disturbed Soils	71	80	84	**88**
Impervious Cover	0.95	0.95	0.95	**0.95**	Impervious Cover	88	90	90	**90**

Basin #	Undist. ft²	Dist. ft²	Red. Imp. ft²	New Imp. ft²	Total Area ft²	Weighted Volumetric Runoff Coef. (Rv) (eq. 4-24*) U %	D %	Redev. I %	I %	R_v %	WQ_v ft³ eq. 4-25*
Res Lots	0	326,700	0	980,100	1,306,800	0.000	0.063	0.000	0.713	**0.7750**	**101,277**
Estate Lots	1,215,330	0	0	135,030	1,350,360	0.028	0.000	0.000	0.095	**0.1229**	**16,595**
N Comm	0	26,130	0	148,100	174,230	0.000	0.037	0.000	0.808	**0.8450**	**14,723**
TOTALS	**1,215,330**	**352,830**	**0**	**1,263,230**	**2,831,390**						**132,595**

Pond Volume Below Static Pool						
Basin	Static Pond Sq.Ft.	Pond Bottom Area Acre	Sq. Ft.	Depth Feet	Acre	Volume Acre-Ft.
N Pond	62184	1.4	34000	0.8	7	7.7
M Pond	54000	1.2	27500	0.6	7	6.5
S Pond	80000	1.8	50000	1.1	7	10.4
Totals:		1.4		0.8		24.7

Pond Volume > WQ_v		
Pond	WQ_v	Check
24.7	3.0	Yes

Basin	% Impervious	Composite Cn
Residential Lots	25%	91
Estate Lots	10%	85
N Commercial	85%	97

Offsite from West
Ag Field
Area = 19 acres
CN = 80*
Tc = 75 min
Q_2 = 14 cfs
Q_5 = 22 cfs
Q_{10} = 27 cfs
Q_{25} = 35 cfs
Q_{100} = 49 cfs

*Pre-developed or Undisturbed Pervious in Soil Type C. Currently of farmed and tilled cropland.

(A) Offsite flow from the west enters the property and will be conveyed through SWS to the southern pond. The offsite flow will be detained and then released to the south channel section.

(B) The ultimate discharge point for this basin (including this site and offsite areas) is a railroad box culvert located at point B. The box is a 12x10 RCBC under the (former) elevated railroad. The proposed flow was calculated using the three upstream ponds detained flows and the undetained adjacent residential lots from the east and west.

Existing Flow at Point B	Proposed Flows at Point B
Q_2 = 44 cfs	Q_2 = 33 cfs
Q_5 = 63 cfs	Q_5 = 53 cfs
Q_{10} = 75 cfs	Q_{10} = 64 cfs
Q_{100} = 118 cfs	Q_{100} = 108 cfs

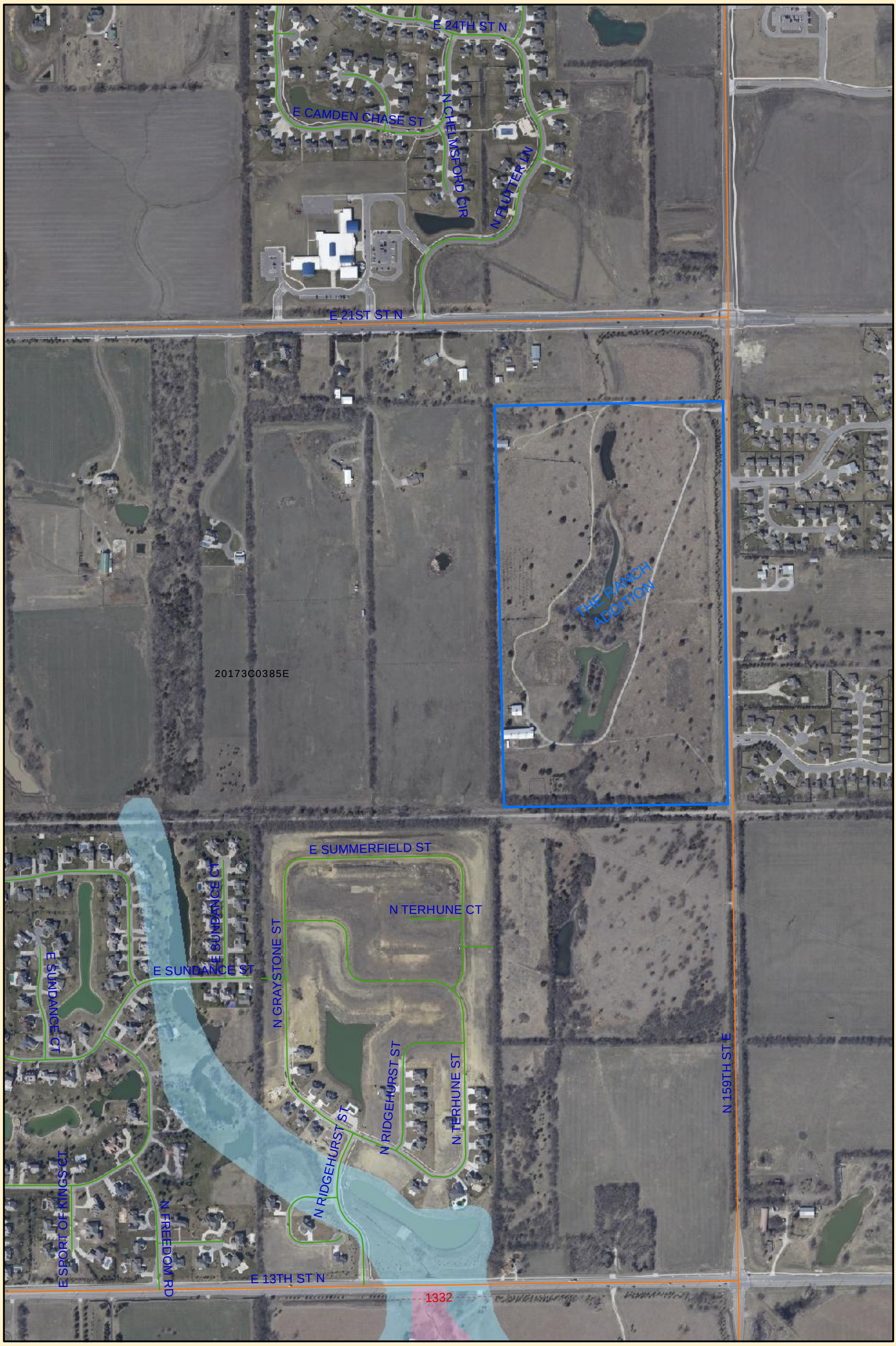
NOTES: There is no FEMA SFHA located on this property as of this date per FEMA FIRM Panel 385 of 700, for Wichita, Sedgwick County, Kansas; effective February 2, 2007.

The internal Storm Water Sewer will drain the developed lots/streets into the proposed pond system. On-site private SWS will serve individual lots and tie into the public SWS system as shown.

Basin	Description	Area (acres)	CN	Tc (min)	Q2 (cfs)	Q5 (cfs)	Q10 (cfs)	Q25 (cfs)	Q100 (cfs)
A	N Estate Lot & N Comm	13.5	84	15	33	48	58	72	97
B	W Dev to N Pond	10.3	87	15	28	40	48	58	77
C	W Dev to Middle Pond	6.0	87	15	16	23	28	34	45
D	Estate Lot to Mid Pond	5.2	84	15	13	18	22	28	38
E	SW Dev to South Pond	7.0	87	15	19	27	32	40	53
F	S Estate to South Pond	8.8	84	15	22	31	38	47	63
G	S Undetained	10.0	86	15	26	37	45	55	74

DRAINAGE PLAN
THE RANCH
18 JUNE 2013

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



THE RANCH

0 250 500 1,000 Feet

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SUPPORTING CALCULATIONS

APPENDIX A: Soil Borings

APPENDIX B : HydraFlow Hydrographs
- Existing Conditions & Existing Pond Routing
- Developed Conditions & Pond Routing

APPENDIX C : HydraFlow SWS
- System 1
- System 2
- System 3

APPENDIX D : Water Quality & Channel Protection

Soil Borings

HydraFlow Hydrographs

Existing Conditions & Existing Pond Routing
Developed Conditions & Pond Routing

HydraFlow SWS

System 1
System 2
System 3

Water Quality
&
Channel Protection

Table 4-13 Volumetric Runoff Coefficients by Land Use and Hydrologic Soil Group

Land Use	Hydrologic Soil Group				Land Use	Hydrologic Soil Group			
	A	B	**C**	D		A	B	**C**	D
Undisturbed	0.02	0.03	0.04	**0.05**	Undisturbed	55	71	80	**84**
Turf or Disturbed Soils	0.15	0.20	0.22	**0.25**	Turf or Disturbed Soils	71	80	84	**88**
Impervious Cover	0.95	0.95	0.95	**0.95**	Impervious Cover	98	98	98	**98**

Basin	**Weighted Volumetric Runoff Coef. (R_v) (eq. 4-24*)**										**WQ_v**
	Undist.	Dist.	Red. Imp.	New Imp.	Totol	U	D	Redev. I	I	**R_v**	**ft^3**
#	ft^2	ft^2	ft^2	ft^2	Area ft^2	%	%	%	%	%	**eq. 4-25***
Res Lots	*0*	*326,700*	*0*	*980,100*	1,306,800	0.000	0.063	0.000	0.713	**0.7750**	**101,277**
Estate Lots	*1,215,330*	*0*	*0*	*135,030*	1,350,360	0.028	0.000	0.000	0.095	**0.1229**	**16,595**
N Comm	*0*	*26,130*	*0*	*148,100*	174,230	0.000	0.037	0.000	0.808	**0.8450**	**14,723**
TOTALS	***1,215,330***	***352,830***	***0***	***1,263,230***	***2,831,390***						***132,595***

91

Pond Volume Below Static Pool						
	Static	**Pond Bottom Area**			**Depth**	**Volume**
Basin	**Sq.Ft.**	**Acre**	**Sq. Ft.**	**Acre**	**Feet**	**Acre-Ft.**
N Pond	62184	1.4	34000	0.8	7	7.7
M Pond	54000	1.2	27500	0.6	7	6.5
S Pond	80000	1.8	50000	1.1	7	10.4
Totals:		1.4		0.8		24.7

Pond Volume > WQv		
Pond	**WQv**	**Check**
24.7	3.0	**Yes**

Basin	**% Impervious**	**Composite CN**
Residential Lots	25%	91
Estate Lots	10%	85
N Commercial	85%	97

THE RANCH CPv

By TRK | Date 6.17.13 | Page 1 | Of

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VOLUME · EXISTING 1yr = 304,593 ft³ (volumes from HydraFlow for each conditions.)

· DEVELOPED 1yr = 405,409 ft³

CPv needed = Δ = 100,816 ft³

- TO RELEASE VOLUME IN 24 HOURS -

$24 \text{ HOURS} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{60 \text{ sec}}{1 \text{ min}} = 86,400 \text{ sec}$

$Q = \frac{100,816 \text{ ft}^3}{86,400 \text{ sec}} = 1.17 \text{ ft}^3/\text{sec}$ (size orifice for this flow)

ORIFICE EQ:

$Q = CA(2gH)^{.5}$ H=? Assume 4" Head from centroid = 0.33'

$1.17 = (0.8)(2 \times 32.2 \times 0.33)^{0.5} A$

$A = 0.316 \text{ ft}^2$
$= 45.5 \text{ in}^2 \longrightarrow D = 7.6 \text{ in}$

- TO RELEASE VOLUME IN 48 HOURS -

$48 \text{ HOURS} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{60 \text{ sec}}{1 \text{ min}} = 172,800 \text{ sec}$

$Q = \frac{100,816 \text{ ft}^3}{172,800 \text{ sec}} = 0.58 \frac{\text{ft}^3}{\text{sec}}$ (size orifice for this flow)

ORIFICE EQ:

$Q = CA(2gH)^{.5}$ H=? Assume 6" Head for smaller pipe H=0.5'

$0.58 = (0.8)(2 \times 32.2 \times 0.5)^{.5} A$

$A = 0.128 \text{ ft}^2$
$= 18.4 \text{ in}^2 \longrightarrow D = 4.8 \text{ in}$

- TO RELEASE THE CPv over 24 HOURS USE 8 in ORIFICE, UP TO 48 HOURS USE 5" ORIFICE..... IN THIS CASE WE RECOMMEND 5" ORIFICE, TO FALL BETWEEN THE REQUIRED 24-48 HOUR TIME INTERVAL.

Drainage Plan

1:100 Scale