FINAL STORMWATER DRAINAGE STUDY

PARAGON STAR VILLAGE MIXED-USE DEVELOPMENT

Prepared for Paragon Star, LLC
GBA NO. 12720

September 13, 2019

9801 Renner Boulevard, Ste. 300
Lenexa, KS 66219-9745
913.492.0400 | www.gbateam.com

9801 Renner Boulevard
Lenexa, KS 66219

TABLE OF CONTENTS

Introduction: 2
Methodology: 2
Existing Conditions: 3
Wetland Impacts: 4
Proposed Conditions: 4
Stream Buffer Zone: 5
Water Quality: 5
Flood Study: 6
Stormwater Detention Study: 8
Summary and Recommendations: 9

APPENDIX A – LOCATION INFORMATION A-1

Exhibit 1 - Location Maps

Figure 1 – Location Map
Figure 2 – USGS Topographic Map

APPENDIX B – EXISTING CONDITIONS A-2

Exhibit 2 - FEMA Insurance Rate Maps, FIRMette

Exhibit 3 - USDA Soil Resource Report

Exhibit 4 – Historic Topographic and Aerial Map with Lagoon Location

Exhibit 5 - Longview Dam Breach EAP Exhibit

Exhibit 6 - Existing Conditions Plan

APPENDIX C – PROPOSED CONDITIONS A-3

Plan Sheets C003 and C004 - Grading Plan

Plan Sheets C009, C010, and C011 - Utility Plans

Plan Sheets C012 and C013 - Drainage Map and Calculations

Exhibit 7 - Regional Drainage Map

Exhibit 8 - U.S. Army Corps of Engineers 404 Permit

Exhibit 9 - MDNR 401 Water Quality Certification and Permit

APPENDIX D – WETLAND DELINEATION & PERMITS A-4

APPENDIX E – FLOOD STUDY EXHIBITS A-5

APPENDIX F – MASS GRADING CULVERT ANALYSIS & STREAM ASSESSMENT A-6

Introduction:

Paragon Star, LLC proposes to construct a multi-use development on a 120 acre site located at the northeast corner of Interstate 470 and View High Drive in Lee's Summit, Missouri. The development includes a sporting complex with 10 synthetic turf fields with lighting, multi-purpose clubhouse, and associated parking areas. The development also includes a mixed-use building zone or "village" that includes hotel, restaurant, and entertainment accommodations, new housing and office options and, associated parking areas. A roadway network, trail system, and utilities, including storm sewer, sanitary sewers, natural gas, and electric service, will also be constructed within the development.

In addition to discussing the overall development conditions, this report will serve as the final stormwater drainage study for the first phase of development of the mixed-use portion of the Paragon Star development. The mixed-use development will encompass approximately 38 acres of the Paragon Star property. The proposed site is situated between Interstate 470 and the Little Blue River. Paragon Parkway will be constructed running east-west, bisecting the mixed-use development. Paragon Parkway will connect to the south roundabout on River Road on the east and the new roundabout on View High Drive to the west.

Methodology:

The Study methodology is based on allowable methods and procedures outlined in "The City of Lee's Summit Design and Construction Manual and the Kansas City Metro Chapter of the American Public Works Association (APWA) Section 5600. A summary of each component of the report is provided below.

- Storm depths are based on TR-55 (24 hour duration).
- The October 2012 Edition of the MARC BMP Manual was used for water quality calculations.
- The flood study is based on analysis performed with HEC-RAS 4.1.0 software and the FEMA flood study for the area dated October 10, 2014.
- The Stormwater Detention Study was performed using XP-SWMM. See Flood Study portion of this report for further information.
- The Flood Study HEC-RAS data was obtained from FEMA.

Existing Conditions:

The 120 acre project site is located in Lee's Summit, Jackson County, Missouri at the northeast corner of Interstate 470 and View High Drive. The site ranges in elevation from approximately 796 feet along the Little Blue River and approximately 920 feet to the north. The site sits within the Little Blue River watershed. The Little Blue River flows through the southern portion of the site from west to east. The Little Blue River enters the site via a triple 20'x15' RCB under the existing View High Drive. The site is covered by both wooded areas and open grassed areas and drains via overland flow and through small unnamed tributaries to the Little Blue River. A total of 66.4 square miles drain to the Little Blue River before it exits the project site. The existing floodplain boundary for the Little Blue River covers approximately half the project site, with 22 acres of existing wetlands in the floodplain.

Of the 120 total acres, 38 acres will be developed within Lee's Summit for the mixed-use portion of the property.

Wastewater lagoons were previously constructed on the site, and since abandoned and filled in. The fill has since settled and created a low lying area and the majority of the wetlands which exist on site today. The location of previous lagoons can be found in Appendix B.

The currently adopted FEMA Flood Insurance Rate Maps (FIRM) for the project site are designated Community Panel No. 29095C0279F, revised September 29, 2006 and Community Panel No. 29095C0287F, revised September 29, 2006. However, as instructed by the City of Lee's Summit and FEMA, GBA has used the preliminary FIRM numbered 29095C0404G and 29095C0412G, both dated October 10, 2014. The preliminary FIRMs are to be adopted as the current standard in the near future and were used in the analysis of the site. The property lies partially within an area designated as Zone X and Zone AE. Zone X areas, when not hatched, are areas determined to be outside the 0.2% annual chance floodplain. Zone X, when hatched, are areas of 0.2% annual chance flood and areas of 1% annual chance flood with average depths less than 1 foot. Zone AE is described as a special flood hazard area subject to inundation by the 1% annual chance flood, with base flood elevations determined. See Appendix B for details.

According to the NRCS soil report, the undisturbed site consisted of group C and group D soil groups. Existing soils have been considered as group C for conservative water quality calculations. A negligible amount of impervious surface is located on site, however approximately 1.54 acres of gravel surface has been created near the southern property line. Using this data, a composite curve number (CN) of 76 was calculated for the existing site. See Appendix C for details.

No stormwater detention facilities are currently located on site. The project site is located within the Little Blue River watershed.

The Little Blue River and its tributaries are subject to APWA Section 5605.3 - Stream Preservation and Buffer Zones. Stream buffer zone widths are dependent on each stream's tributary area. The stream buffer zone is measured from the ordinary high water mark of the stream and extends outwards, on each side of the waterway, the appropriate length. Streams with tributary areas greater than 5000 acres have a stream buffer zone of 120 feet on either side. The current condition of the buffer through the project site is dense hardwood vegetation.

The site is located downstream of Longview Dam, and therefore is included in the *Longview Lake Emergency Action Plan,* dated July 2011, produced by the US Army Corps of Engineers. In the unlikely event Longview Dam fails, the project area would be inundated by the high flows produced by the failure. An exhibit from the aforementioned emergency action plan has been included in Appendix B to show the limits of inundation in the event of dam failure.

Approximately 103 acres upstream of the site drain through the project area, under Interstate 470 through a concrete culvert a and an unnamed tributary to the Little Blue River. The tributary is located near the southeast corner of the project area.

Wetland Impacts:

On January 19, January 28th, February 7th, and April 10, 2013 the *Preliminary Waters of the U.S. Delineation* (Delineation) was completed at the project site. In summary, the Delineation process identified 20.61 acres of wetlands to be filled and 1,089 linear feet of three ephemeral streams to be piped or filled. The project proposes to redevelop the property as a soccer complex and mixed-use development which will require multiple anticipated permanent fills within potential jurisdictional waters. See Appendix D for details. The full Wetland Delineation report, including Routine Wetland Determination Data Forms can be provided upon request.

A U.S. Army Corps of Engineers permit has been acquired for wetland and stream fills. The purchase of 20.61 acres of wetland credits and 3,403 stream credits from an approved compensatory mitigation bank in the service area of the project is required prior to project commencement. A 401 Water Quality Certification and permit has also been acquired through the Missouri Department of Natural Resources. Permits from U.S. Army Corps of Engineers and MDNR are included in Appendix C.

A tributary of the Little Blue River crosses under Interstate 470 and enters the project site near the southeast corner. This Jurisdictional Water of the U.S. has not been permitted to be filled and will be permitted prior to development of this portion of the site. The first phase of the mixed-use development does not impact this tributary.

Proposed Conditions:

Paragon Star, LLC proposes to construct a mixed-use building zone or “village” that includes hotel, restaurant, entertainment accommodations, new housing, and office options with the associated parking areas and infrastructure. The purpose of this study is to analyze the mixed-use development.

The mixed-use development will encompass approximately 38 acres of the Paragon Star property. The proposed site is situated between Interstate 470 and the Little Blue River. Paragon Parkway will be constructed running east-west and will bisect the mixed-use development. Paragon Parkway will connect to the south roundabout on River Road on the east and the new roundabout on View High Drive to the west.

Full build out of the area as shown in the preliminary development plan includes approximately 18.53 acres of impervious surface through pavement and building area. The first phase of development includes approximately 13.54 acres of impervious surface. See the Stormwater Detention section of this report for stormwater detention discussion.

The first phase of development of the mixed-use area includes Paragon Parkway, the retail/commercial south of the Paragon Parkway, one office building south of Paragon Parkway, and the associated parking and infrastructure. The multi-family and commercial/retail north of Paragon Parkway, the two buildings southeast of the courtyard, and the hotels towards the southeast corner of the property will be part of a later phase of development. See Appendix C for details.

Storm drainage on site will be handled with enclosed storm sewer. Storm sewer has been designed per City of Lee's Summit standards, to the 10-year storm. Streets and parking lots will be provided with curb, gutter, and curb inlets to divert local drainage into the storm sewer system. Multiple storm sewer lines, consisting of RCP and HDPE, will collect stormwater from the proposed development and convey it to the Little Blue River. The enclosed storm sewer will discharge into the Little Blue River along various points throughout the project. Storm sewer layout and calculations can be found in Appendix C.

An unnamed tributary of the Little Blue River currently crosses under Interstate 470 and enters the project site near the southeast corner. Approximately 103 acres drain to the tributary, with an estimated C value of 0.40. This Jurisdictional Water of the U.S. has not been permitted to be filled through the U.S. Army Corps of Engineers and will be permitted prior to development of this portion of the site. The hotels in this area are not to be constructed with the first phase of development. When the area is developed, the tributary will be conveyed in a large diameter pipe (84" Dia.) or reinforced concrete box (7'x6').

Stream Buffer Zone:

The Little Blue River within the site is subject to a 120 foot stream buffer zone. Existing trees will be preserved where possible within the entire property; however, the bulk of the preserved trees will lie within the stream buffer zone. Bridges will be constructed to allow floodway function and minimize scour. At locations where grading within the stream corridor is required, the graded areas are to be restored as vegetated stream corridor. See Appendix C for grading details.

Water Quality:

The stream corridor following the Little Blue River and its tributaries will be preserved or restored. All disturbed areas within the stream corridor will be replanted with native vegetation, aside from the fire access road on the north side of the development.

Other water quality BMPs are provided within the Paragon Star development, including bioretention planters, native vegetation, and an existing U.S. Army Corps of Engineers jurisdictional wetland. These

BMPs are located on the north side of the Little Blue River, with the soccer complex, and are described in the associated stormwater report, dated January 28, 2019, prepared by GBA.

Flood Study:

The objective of this Flood Study is to report the floodplain impacts of the proposed Paragon Star development, located near View High Drive and I-470 in Lee's Summit, Missouri. Little Blue River flows through the property and will be affected by the project. Expected changes to the hydraulics of both flooding sources were evaluated for the impacts on the flood elevations beyond the property limits and the location of the FEMA Special Flood Hazard Area (SFHA) and Floodway. The Flood Study results were also utilized to establish low opening elevations for buildings as well as street and parking lot elevations, and to size the roadway and pedestrian bridges that will cross the river.

The project proposes placing fill within a federally defined floodplain as well as redefining the regulatory floodway. Therefore, a Conditional Letter of Map Revision (CLOMR) is required. To meet the objectives of this Flood Study and the CLOMR, the analyses and discussion provided in this report are based on the following data:

- Preliminary hydraulic model (HEC-RAS 4.1.0) for Little Blue River, received from the City of Lee's Summit
- FEMA panels 29095C0404G and 29095C0412G, Preliminary October 10, 2014

Per City guidance, this Flood Study and subsequent CLOMR were based on the October 10, 2014 preliminary model and FIRM panels rather than the September 29, 2006 Effective data. The preliminary data show changes since the effective date that include an approximately 4-ft increase in the BFE and a floodway calculation.

Site Description

Little Blue River enters the project site at View High Drive, flows East, and leaves the property as it flows through the abandoned railroad bridge located approximately 4,800-ft downstream of View High Drive. Cedar Creek, a tributary of Little Blue River, enters the project site approximately 520-ft upstream of the abandoned railroad bridge. The Cedar Creek floodplain is not impacted by the proposed Paragon Star development. A total of 66.4 square miles drain to the project site, with 8-square miles below and unaffected by Longview Dam (Appendix E: Exhibit A).

The existing floodplain boundary for Little Blue River is broad and covers over half of the land area of the site (Appendix E: Exhibit B). The water surface elevations through the site are currently controlled by backwater effects from the Railroad bridge. The bridge is not currently in use by the railroad. Near the downstream end of the project site, between cross section stations 56837.7 and 59234.2, approximately 22 acres of existing wetlands are in the floodplain. There are currently no bridges crossing Little Blue River between the Railroad bridge and View High Drive. Beyond the limits of the project area, Upstream of I-470, there is one building located within the Preliminary floodway.

Model Development

The Duplicate Effective, Corrected Effective and Proposed Conditions Models contain profiles for the 100-, 10-, 4-, 2-, 1-, and 0.2-percent chance flows for existing conditions. Table 1 provides a list of the name and description of the plan files that are included in the HEC-RAS model.

Table 1: Description of model plans and water surface profiles used in the Flood Study

HEC-RAS Plan	Plan Short ID	Flow Profiles	Description
Duplicate Effective	DuplicateEffecti	100yr, FDWY, 500yr, 50yr, 25yr, 10yr, 1yr	Copy of the 2014 Preliminary Model received from City of Lee's Summit
Corrected Effective	CorrectedEff	100yr, FDWY, 500yr, 50yr, 25yr, 10yr, 1yr	Duplicate Effective model updated with topography collected in 2015, survey data collected in 2016, the Railroad bridge at the downstream limits of the project area, and additional cross sections placed where needed to
Proposed Conditions	Proposed	100yr, FDWY, 500yr, 50yr, 25yr, 10yr, 1yr	Corrected Effective model updated to model proposed development and its effects on the floodplain.

To determine if the proposed project would impact the 1-percent chance floodplain elevations outside of the project area, the model was studied sufficiently upstream and downstream of the project area. The model contains the entire studied Little Blue River reach length, though proposed changes to the model were limited to between cross section stations 56362.9 and 63690.9.

Prior to updating the model with the proposed development, a Corrected Effective Model was created to correct any errors that were observed in the Duplicate Effective Model. Modifications to the model include adding in the railroad bridge at the downstream end of the project area, just downstream of lettered cross section AT (station 56549.9). This bridge was in place at the time the model was developed for the 2014 Preliminary DFIRM, but was not included in that analysis. All of the previously modeled cross sections were updated in the overbank areas with revised topographic data collected in 2015, and in-stream data was revised with detailed survey collected in 2016. Cross sections were added at the following stations: 56658, 58764.42, 58788.61, 58807.06, 58996.41, 59645.95, and 60101.84. These sections were added to properly model the impacts of the proposed development at those locations. Lettered cross section AV (station 60784.3) was relocated to station 60736.85 for the purpose of modeling a proposed bridge and cross section AX (station 61539.3) was relocated to station 61487.2 because it was not positioned right at the upstream face of the culvert under View High Drive in the Preliminary model. Overbank Manning's N-values were revised based on a site visit conducted on April 12, 2016.

The Proposed Conditions Model was developed using the proposed 2' contours and infrastructure layout shown on Exhibit B (Appendix E). Two open span bridges that will pass the 1-percent chance event have been proposed at approximate river stations 58924.5 and 60897.3. Two pedestrian bridges which the 1-percent chance event will overtop have been proposed at approximate stations 58776.11 and 59687.6.

Manning's n values were adjusted throughout the project areas to model the proposed changes in land use due to the development.

Flood Study Results

Exhibit B (Appendix E) displays a comparison of the Preliminary, Corrected Effective, and the Proposed Conditions floodplain and floodway. Table 2 (Appendix E), with Exhibit C (Appendix E), presents a comparison of the water surface elevation results from the Duplicate Effective, Corrected Effective, and Proposed Conditions models for Little Blue River from the downstream limits of the project area to just downstream of Longview Dam. The proposed conditions floodplain boundaries for Little Blue River decreased in width within the project area. Upstream of the proposed development, the water surface elevation increases a maximum of 0.2' from the upstream face of View High Drive to just downstream of Longview Lake.

Stormwater Detention Study:

The objective of the detention study was to determine the impacts of increasing the impervious area of the site with the planned conditions. If the proposed project was found to increase the peak discharge of Little Blue River at any point downstream of the project site, then detention would be required onsite. The site drains directly into Little Blue River as it runs from the west to the east through the site. Little Blue River has a watershed area of 66.4 square miles (42,500 acres) where it leaves the project site. The project area is 136 acres and makes up approximately 0.3% of the total Little Blue River watershed.

Existing land use of the project area is undeveloped wetlands, wooded riparian area and floodplain, and maintained grassland. The land use for the proposed, mixed use development will consist of soccer fields, roadways, buildings, and parking lots. To model the change in land use and the resulting impacts on the hydrology of the site, the XP-SWMM model that was used in the development of the FEMA flows was obtained from the City of Lee's Summit.

The XP-SWMM model was updated to use the SCS Hydrology methodology in the runoff mode on the sub-basins within the project area. Times of Concentration were calculated for existing conditions and updated in the model. The existing model was run and the existing hydrograph was exported.

The model was then updated with the increased impervious percentages and updated times of concentration for the proposed conditions model. The proposed model was run and the proposed hydrograph was exported.

The existing hydrograph for the channel downstream of the site was compared to the proposed hydrograph (see below). The existing hydrograph has a higher peak flow because the proposed changes to the site result in a quicker peak, reducing the overall peak flow downstream. Based on this result, stormwater detention would not be beneficial to the site.

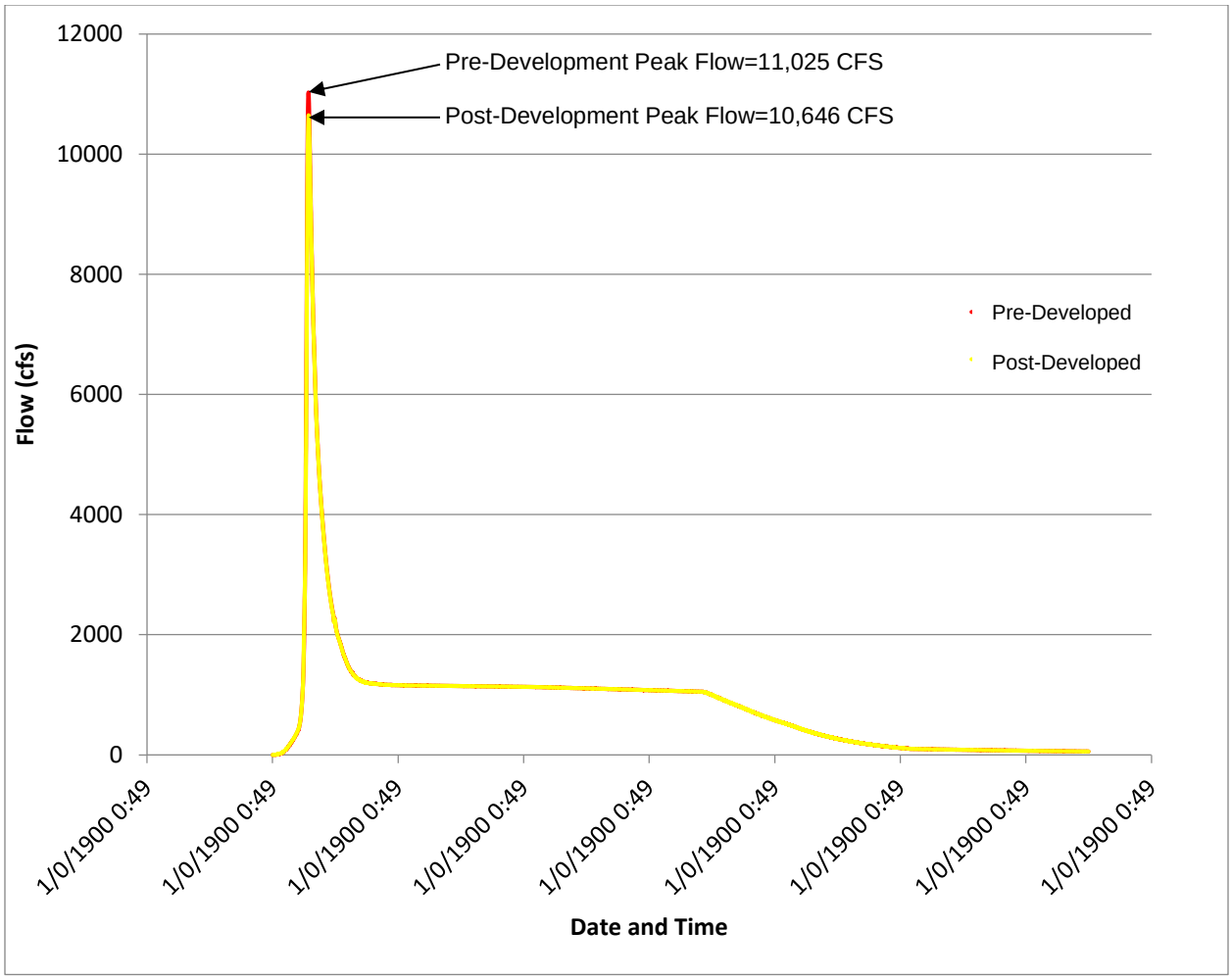


Figure 1 – Little Blue River Flow Analysis at East Property Line

Summary and Recommendations:

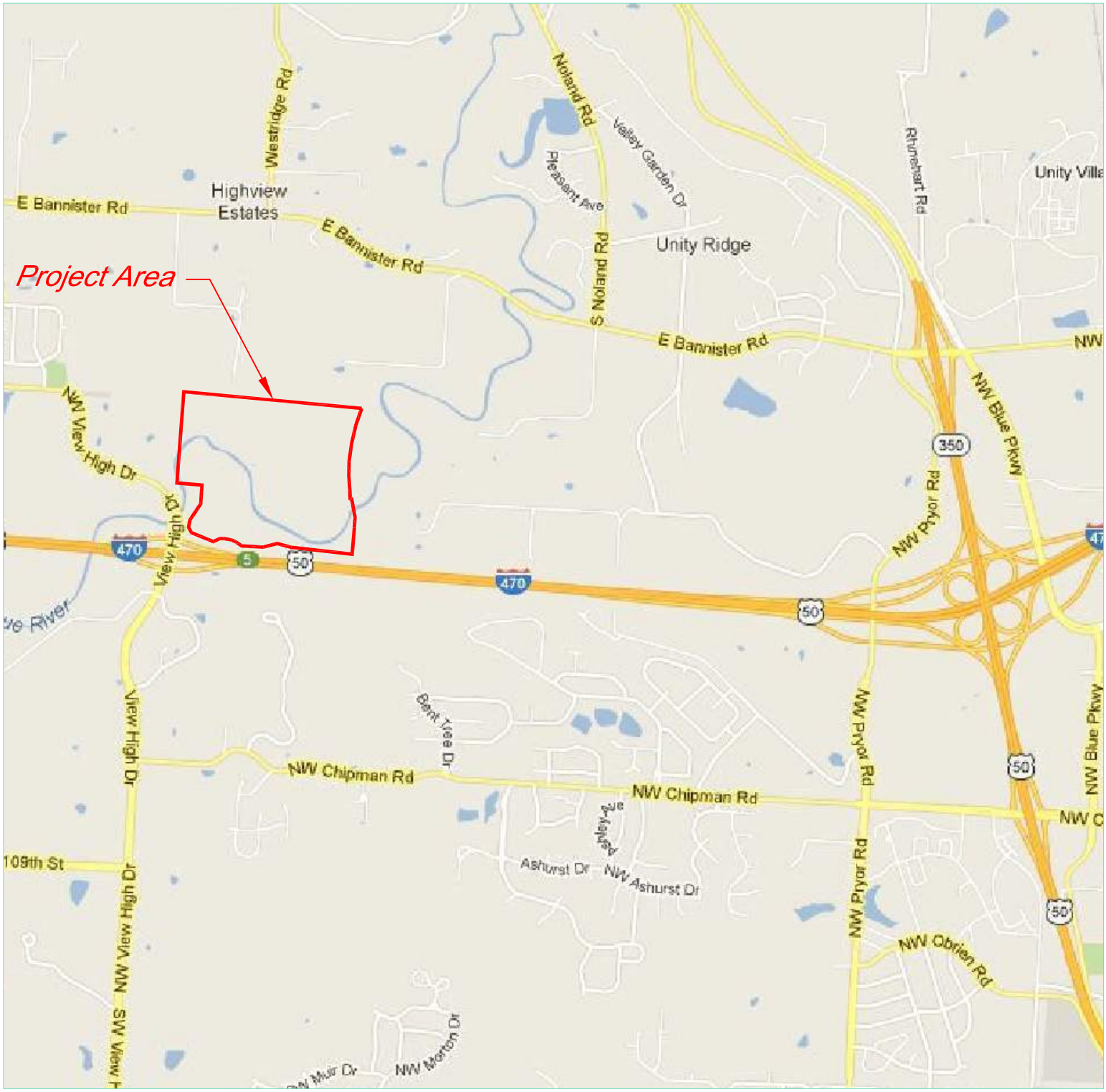
Design of the Paragon Star Soccer Complex and mixed-use development will conform to City Standards. The proposed mixed-use development will add approximately 18.53 acres of impervious area to the site, which will drain via overland flow and enclosed storm sewer to the Little blue Valley River. A full wetland delineation and flood study have been included within this report for further analysis in their respective areas. Construction of the proposed development according to the recommendations of this report will meet or exceed the stormwater requirements of the City of Lee's Summit, Missouri.

APPENDIX A – LOCATION INFORMATION

Exhibit 1 – Location Maps

Figure 1 – Location Map

Figure 2 – USGS Topographic Map



LEGEND

Project Area

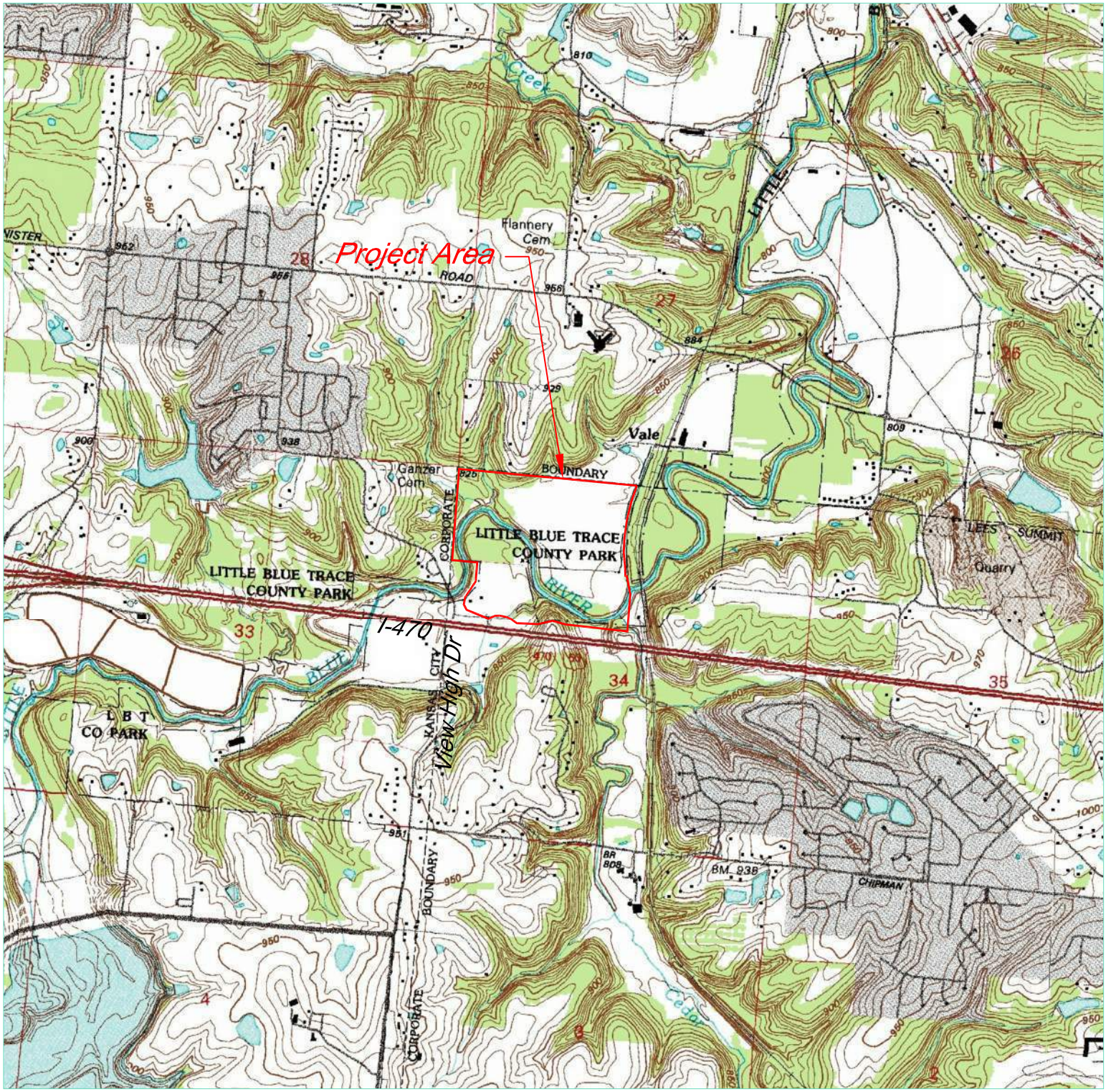
1"=2000'

Source: 2013 Google Maps – www.google.com/maps

Project Location: NW¼ of Section 34 and SW ¼ of Section 27, Township 48N, Range 32W

GBA architects engineers

PROJECT NUMBER	LOCATION MAP	FIGURE
12720.00	View High Project View High Drive and Interstate 470 Kansas City/Lee's Summit, Jackson Co., MO.	1
DATE 6–29–2016		



Source: USGS 7.5 Minute Quadrangle – Lee's Summit, MO 1990

Project Location: NW¼ of Section 34 and SW ¼ of Section 27, Township 48N, Range 32W

LEGEND

Project Area

1"=2000'

GBA architects engineers

PROJECT NUMBER	TOPOGRAPHIC MAP	FIGURE
12720.00	View High Project View High Drive and Interstate 470 Kansas City/Lee's Summit, Jackson Co., MO.	2
DATE 6–29–2016		

APPENDIX B – EXISTING CONDITIONS

Exhibit 2 – FEMA Flood Insurance Rate Map, FIRMette

Exhibit 3 – USDA Soil Resource Report

Exhibit 4 – Historic Topographic and Aerial Map with Lagoon Location

Exhibit 5 – Long view Dam Breach EAP Exhibit

Exhibit 6 – Existing Conditions Plan

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Missouri State Plane West Zone (FIPS zone 2403). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from the U.S.D.A Farm Service National Agriculture Imagery Program (NAIP) dated 2010, and by the U.S Geological Survey Digital Orthophoto Quadrangles dated 1993 or later, produced at a scale of 1:24,000.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

NOTICE TO MAP USERS

FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period or at the final Consultation Coordination Officer's meeting. Approved requests for changes will be shown on the final printed FIRM.

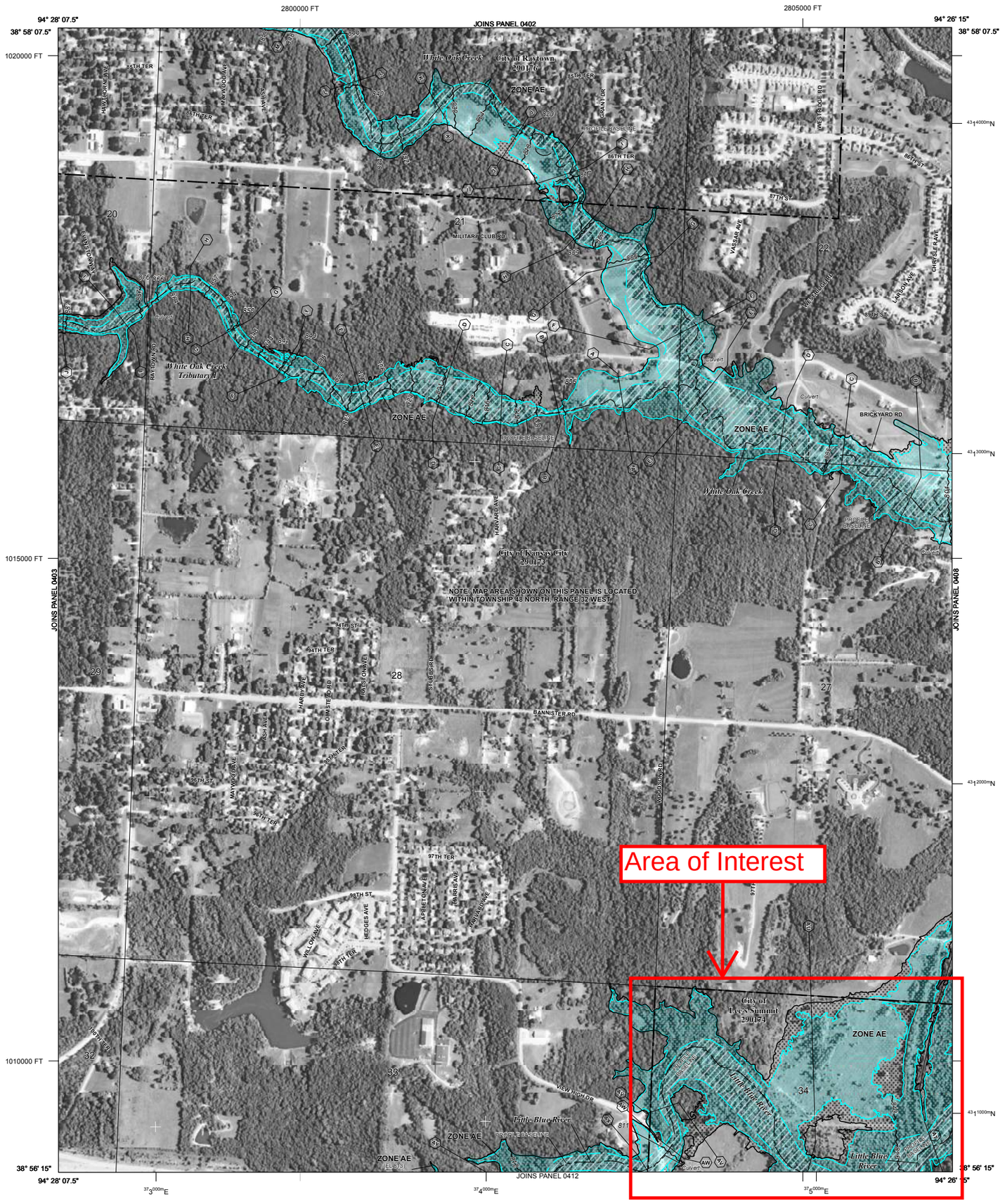


Exhibit 2

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A ⟷ A	Cross section line
23 ⟷ 23	Transect line
	Culvert
	Bridge
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
3100000 FT	5000-foot ticks: Missouri State Plane West Zone (FIPS Zone 2403), Transverse Mercator projection
4389000mN	1000-meter Universal Transverse Mercator grid values, zone 15
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0404G

FIRM

FLOOD INSURANCE RATE MAP

JACKSON COUNTY, MISSOURI
AND INCORPORATED AREAS

PANEL 404 OF 625
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
KANSAS CITY, CITY OF	290173	0404	G
LEE'S SUMMIT, CITY OF	290174	0404	G
RAYTOWN, CITY OF	290176	0404	G

Preliminary
October 10, 2014

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

MAP NUMBER
29095C0404G
MAP REVISED

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Missouri State Plane West Zone (FIPS zone 2403). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from the U.S.D.A Farm Service National Agriculture Imagery Program (NAIP) dated 2010, and by the U.S Geological Survey Digital Orthophoto Quadrangles dated 1993 or later, produced at a scale of 1:24,000.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

NOTICE TO MAP USERS

FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period or at the final Consultation Coordination Officer's meeting. Approved requests for changes will be shown on the final printed FIRM.

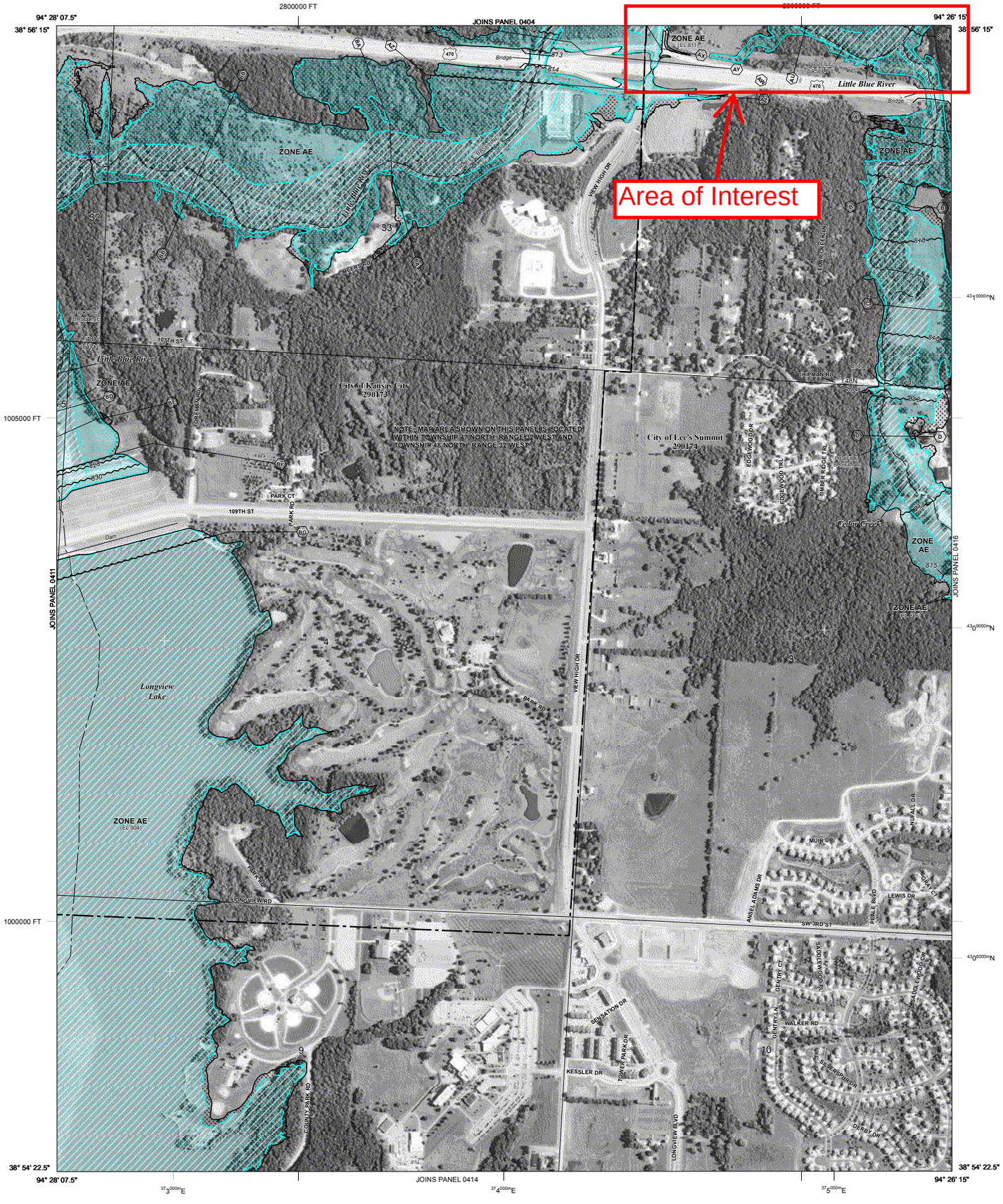


Exhibit 2

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A A	Cross section line
23 23	Transect line
	Culvert
	Bridge
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
3100000 FT	5000-foot ticks: Missouri State Plane West Zone (FIPS Zone 2403), Transverse Mercator projection
4289000mN	1000-meter Universal Transverse Mercator grid values, zone 15
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0412G

FIRM

FLOOD INSURANCE RATE MAP

JACKSON COUNTY, MISSOURI
AND INCORPORATED AREAS

PANEL 412 OF 625
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
KANSAS CITY, CITY OF	290173	0412	G
LEE'S SUMMIT, CITY OF	290174	0412	G

Preliminary
October 10, 2014

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

MAP NUMBER
29095C0412G
MAP REVISED

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

United States Department of Agriculture

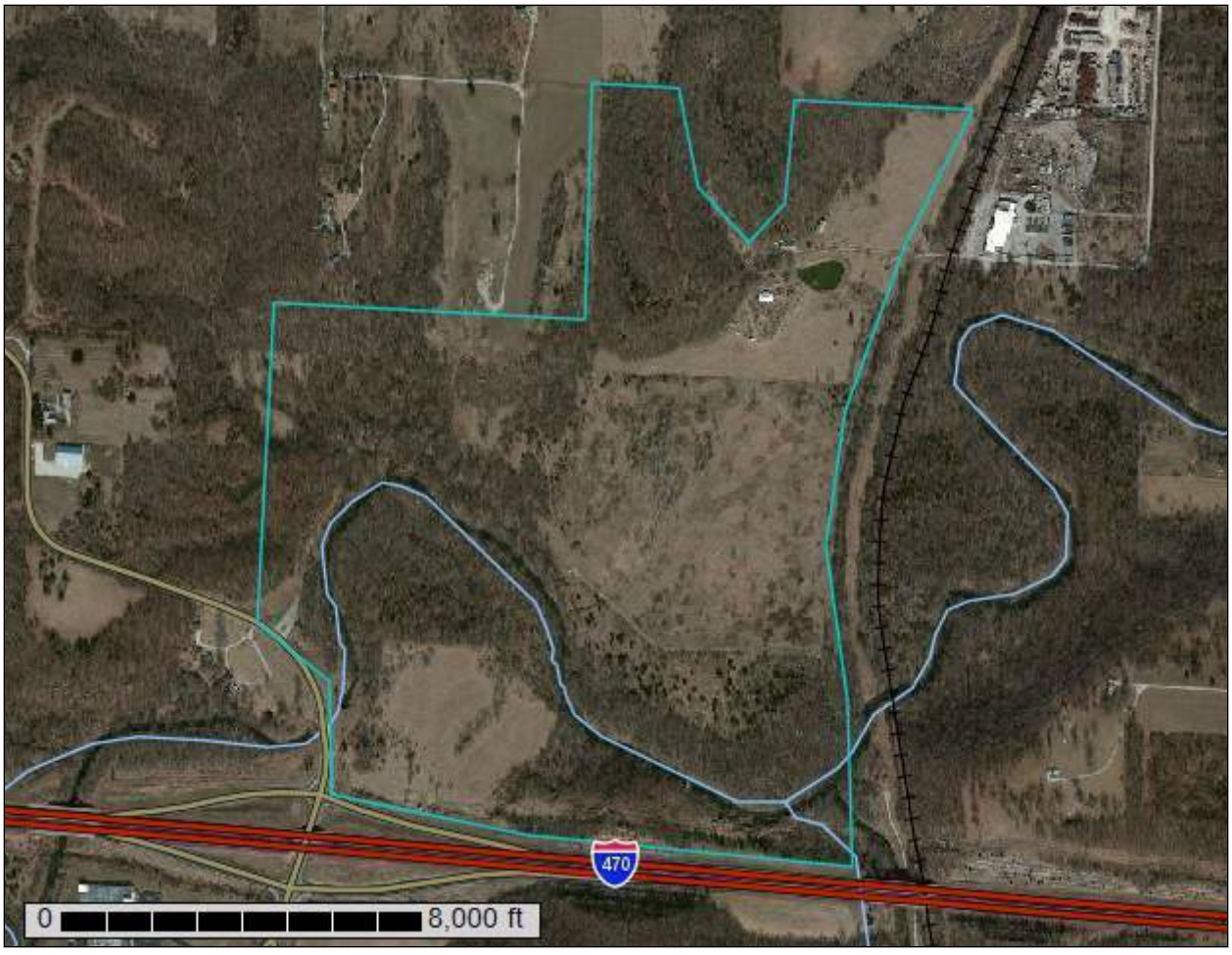
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Jackson County, Missouri

Exhibit 3



April 27, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....7
Soil Map.....8
Legend.....9
Map Unit Legend.....10
Map Unit Descriptions.....10
Jackson County, Missouri.....12
10107—Menfro silty clay loam, 9 to 14 percent slopes, severely eroded…12
10113—Oska silty clay loam, 5 to 9 percent slopes, eroded.....13
10120—Sharpsburg silt loam, 2 to 5 percent slopes.....14
10141—Snead-Rock outcrop complex, 14 to 30 percent slopes.....15
36007—Bremer silt loam, 0 to 2 percent slopes, occasionally flooded.....16
36020—Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded...17
99033—Udarents-Urban land complex, 2 to 9 percent slopes.....19
References.....21

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:7,950 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Jackson County, Missouri
Survey Area Data: Version 15, Sep 11, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 19, 2012—Mar 25, 2012

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

Map Unit Legend

Jackson County, Missouri (MO095)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
10107	Menfro silty clay loam, 9 to 14 percent slopes, severely eroded	0.5	0.3%
10113	Oska silty clay loam, 5 to 9 percent slopes, eroded	5.3	3.0%
10120	Sharpsburg silt loam, 2 to 5 percent slopes	0.9	0.5%
10141	Snead-Rock outcrop complex, 14 to 30 percent slopes	34.4	19.2%
36007	Bremer silt loam, 0 to 2 percent slopes, occasionally flooded	80.3	44.7%
36020	Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded	53.4	29.7%
99033	Udarents-Urban land complex, 2 to 9 percent slopes	4.7	2.6%
Totals for Area of Interest		**179.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified

by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Jackson County, Missouri

10107—Menfro silty clay loam, 9 to 14 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: yrm0
Elevation: 400 to 900 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Menfro and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Menfro

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess

Typical profile

A - 0 to 6 inches: silty clay loam
Bt - 6 to 40 inches: silty clay loam
C - 40 to 80 inches: silt loam

Properties and qualities

Slope: 9 to 14 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Deep Loess Upland Prairie (R107BY002MO)
Other vegetative classification: Trees/Timber (Woody Vegetation)

10113—Oska silty clay loam, 5 to 9 percent slopes, eroded

Map Unit Setting

National map unit symbol: yrm7
Elevation: 600 to 1,200 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Oska and similar soils: 90 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oska

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum

Typical profile

A - 0 to 7 inches: silty clay loam
Bt - 7 to 34 inches: silty clay loam
R - 34 to 80 inches: bedrock

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: Limestone Upland Prairie (R112XY020MO)
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)

Minor Components

Sampsel

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Concave
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)

10120—Sharpsburg silt loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2ql02
Elevation: 1,000 to 1,300 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sharpsburg and similar soils: 95 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sharpsburg

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess

Typical profile

A - 0 to 17 inches: silt loam
Bt - 17 to 55 inches: silty clay loam
C - 55 to 60 inches: silty clay loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very high (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: Loess Upland Prairie (R109XY002MO)
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)

10141—Snead-Rock outcrop complex, 14 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2ql0p
Elevation: 600 to 1,100 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Snead and similar soils: 70 percent
Rock outcrop: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Snead

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from calcareous shale

Typical profile

Ap - 0 to 3 inches: silty clay loam
Bw - 3 to 24 inches: silty clay
Cr - 24 to 80 inches: bedrock

Properties and qualities

Slope: 14 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Interbedded Sedimentary Backslope Savanna (R109XY012MO)
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)

Description of Rock Outcrop

Typical profile

R - 0 to 80 inches: bedrock

Properties and qualities

Slope: 14 to 30 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

Minor Components

Sampsel

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Concave
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)

36007—Bremer silt loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2qnvb
Elevation: 500 to 1,400 feet
Mean annual precipitation: 35 to 41 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 177 to 209 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Bremer and similar soils: 90 percent
Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bremer

Setting

Landform: Flood-plain steps
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 20 inches: silt loam
Btg - 20 to 41 inches: silty clay loam
Cg - 41 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Ecological site: Wet Terrace Prairie (R109XY038MO)
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)

Minor Components

Colo

Percent of map unit: 5 percent
Landform: Flood-plain steps
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)

36020—Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2qnvq
Elevation: 500 to 1,400 feet
Mean annual precipitation: 35 to 41 inches

Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 177 to 209 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Kennebec and similar soils: 90 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kennebec

Setting

Landform: Flood-plain steps
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 19 inches: silt loam
AC - 19 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 36 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very high (about 12.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Ecological site: Loamy Floodplain Prairie (R109XY005MO)
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)

Minor Components

Colo

Percent of map unit: 3 percent
Landform: Flood-plain steps
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)

Nodaway, frequently flooded

Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)

99033—Udarents-Urban land complex, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: 1n85n
Elevation: 720 to 1,050 feet
Mean annual precipitation: 33 to 43 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 170 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Udarents and similar soils: 50 percent
Urban land: 47 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udarents

Setting

Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mine spoil or earthy fill

Typical profile

C1 - 0 to 5 inches: silt loam
C2 - 5 to 80 inches: silty clay loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)

Description of Urban Land

Setting

Landform position (two-dimensional): Backslope
Across-slope shape: Convex

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

USGS Historical Topographic Map
(Not To Scale)

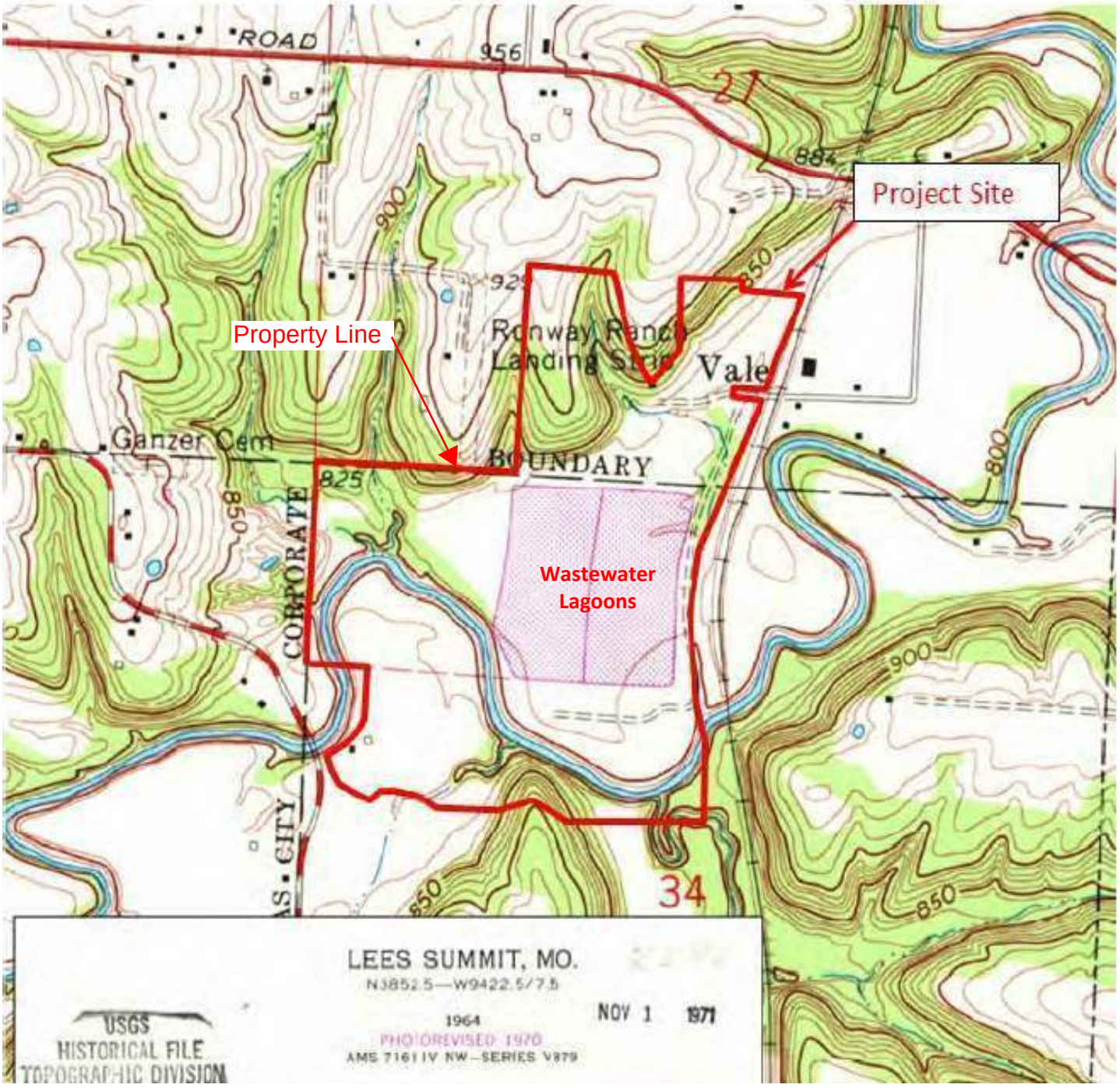


Exhibit 4

Exhibit 4


Property Line
Wastewater Lagoons
INQUIRY #: 4319463.9
YEAR: 1976
= 500'
N

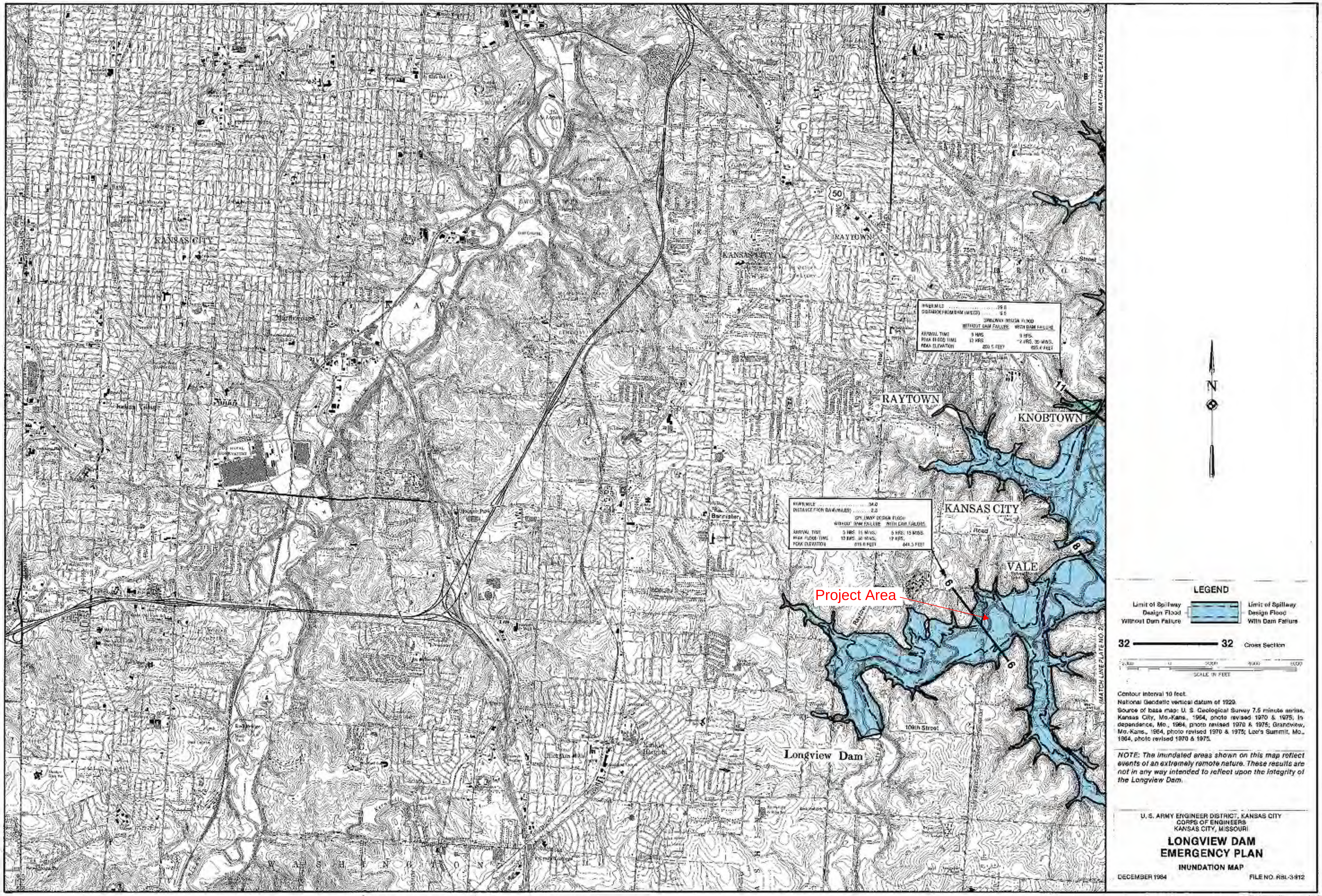
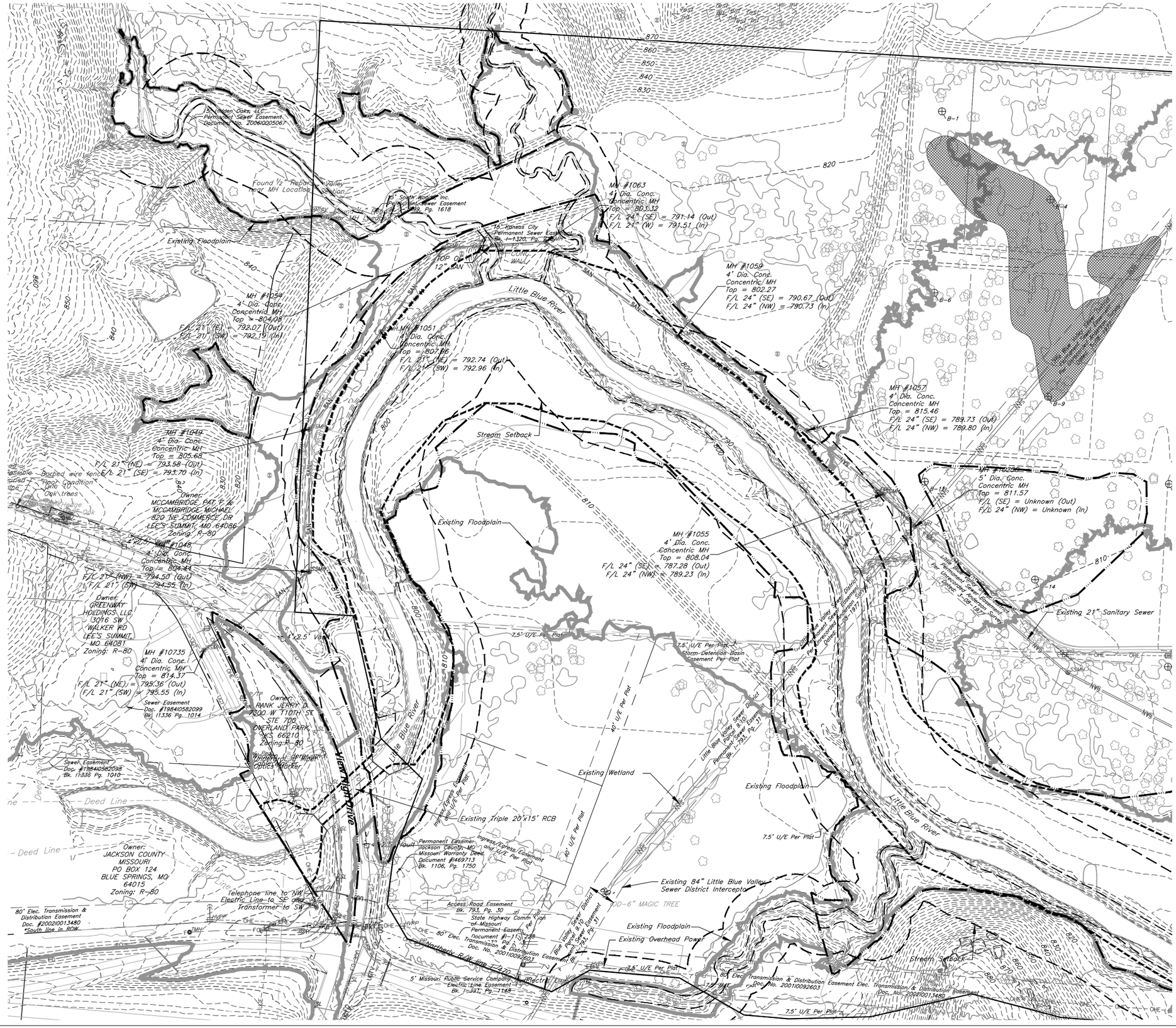


Exhibit 5

PLATE NO. 1

7-2-11



PARAGON STAR VILLAGE

View High Drive & I-470
Lee's Summit, MO

Project No.:	17042.04
Date:	02.15.2019
Issued For:	PRELIM. DEV. PACKAGE

REVISIONS

No.	Date	Description

REGISTRATION

NOT FOR CONSTRUCTION

PROJECT TEAM

ARCHITECT	FINKLE+WILLIAMS ARCHITECTURE
CIVIL	GBA
LANDSCAPE	HOERR SCHAUDT / LAND 3

CIVIL ENGINEERING BY:
GBA
9801 Renner Boulevard
Lenexa, Kansas 66219
913.492.0400
www.gbateam.com

SHEET TITLE

Existing Conditions

SHEET NUMBER

C003

APPENDIX C – PROPOSED CONDITIONS

Plan Sheets C003 and C004 – Grading Plan

Plan Sheets C010 and C011 – Utility Plans

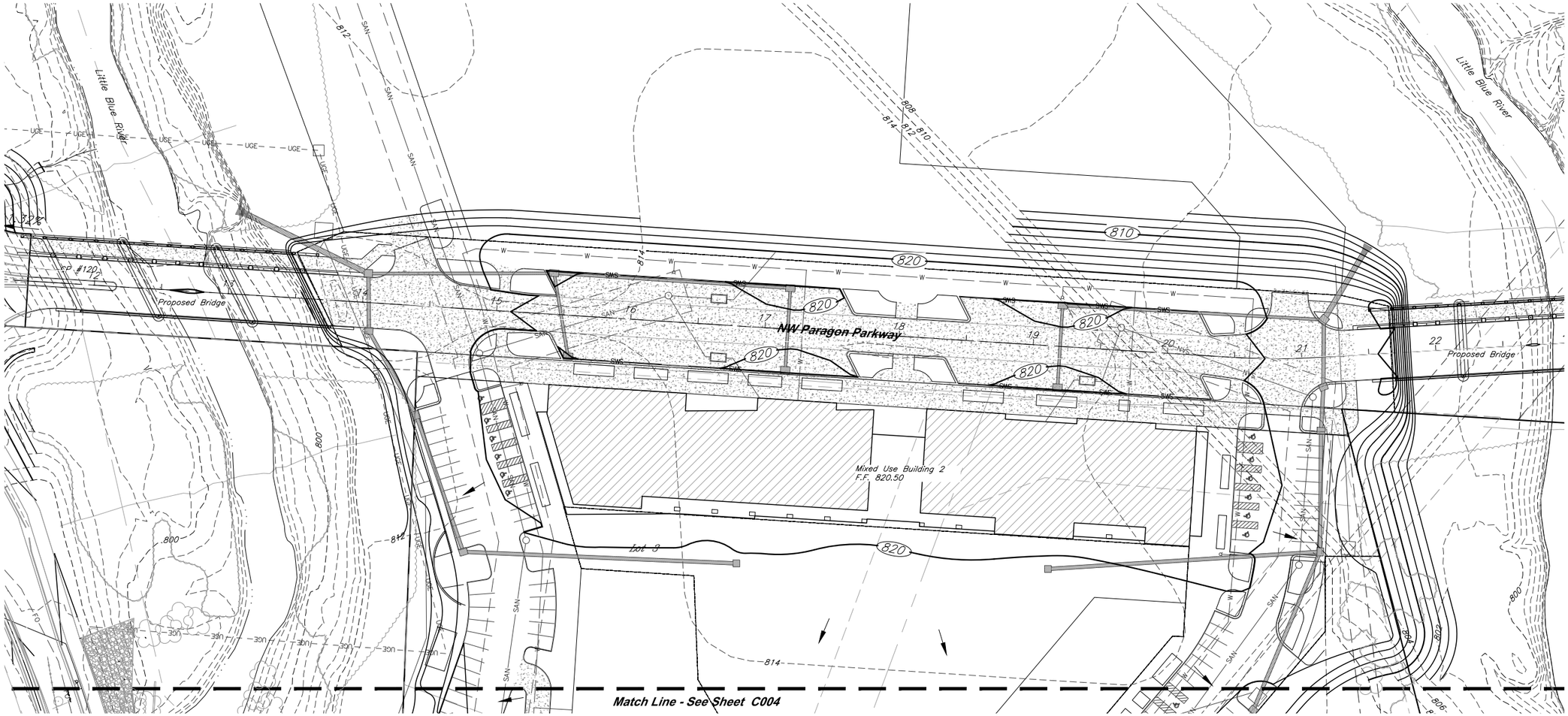
Plan Sheets C012 and C013 – Drainage Map and Calculations

Exhibit 7 – Regional Drainage Map

Exhibit 8 – U.S. Army Corps of Engineers 404 Permit

Exhibit 9 – MDNR 401 Water Quality Certification and Permit

G:\1272D\Civil 3D\Production Drawings\FDP LS MXD\1272DC0700.dwg 9/11/2019 3:32:09 PM JAY HEALY 0.39:1



CAUTION!
Numerous Utilities on site. Contractor to verify location and elevation of all utilities prior to commencing construction.

Note: Minimum finish floor of all buildings on lots within the proposed floodplain is 813.00.

LEGEND

- Existing Contour
- Proposed Contour
- Proposed Floodway
- Proposed Floodplain
- Stream Corridor
- Drainage Flow Arrow

40' 0' 40' 80'
SCALE : 1 INCH = 40 FEET

CIVIL ENGINEERING
GBA
9801 Renner Boulevard
Lenexa, KS 66219
913.492.0400
www.gbateam.com
MO Certificate of Authority # 000133

LANDSCAPE ARCHITECTURE
LAND3 Studio, LLC
317 SE Main
Lee's Summit, MO 64063
www.land3studio.com
MO Certificate of Authority # 2008001860

LANDSCAPE ARCHITECTURE
Hoerr Schaudt Landscape Architects
2100 Central Street, Suite 01C
Kansas City, MO 64108
816.510.0438
www.hoerrschaudt.com
MO Certificate of Authority #2019004088

MEP ENGINEERING
HENDERSON ENGINEERS, Inc.
8345 Lenexa Drive
Lenexa, KS 66214
913.742.5000
www.hei-eng.com
Missouri Certificate of Authority # 000556

ARCHITECTURE
FINKLE + WILLIAMS Architecture
7007 College Boulevard, Suite 415
Overland Park, KS 66211
913.498.1550
www.finklewilliams.com
Missouri Certificate of Authority #F00453304

PROJECT:

Paragon Star Village

1401 NW View High Dr, Lee's Summit, MO 64081

Final Development Plan - Phase One

ISSUE:

PROFESSIONAL SEAL:

DRAWING TITLE:

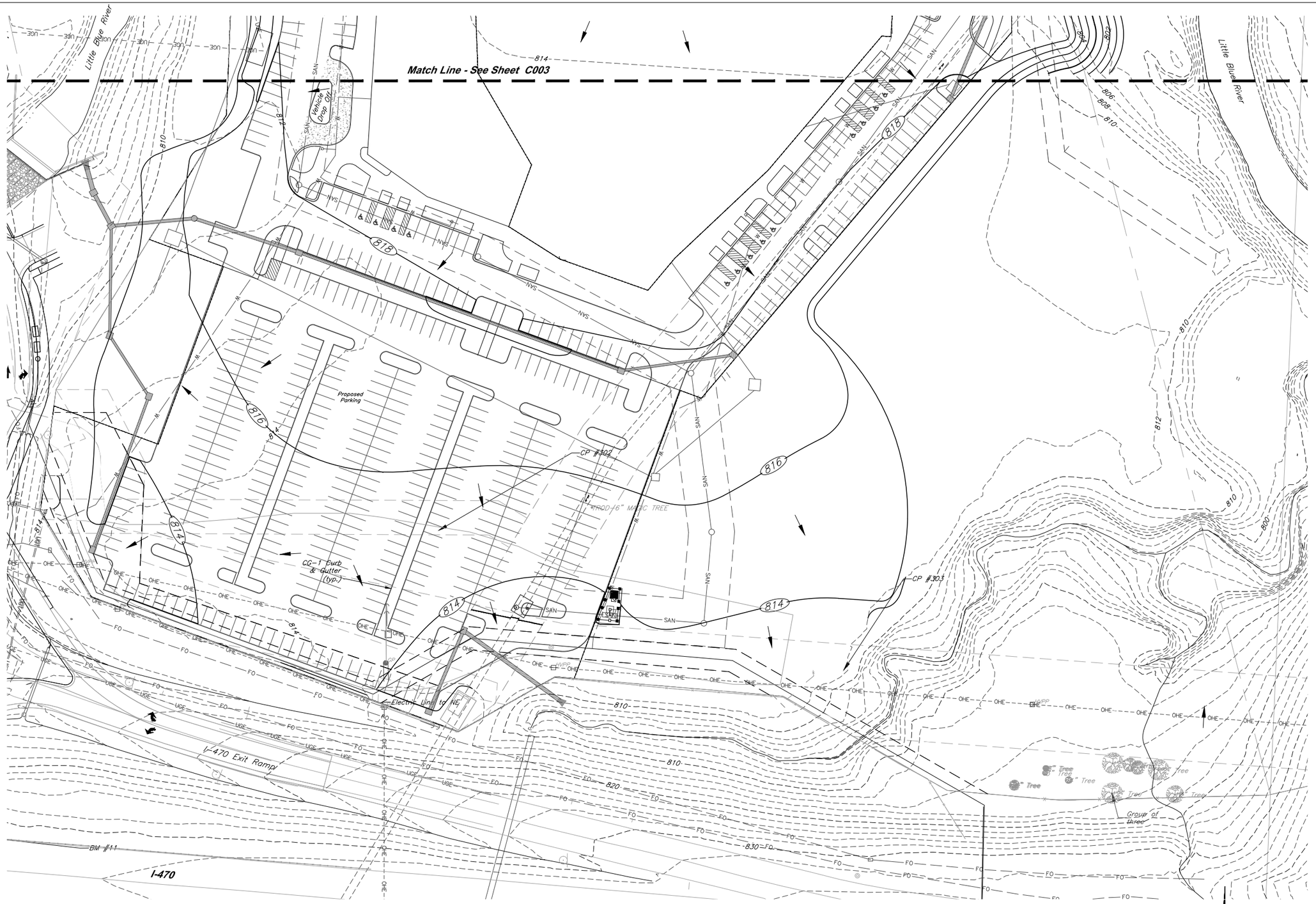
Grading Plan

JOB NO: 1249 SCALE:
DATE: 09.13.2019 DRAWN BY: DGL

SHEET NO:

C003

G:\12720\Civil 3D\Production Drawings\FDP LS MXD\12720C0700.dwg 9/11/2019 3:43:18 PM JAY HEALY 0.39:1



Note: Minimum finish floor of all buildings on lots within the proposed floodplain is 813.00.

CAUTION!
Numerous Utilities on site. Contractor to verify location and elevation of all utilities prior to commencing construction.

LEGEND

- 900 — Existing Contour
- 900 — Proposed Contour
- Proposed Floodway
- Proposed Floodplain
- Stream Corridor
- Drainage Flow Arrow

40' 0' 40' 80'
SCALE : 1 INCH = 40 FEET

GBA
9801 Renner Boulevard
Lenexa, KS 66219
913.492.0400
www.gbateam.com
MO Certificate of Authority # 000133

LAND3 Studio, LLC
317 SE Main
Lee's Summit, MO 64063
www.land3studio.com
MO Certificate of Authority # 2008001860

Hoerr Schaudt Landscape Architects
2100 Central Street, Suite 01C
Kansas City, MO 64108
816.510.0438
www.hoerrschaudt.com
MO Certificate of Authority #2019004088

HENDERSON ENGINEERS, Inc.
8345 Lenexa Drive
Lenexa, KS 66214
913.742.5000
www.hei-eng.com
Missouri Certificate of Authority # 000556

FINKLE + WILLIAMS Architecture
7007 College Boulevard, Suite 415
Overland Park, KS 66211
913.498.1550
www.finklewilliams.com
Missouri Certificate of Authority #F00453304

PROJECT:

Paragon Star Village

1401 NW View High Dr, Lee's Summit, MO 64081

Final Development Plan - Phase One

ISSUE:

PROFESSIONAL SEAL:

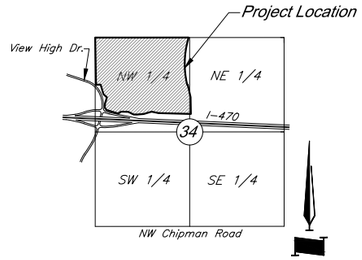
DRAWING TITLE:

Grading Plan

JOB NO: 1249 SCALE:
DATE: 09.13.2019 DRAWN BY: DGL

SHEET NO:

C004



VICINITY MAP

Scale: 1"=2000'

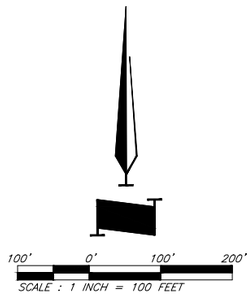
Legend

- SAN — Proposed Sanitary Sewer
- W — Proposed Water Line
- Proposed Fire Hydrant
- Proposed Storm Sewer

Note: All utilities shown are to be constructed as part of Phase 1.

Prepared and Submitted By:

George Butler Associates, Inc.
9801 Renner Boulevard Lenexa, Kansas 66219
Phone: 913-492-0400 Fax: 913-577-8312
Contact: Brad Burton P.E.
Email: bburton@gbateam.com



GBA
9801 Renner Boulevard
Lenexa, KS 66219
913.492.0400
www.gbateam.com
MO Certificate of Authority # 000133

LAND3 Studio, LLC
317 SE Main
Lee's Summit, MO 64063
www.land3studio.com
MO Certificate of Authority # 2008001860

Hoerr Schaudt Landscape Architects
2100 Central Street, Suite 01C
Kansas City, MO 64108
816.510.0438
www.hoerrschaudt.com
MO Certificate of Authority #2019004088

HENDERSON ENGINEERS, Inc.
8345 Lenexa Drive
Lenexa, KS 66214
913.742.5000
www.hei-eng.com
Missouri Certificate of Authority # 000556

FINKLE + WILLIAMS Architecture
7007 College Boulevard, Suite 415
Overland Park, KS 66211
913.498.1550
www.finklewilliams.com
Missouri Certificate of Authority #F00453304

PROJECT:

Paragon Star Village

1401 NW View High Dr, Lee's Summit, MO 64081

Final Development Plan - Phase One

ISSUE:

PROFESSIONAL SEAL:

DRAWING TITLE:

Utility Overview

JOB NO: 1249 SCALE:

DATE: 09.13.2019 DRAWN BY: DGL

SHEET NO:

C009

Utility Legend

CATV Ped. Cable TV Pedestal	FO Fiber Optic Line
P.P. Power Pole	FP Fire Protection Line
Guy Anchor	G Gas Line
EMH Electrical Manhole	OHE Over Head Electric
Electrical Transformer	OHT Over Head Telephone
G.M. Gas Meter	OHTV Over Head Cable TV
Curb Inlet	PL Property Line
SSMH Sanitary Sewer Manhole	ROW Right-of-Way Line
S.O. Sanitary Cleanout	SAN Existing Sanitary Sewer Line
L.P. Light Pole	UGE Underground Electric
Boring Hole	UGT Underground Telephone
Sign	UGTV Underground Cable TV
Tel. Ped. Telephone Pedestal	W Water Line
T.S. Traffic Signal Post	Proposed Storm Sewer
TMH Traffic Manhole	Future Storm Sewer
F.H. Fire Hydrant	SAN Proposed Sanitary Sewer Line
W.M. Water Meter	SWS Proposed Underdrain

Note: Fire department connection locations are preliminary and subject to change upon final design. IFC distance requirements for FDCs shall be met with final design.

40' 0' 40' 80'

SCALE : 1 INCH = 40 FEET

Sta. 13+02.99, 62.71' Lt.
Paragon Parkway
Construct 42" End Section W/Toewall
N-1009605.2844 E-2803983.3882

Sta. 14+03.00
Paragon Parkway
Construct 5'x5' Curb Inlet
N-1009557.8249 E-2804080.5867

Sta. 14+06.00
Paragon Parkway
Construct 5'x4' Curb Inlet
N-1009515.2202 E-2804080.8918

Sta. 2+22.62
Line 4100
Construct 5'x4' Curb Inlet
N-1009452.5690 E-2804116.0579

Sta. 3+30.23
Line 4100
Construct 5'x4' Curb Inlet
N-1009350.8198 E-2804151.1014

Sta. 5+33.67
Line 4100
Construct 4'x4' Area Inlet
N-1009342.1842 E-2804354.3565

Sta. 1+38.15
Line 4300
Construct 6'x4' Double Grate Curb Inlet
N-1009558.1103 E-2804218.7371

Sta. 15+55.05
Paragon Parkway
Construct 6'x4' Double Grate Curb Inlet
N-1009496.2893 E-2804229.0437

Sta. 17+17.00
Paragon Parkway
Construct 6'x4' Double Grate Curb Inlet
N-1009546.9661 E-2804394.5284

Sta. 17+17.00
Paragon Parkway
Construct 6'x4' Double Grate Curb Inlet
N-1009486.0433 E-2804390.6664

Sta. 19+20.00
Paragon Parkway
Construct 6'x4' Double Grate Curb Inlet
N-1009473.1943 E-2804593.2593

Sta. 4+39.67
Line 4800
Construct 4'x4' Area Inlet
N-1009338.0271 E-2804586.1511

Sta. 21+18.09
Paragon Parkway
Construct 5'x5' Curb Inlet
N-1009523.4752 E-2804791.3731

Sta. 19+20.00
Paragon Parkway
Construct 6'x4' Double Grate Curb Inlet
N-1009534.1227 E-2804597.1220

Sta. 21+54.18
Paragon Parkway
Construct 5'x3' 36" End Section W/Toewall
N-1009578.4084 E-2804824.3425

Sta. 21+14.90
Paragon Parkway
Construct 5'x4' Curb Inlet
N-1009473.5137 E-2804791.0745

Sta. 1+46.87
Line 4800
Construct 5'x4' Curb Inlet
N-1009440.7491 E-2804789.3457

Sta. 2+36.82
Line 4800
Construct 5'x4' Curb Inlet
N-1009350.8067 E-2804788.6073

Sta. 1+27.92
Line 4900
Construct 5'x4' Curb Inlet
N-1009232.9357 E-2804738.9069

4100 4101 4102 4103 4104 4105 4301 4302 4303 4800 4801 4802 4803 4804 4805 4901 5401 5402 5501

NW Paragon Parkway

Mixed Use Building 2

Mixed Use Building 2

Proposed Restaurant

Proposed Water Line

Fire Hydrant

Underdrain behind back of curb

2000 Gal. Grease Interceptor

FDC

32' Sanitary Sewer Easement

60' Proposed Little Blue Valley Permanent Sewer Easement

Matchline See Sheet C011

CIVIL ENGINEERING
GBA
9801 Renner Boulevard
Lenexa, KS 66219
913.492.0400
www.gbateam.com
MO Certificate of Authority # 000133

LANDSCAPE ARCHITECTURE
LAND3 Studio, LLC
317 SE Main
Lee's Summit, MO 64063
www.land3studio.com
MO Certificate of Authority # 2008001860

LANDSCAPE ARCHITECTURE
Haerr Schaudt Landscape Architects
2100 Central Street, Suite 01C
Kansas City, MO 64108
816.510.0438
www.haerrschaudt.com
MO Certificate of Authority #2019004088

MEP ENGINEERING
HENDERSON ENGINEERS, Inc.
8345 Lenexa Drive
Lenexa, KS 66214
913.742.5000
www.hei-eng.com
Missouri Certificate of Authority # 000556

ARCHITECTURE
FINKLE + WILLIAMS Architecture
7007 College Boulevard, Suite 415
Overland Park, KS 66211
913.498.1550
www.finklewilliams.com
Missouri Certificate of Authority #F00453304

PROJECT:

Paragon Star Village

1401 NW View High Dr, Lee's Summit, MO 64081

Final Development Plan - Phase One

ISSUE:

PROFESSIONAL SEAL:

DRAWING TITLE:

Utility Plan

JOB NO: 1249 SCALE:

DATE: 09.13.2019 DRAWN BY: DGL

SHEET NO:

C010

Utility Legend

CATV Ped. Cable TV Pedestal	FO Fiber Optic Line
P.P. Power Pole	FP Fire Protection Line
Guy Anchor	G Gas Line
E.M.H. Electrical Manhole	OHE Over Head Electric
Electrical Transformer	OHT Over Head Telephone
G.M. Gas Meter	OHTV Over Head Cable TV
Curb Inlet	℄ Property Line
S.S.M.H. Sanitary Sewer Manhole	ROW Right-of-Way Line
S.C.O. Sanitary Cleanout	SAN Existing Sanitary Sewer Line
L.P. Light Pole	UGE Underground Electric
Boring Hole	UGT Underground Telephone
Sign	UGTV Underground Cable TV
Tel. Ped. Telephone Pedestal	W Water Line
T.S. Traffic Signal Post	Proposed Storm Sewer
T.R.M.H. Traffic Manhole	Future Storm Sewer
F.H. Fire Hydrant	SAN Proposed Sanitary Sewer Line
W.M. Water Meter	

Note: Fire department connection locations are preliminary and subject to change upon final design. IFC distance requirements for FDCs shall be met with final design.

40' 0' 40' 80'

SCALE : 1 INCH = 40 FEET

Matchline See Sheet C010

Sta. 0+00.00, 0.00'
Line 5200
Construct 36" End Section W/Toewall
N-1009179.1626 E-2803981.8708

Sta. 0+62.11
Line 5200
Construct 5'x4' Curb Inlet
N-1009121.9643 E-2804005.0622

Sta. 0+29.11
Line 5200
Construct 5'x4' Curb Inlet
N-1009151.0776 E-2803989.5245

Sta. 1+34.91
Line 5200
Construct 4' Dia Std. Manhole
N-1009128.5962 E-2804077.5585

Sta. 2+31.44
Line 5200
Construct 5'x4' Curb Inlet
N-1009098.6600 E-2804169.3269

Sta. 5+31.44
Line 5200
Construct 5'x4' Curb Inlet
N-1008995.3165 E-2804450.9672

Sta. 6+30.62
Line 5200
Construct 5'x4' Curb Inlet
N-1009008.9844 E-2804549.2043

Sta. 0+95.99
Line 5300
Construct 5'x4' Curb Inlet
N-1009025.9873 E-2804003.6166

Sta. 1+59.23
Line 5300
Construct 5'x4' Curb Inlet
N-1008972.8492 E-2804037.9015

Sta. 3+02.26
Line 5300
Construct 5'x4' Curb Inlet
N-1008838.5827 E-2803988.5932

Sta. 1+08.62
Line 4500
Construct 5'x4' Curb Inlet
N-1008767.9008 E-2804313.1165

Sta. 1+85.73
Line 4500
Construct 5'x4' Curb Inlet
N-1008696.9961 E-2804282.8193

Sta. -0+00.00
Line 4500
Construct 5'x3' 24" End Section W/Toewall
N-1008704.0113 E-2804400.9617

Fire Hydrant
Proposed Office Building
Proposed Water Line
FDC
Proposed Parking
Connection to Existing Sanitary Sewer
Proposed Sanitary Meter Structure
Proposed Sanitary Sewer
Existing Meter Structure
Existing 5'x4' RCB
Group three

CIVIL ENGINEERING
GBA
9801 Renner Boulevard
Lenexa, KS 66219
913.492.0400
www.gbateam.com
MO Certificate of Authority # 000133

LANDSCAPE ARCHITECTURE
LAND3 Studio, LLC
317 SE Main
Lee's Summit, MO 64063
www.land3studio.com
MO Certificate of Authority # 2008001860

LANDSCAPE ARCHITECTURE
Hoerr Schaudt Landscape Architects
2100 Central Street, Suite 01C
Kansas City, MO 64108
816.510.0438
www.hoerrschaudt.com
MO Certificate of Authority #2019004088

MEP ENGINEERING
HENDERSON ENGINEERS, Inc.
8345 Lenexa Drive
Lenexa, KS 66214
913.742.5000
www.hei-eng.com
Missouri Certificate of Authority # 000556

ARCHITECTURE
FINKLE + WILLIAMS Architecture
7007 College Boulevard, Suite 415
Overland Park, KS 66211
913.498.1550
www.finklewilliams.com
Missouri Certificate of Authority #F00453304

PROJECT:

Paragon Star Village

1401 NW View High Dr, Lee's Summit, MO 64081

Final Development Plan - Phase One

ISSUE:

PROFESSIONAL SEAL:

DRAWING TITLE:

Utility Plan

JOB NO: 1249 SCALE:
DATE: 09.13.2019 DRAWN BY: DGL

SHEET NO:

C011

LEGEND

- 900 — Existing Contour
- 900 — Proposed Contour
- Proposed Floodway
- Proposed Floodplain
- Stream Corridor

60' 0' 60' 120'

SCALE : 1 INCH = 60 FEET

CIVIL ENGINEERING
GBA
9801 Renner Boulevard
Lenexa, KS 66219
913.492.0400
www.gbateam.com
MO Certificate of Authority # 000133

LANDSCAPE ARCHITECTURE
LAND3 Studio, LLC
317 SE Main
Lee's Summit, MO 64063
www.land3studio.com
MO Certificate of Authority # 2008001860

LANDSCAPE ARCHITECTURE
Haerr Schaudt Landscape Architects
2100 Central Street, Suite 01C
Kansas City, MO 64108
816.510.0438
www.haerrschaudt.com
MO Certificate of Authority #2019004088

MEP ENGINEERING
HENDERSON ENGINEERS, Inc.
8345 Lenexa Drive
Lenexa, KS 66214
913.742.5000
www.hei-eng.com
Missouri Certificate of Authority # 000556

ARCHITECTURE
FINKLE + WILLIAMS Architecture
7007 College Boulevard, Suite 415
Overland Park, KS 66211
913.498.1550
www.finklewilliams.com
Missouri Certificate of Authority #F00453304

PROJECT:

Paragon Star Village

1401 NW View High Dr, Lee's Summit, MO 64081

Final Development Plan - Phase One

ISSUE:

PROFESSIONAL SEAL:

DRAWING TITLE:

Drainage Map

JOB NO: 1249 SCALE:

DATE: 09.13.2019 DRAWN BY: DGL

SHEET NO:

C012

100 Year Storm

	Structures		Runoff Calculations									Pipe Design								Design Checks											
	From	To	Direct Area (acre)	Line In (acre)	Total Area (acre)	C	K	Tc (min)	Flow Time (min)	Intensity (in/hr)	Design Q (cfs)	Description	Pipe length (lin ft)	Pipe Slope Slope, %	Pipe dia (in)	Manning's n Value	Q full (cfs)	Pipe Area, sf	V full fps	Design V fps	Hw/D	outlet head, H	HW, Inlet Control, (ft)	HW, Outlet Control, (ft)	Inlet Top Elevation	upstream flowline	downstream flowline	Invert Drop (ft)	Downstream water elevation	Hydraulic Grade Elev. (Calculated)	Hydraulic Grade (allowable)	Comments
	4105		1.06			0.90	1.25	5.00		10.32	12.3	Curb Inlet													819.50					811.26	818.17	
		4104			1.06	0.90	1.25	5.00	0.43	10.32	12.3	RCP	206.90	2.00	24	0.013	32.08	3.14	10.21	8.01	1.0	1.64	811.26	809.75		809.31	805.17		808.11			
	4104		0.00	0.48		0.90	1.25	5.00		10.32	0.0	Junction Box													818.00			0.5		808.11	816.67	Tie in from Line 4200
		4103			1.54	0.90	1.25	5.43	0.17	10.15	17.5	HDPE	110.95	2.00	24	0.01	41.70	3.14	13.27	10.69	1.3	2.04	807.25	808.11		804.67	802.45		806.07			
Line 4100	4103		0.42			0.90	1.25	5.00		10.32	4.9	Curb Inlet													818.00			0.5		806.07	816.67	
		4102			1.96	0.90	1.25	5.60	0.10	10.08	22.2	HDPE	71.85	2.00	24	0.01	41.70	3.14	13.27	11.49	1.7	2.46	805.29	806.07		801.95	800.52		803.60			
	4102		0.13			0.90	1.25	5.00		10.32	1.5	Curb Inlet													818.00			0.5		803.60	816.67	
		4101			2.09	0.90	1.25	5.71	0.07	10.04	23.6	RCP	42.61	2.00	24	0.013	32.08	3.14	10.21	9.76	1.8	2.08	803.60	803.23		800.02	799.16		801.15			
	4101		0.18	0.84		0.90	1.25	5.00		10.32	2.1	Curb Inlet													818.00			1		801.15	816.67	Tie in from Line 4300
		4100			3.11	0.90	1.25	5.78	0.14	10.01	35.0	HDPE	108.17	2.00	36	0.01	122.95	7.07	17.39	12.61	1.0	1.12	801.15	798.62		798.16	796.00		797.50			
Line 4200	4201		0.48			0.90	1.25	5.00		10.32	5.6	Curb Inlet													818.00					807.84	816.67	
		4104			0.48	0.90	1.25	5.00	0.04	10.32	5.6	RCP	24.11	5.00	24	0.013	50.72	3.14	16.15	8.95	0.7	0.09	807.84	806.26		806.38	805.17		806.17			Connect to Line 4100
	4303		0.35			0.90	1.25	5.00		10.32	4.1	Curb Inlet													819.50					814.36	818.17	
		4302			0.35	0.90	1.25	5.00	0.17	10.32	4.1	RCP	62.05	2.00	18	0.013	14.90	1.77	8.43	6.05	0.8	0.30	815.80	814.67		814.59	813.35		814.36			
Line 4300	4302		0.20			0.90	1.25	5.00		10.32	2.3	Curb Inlet													819.50			0.5		814.36	818.17	
		4301			0.55	0.90	1.25	5.17	0.36	10.25	6.3	HDPE	179.65	2.00	18	0.01	19.36	1.77	10.96	8.22	1.0	1.69	814.36	812.61		812.85	809.25		810.92			
	4301		0.12	0.17		0.90	1.25	5.00		10.32	1.4	Curb Inlet													819.50			0.5		810.92	818.17	Tie in from Line 5500
		4101			0.84	0.90	1.25	5.54	0.30	10.10	9.5	RCP	137.65	2.00	18	0.013	14.90	1.77	8.43	7.72	1.4	3.06	810.92	809.81		808.75	806.00		806.75			Connect to Line 4100
	4502		1.07			0.90	1.25	5.00		10.32	12.4	Curb Inlet													814.00					810.85	812.67	
Line 4500		4501			1.07	0.90	1.25	5.00	1.29	10.32	12.4	RCP	77.11	1.00	24	0.013	22.68	3.14	7.22	1.00	1.0	0.81	810.85	810.55		808.88	808.11		809.75			
	4501		0.44			0.90	1.25	5.00		10.32	5.1	Curb Inlet													814.00			0.5		809.75	812.67	
		4500			1.51	0.90	1.25	6.29	0.34	9.81	16.7	RCP	108.62	0.50	30	0.013	29.08	4.91	5.92	5.25	0.9	0.61	809.75	808.93		807.61	807.07		808.32			
	4804		0.89			0.90	1.25	5.00		10.32	10.3	Curb Inlet													819.50					813.39	818.17	
		4803			0.89	0.90	1.25	5.00	0.46	10.32	10.3	HDPE	197.37	1.00	24	0.01	29.49	3.14	9.39	7.17	0.9	1.11	807.97	813.39		806.20	804.22		812.28			
	4803		0.19	0.67		0.90	1.25	5.00		10.32	2.2	Curb Inlet													819.00			0.5		812.28	817.67	Tie in from Line 4900
Line 4800		4802			1.75	0.90	1.25	5.46	0.24	10.14	20.0	HDPE	127.11	1.00	24	0.01	29.49	3.14	9.39	8.74	1.5	2.94	806.67	812.28		803.72	802.45		809.34			
	4802		0.15			0.90	1.25	5.00		10.32	1.7	Curb Inlet													819.00			0.5		809.34	817.67	
		4801			1.90	0.90	1.25	5.70	0.11	10.04	21.5	RCP	49.19	1.00	24	0.013	22.68	3.14	7.22	7.43	1.6	1.85	809.34	809.26		806.14	805.65		807.41			
	4801		0.14	0.69		0.90	1.25	5.00		10.32	1.6	Curb Inlet													819.00			1		807.41	817.67	Tie in from Line 5400
		4101			2.73	0.90	1.25	5.81	0.14	10.00	30.7	RCP	65.06	1.00	36	0.013	66.88	7.07	9.46	7.82	0.9	0.66	807.41	806.16		804.65	804.00		805.50			
Line 4900	4901		0.67			0.90	1.25	5.00		10.32	7.8	Curb Inlet													818.00					807.03	816.67	Connect to Line 4800
		4803			0.67	0.90	1.25	5.00	0.37	10.32	7.8	RCP	122.54	1.00	24	0.013	22.68	3.14	7.22	5.49	0.8	0.43	807.03	805.66		805.45	804.22		805.22			
	5206		0.37			0.90	1.25	5.00		10.32	4.3	Curb Inlet													817.50					812.25	816.17	
		5205			0.37	0.90	1.25	5.00	0.51	10.32	4.3	RCP	187.98	2.00	18	0.013	14.90	1.77	8.43	6.13	0.8	0.80	812.25	811.05		811.01	807.25		810.24			
	5205		0.59			0.90	1.25	5.00		10.32	6.9	Curb Inlet													817.50			0.5		810.24	816.17	
		5204			0.96	0.90	1.25	5.51	0.36	10.11	10.9	HDPE	206.00	2.00	18	0.01	19.36	1.77	10.96	9.66	1.7	5.63	809.28	810.24		806.75	802.63		804.61			
	5204		0.54			0.90	1.25	5.00		10.32	6.3	Curb Inlet													817.50			0.5		804.61	816.17	
Line 5200		5203			1.50	0.90	1.25	5.87	0.18	9.97	16.8	RCP	96.53	2.00	24	0.013	32.08	3.14	10.21	8.79	1.2	1.71	804.61	804.09		802.13	800.20		802.38			
	5203		0.00			0.90	1.25	5.00		10.32	0.0	Manhole													816.00			0.5		802.38	814.67	
		5202			1.50	0.90	1.25	6.05	0.14	9.90	16.7	RCP	72.80	2.00	24	0.013	32.08	3.14	10.21	8.77	1.2	1.40	802.17	802.38		799.70	798.24		800.98			
	5202		0.10	1.17		0.90	1.25	5.00		10.32	1.2	Curb Inlet													813.50			0.5		800.98	812.17	Tie in from Line 5300
		5201			2.77	0.90	1.25	6.19	0.05	9.85	30.7	RCP	33.00	2.00	30	0.013	58.16	4.91	11.85	10.22	1.3	1.14	800.98	800.53		797.74	797.08		799.39			
	5201		0.09			0.90	1.25	5.00		10.32	1.0	Curb Inlet													813.50			0.5		799.39	812.17	
		5200			2.86	0.90	1.25	6.24	0.05	9.83	31.6	RCP	29.11	2.00	36	0.013	94.58	7.07	13.38	10.10	0.9	0.52	799.39	798.02		796.58	796.00		797.50			
	5303		0.54			0.90	1.25	5.00		10.32	6.3	Curb Inlet													813.50					808.88	812.17	
		5302			0.54	0.90	1.25	5.00	0.35	10.32	6.3	RCP	143.04	2.00	18	0.013	14.90	1.77	8.43	6.79	1.0	1.36	808.88	808.55		807.38	804.52		807.19			
Line 5300	5302		0.43			0.90	1.25	5.00		10.32	5.0	Curb Inlet													815.00			0.5		807.19	813.67	
		5301			0.97	0.90	1.25	5.35	0.11	10.18	11.1	RCP	63.24	3.00	18	0.013	18.24	1.77	10.32	9.31	1.7	2.30	806.60	807.19		804.02	802.12		804.89			
	5301		0.20			0.90	1.25	5.00		10.32	2.3	Curb Inlet													814.00			0.5		804.89	812.67	
		5202			1.17	0.90	1.25	5.46	0.16	10.13	13.3	RCP	95.99	3.00	18	0.013	18.24	1.77	10.32	9.85	2.2	4.48	804.89	803.97		801.62	798.74		799.49			
	5402		0.45			0.90	1.25	5.00		10.32	5.2	Curb Inlet													819.50					810.16	818.17	
Line 5400		5401			0.45	0.90	1.25	5.00	0.21	10.32	5.2	RCP	62.05	1.00	24	0.013	22.68	3.14	7.22	4.95	0.7	0.12	810.16	809.31		808.71	808.09		809.18			
	5401		0.24			0.90	1.25	5.00		10.32	2.8	Curb Inlet													819.50			0.5		809.18	818.17	
		4801			0.69	0.90	1.25	5.21	0.59	10.24	7.9	RCP	193.95	1.00	24	0.013	22.68	3.14	7.22	5.52	0.8	0.65	809.18	807.30		807.59	805.65		806.65			Connect to Line 4800
Line 5500	5401		0.17			0.90	1.25	5.00		10.32	2.0	Curb Inlet													819.50					811.56	818.17	
		4301			0.17	0.90	1.25	5.00	0.21	10.32	2.0	RCP	62.67	2.00	18	0.013	14.90	1.77	8.43	5.02	0.7	0.07	811.56	810.08		810.51	809.25		810.00			Connect to Line 4300

CIVIL ENGINEERING
GBA
9801 Renner Boulevard
Lenexa, KS 66219
913.492.0400
www.gbateam.com
MO Certificate of Authority # 000133

LANDSCAPE ARCHITECTURE
LAND3 Studio, LLC
317 SE Main
Lee's Summit, MO 64063
www.land3studio.com
MO Certificate of Authority # 2008001860

LANDSCAPE ARCHITECTURE
Hoerr Schaudt Landscape Architects
2100 Central Street, Suite 01C
Kansas City, MO 64108
816.510.0438
www.hoerrschaudt.com
MO Certificate of Authority #2019004088

MEP ENGINEERING
HENDERSON ENGINEERS, Inc.
8345 Lenexa Drive
Lenexa, KS 66214
913.742.5000
www.hei-eng.com
Missouri Certificate of Authority # 000556

ARCHITECTURE
FINKLE + WILLIAMS Architecture
7007 College Boulevard, Suite 415
Overland Park, KS 66211
913.498.1550
www.finklewilliams.com
Missouri Certificate of Authority #F00453304

PROJECT:

Paragon Star Village

1401 NW View High Dr, Lee's Summit, MO 64081

Final Development Plan - Phase One

ISSUE:

PROFESSIONAL SEAL:

DRAWING TITLE:

Drainage Calculations

JOB NO: 1249 SCALE:

DATE: 09.13.2019 DRAWN BY: DGL

SHEET NO:

C013

1 Year Storm

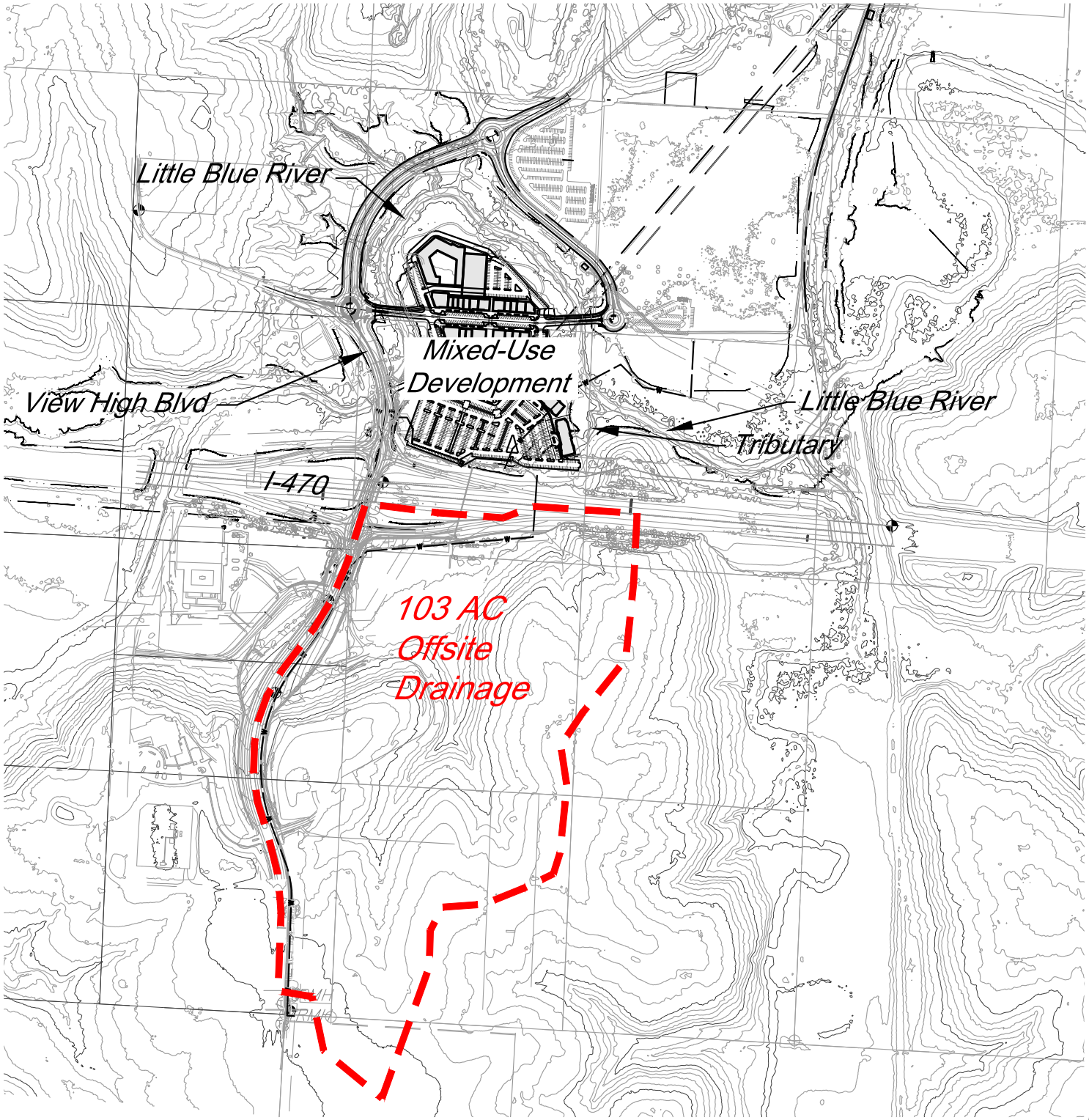
	Structures		Runoff Calculations									Pipe Design								Design Checks										
	From	To	Direct Area (acre)	Line In (acre)	Total Area (acre)	C	K	Tc (min)	Flow Time (min)	Intensity (in/hr)	Design Q (cfs)	Description	Pipe length (lin ft)	Pipe Slope Slope, %	Pipe dia (in)	Manning's n Value	Q full (cfs)	Pipe Area, sf	V full fps	Design V fps	Hw/D	outlet head, H	HW, Inlet Control, (ft)	HW, Outlet Control, (ft)	Inlet Top Elevation	upstream flowline	downstream flowline	Invert Drop (ft)	Downstream water elevation	Hydraulic Grade Elev. (Calculated)	Hydraulic Grade (allowable)	Comments
Line 4100	4105		1.06			0.90	1.00	5.00		5.41	5.2	Curb Inlet													819.50					810.76	818.17	
		4104			1.06	0.90	1.00	5.00	0.54	5.41	5.2	RCP	206.90	2.00	24	0.013	32.08	3.14	10.21	6.41	0.7	0.29	810.76	806.51		809.31	805.17		806.23			
	4104		0.00	0.48		0.90	1.00	5.00		5.41	0.0	Junction Box													818.00			0.5		806.23	816.67	Tie in from Line 4200
		4103			1.54	0.90	1.00	5.54	0.22	5.28	7.3	HDPE	110.95	2.00	24	0.01	41.70	3.14	13.27	8.48	0.8	0.35	806.23	803.99		804.67	802.45		803.64			
	4103		0.42			0.90	1.00	5.00		5.41	2.0	Curb Inlet													818.00			0.5		803.64	816.67	
		4102			1.96	0.90	1.00	5.76	0.13	5.23	9.2	HDPE	71.85	2.00	24	0.01	41.70	3.14	13.27	9.00	0.8	0.42	803.64	802.17		801.95	800.52		801.74			
	4102		0.13			0.90	1.00	5.00		5.41	0.6	Curb Inlet													818.00			0.5		801.74	816.67	
		4101			2.09	0.90	1.00	5.89	0.09	5.20	9.8	RCP	42.61	2.00	24	0.013	32.08	3.14	10.21	7.52	0.9	0.36	801.74	800.70		800.02	799.16		800.34			
	4101		0.18	0.84		0.90	1.00	5.00		5.41	0.9	Curb Inlet													818.00			1		800.34	816.67	Tie in from Line 4300
		4100			3.11	0.90	1.00	5.98	0.18	5.18	14.5	HDPE	108.17	2.00	36	0.01	122.95	7.07	17.39	9.90	0.7	0.19	800.34	797.69		798.16	796.00		797.50			
Line 4200	4201		0.48			0.90	1.00	5.00		5.41	2.3	Curb Inlet													818.00					807.74	816.67	
		4104			0.48	0.90	1.00	5.00	0.06	5.41	2.3	RCP	24.11	5.00	24	0.013	50.72	3.14	16.15	6.44	0.7	0.02	807.74	806.19		806.38	805.17		806.17			Connect to Line 4100
Line 4300	4303		0.35			0.90	1.00	5.00		5.41	1.7	Curb Inlet													819.50					813.94	818.17	
		4302			0.35	0.90	1.00	5.00	0.22	5.41	1.7	RCP	62.05	2.00	18	0.013	14.90	1.77	8.43	4.74	0.7	0.05	815.63	813.99		814.59	813.35		813.94			
	4302		0.20			0.90	1.00	5.00		5.41	1.0	Curb Inlet													819.50			0.5		813.94	818.17	
		4301			0.55	0.90	1.00	5.22	0.45	5.36	2.7	HDPE	179.65	2.00	18	0.01	19.36	1.77	10.96	6.62	0.7	0.29	813.94	810.25		812.85	809.25		809.96			
	4301		0.12	0.17		0.90	1.00	5.00		5.41	0.6	Curb Inlet													819.50			0.5		809.96	818.17	Tie in from Line 5500
		4101			0.84	0.90	1.00	5.67	0.38	5.25	4.0	RCP	137.65	2.00	18	0.013	14.90	1.77	8.43	6.02	0.8	0.53	809.96	807.28		808.75	806.00		806.75			Connect to Line 4100
Line 4500	4502		1.07			0.90	1.00	5.00		5.41	5.2	Curb Inlet													814.00					810.33	812.67	
		4501			1.07	0.90	1.00	5.00	1.29	5.41	5.2	RCP	77.11	1.00	24	0.013	22.68	3.14	7.22	1.00	0.7	0.14	810.33	809.51		808.88	808.11		809.37			
	4501		0.44			0.90	1.00	5.00		5.41	2.1	Curb Inlet													814.00			0.5		809.37	812.67	
		4500			1.51	0.90	1.00	6.29	0.44	5.11	6.9	RCP	108.62	0.50	30	0.013	29.08	4.91	5.92	4.10	0.7	0.11	809.37	808.43		807.61	807.07		808.32			
Line 4800	4804		0.89			0.90	1.00	5.00		5.41	4.3	Curb Inlet													819.50					808.51	818.17	
		4803			0.89	0.90	1.00	5.00	0.57	5.41	4.3	HDPE	197.37	1.00	24	0.01	29.49	3.14	9.39	5.78	0.7	0.20	807.61	808.51		806.20	804.22		808.31			
	4803		0.19	0.67		0.90	1.00	5.00		5.41	0.9	Curb Inlet													819.00			0.5		808.31	817.67	Tie in from Line 4900
		4802			1.75	0.90	1.00	5.57	0.31	5.27	8.3	HDPE	127.11	1.00	24	0.01	29.49	3.14	9.39	6.79	0.8	0.51	805.34	808.31		803.72	802.45		807.80			
	4802		0.15			0.90	1.00	5.00		5.41	0.7	Curb Inlet													819.00			0.5		807.80	817.67	
		4801			1.90	0.90	1.00	5.88	0.14	5.20	8.9	RCP	49.19	1.00	24	0.013	22.68	3.14	7.22	5.70	0.8	0.32	807.80	807.11		806.14	805.65		806.79			
	4801		0.14	0.69		0.90	1.00	5.00		5.41	0.7	Curb Inlet													819.00			1		806.79	817.67	Tie in from Line 5400
		4101			2.73	0.90	1.00	6.03	0.18	5.17	12.7	RCP	65.06	1.00	36	0.013	66.88	7.07	9.46	6.16	0.7	0.11	806.79	805.61		804.65	804.00		805.50			
Line 4900	4901		0.67			0.90	1.00	5.00		5.41	3.3	Curb Inlet													818.00					806.83	816.67	Connect to Line 4800
		4803			0.67	0.90	1.00	5.00	0.46	5.41	3.3	RCP	122.54	1.00	24	0.013	22.68	3.14	7.22	4.43	0.7	0.08	806.83	805.30		805.45	804.22		805.22			
Line 5200	5206		0.37			0.90	1.00	5.00		5.41	1.8	Curb Inlet													817.50					812.05	816.17	
		5205			0.37	0.90	1.00	5.00	0.65	5.41	1.8	RCP	187.98	2.00	18	0.013	14.90	1.77	8.43	4.84	0.7	0.14	812.05	808.16		811.01	807.25		808.02			
	5205		0.59			0.90	1.00	5.00		5.41	2.9	Curb Inlet													817.50			0.5		808.02	816.17	
		5204			0.96	0.90	1.00	5.65	0.45	5.25	4.5	HDPE	206.00	2.00	18	0.01	19.36	1.77	10.96	7.55	0.8	0.97	808.02	804.64		806.75	802.63		803.66			
	5204		0.54			0.90	1.00	5.00		5.41	2.6	Curb Inlet													817.50			0.5		803.66	816.17	
		5203			1.50	0.90	1.00	6.10	0.23	5.15	7.0	RCP	96.53	2.00	24	0.013	32.08	3.14	10.21	6.88	0.8	0.29	803.66	801.52		802.13	800.20		801.23			
	5203		0.00			0.90	1.00	5.00		5.41	0.0	Manhole													816.00			0.5		801.23	814.67	
		5202			1.50	0.90	1.00	6.34	0.18	5.10	6.9	RCP	72.80	2.00	24	0.013	32.08	3.14	10.21	6.86	0.8	0.24	801.23	799.92		799.70	798.24		799.68			
	5202		0.10	1.17		0.90	1.00	5.00		5.41	0.5	Curb Inlet													813.50			0.5		799.68	812.17	Tie in from Line 5300
		5201			2.77	0.90	1.00	6.51	0.07	5.06	12.6	RCP	33.00	2.00	30	0.013	58.16	4.91	11.85	7.99	0.8	0.19	799.68	798.92		797.74	797.08		798.73			
	5201		0.09			0.90	1.00	5.00		5.41	0.4	Curb Inlet													813.50			0.5		798.73	812.17	
		5200			2.86	0.90	1.00	6.58	0.06	5.05	13.0	RCP	29.11	2.00	36	0.013	94.58	7.07	13.38	8.10	0.7	0.09	798.73	797.59		796.58	796.00		797.50			
Line 5300	5303		0.54			0.90	1.00	5.00		5.41	2.6	Curb Inlet													813.50					808.47	812.17	
		5302			0.54	0.90	1.00	5.00	0.44	5.41	2.6	RCP	143.04	2.00	18	0.013	14.90	1.77	8.43	5.40	0.7	0.24	808.47	805.53		807.38	804.52		805.30			
	5302		0.43			0.90	1.00	5.00		5.41	2.1	Curb Inlet													815.00			0.5		805.30	813.67	
		5301			0.97	0.90	1.00	5.44	0.14	5.30	4.6	RCP	63.24	3.00	18	0.013	18.24	1.77	10.32	7.28	0.9	0.40	805.30	803.42		804.02	802.12		803.02			
	5301		0.20			0.90	1.00	5.00		5.41	1.0	Curb Inlet													814.00			0.5		803.02	812.67	
		5202			1.17	0.90	1.00	5.59	0.21	5.27	5.5	RCP	95.99	3.00	18	0.013	18.24	1.77	10.32	7.60	0.9	0.77	803.02	800.26		801.62	798.74		799.49			
Line 5400	5402		0.45			0.90	1.00	5.00		5.41	2.2	Curb Inlet													819.50					810.07	818.17	
		5401			0.45	0.90	1.00	5.00	0.27	5.41	2.2	RCP	62.05	1.00	24	0.013	22.68	3.14	7.22	3.82	0.7	0.02	810.07	809.00		808.71	808.09		808.97			
	5401		0.24			0.90	1.00	5.00		5.41	1.2	Curb Inlet													819.50			0.5		808.97	818.17	
		4801			0.69	0.90	1.00	5.27	0.73	5.34	3.3	RCP	193.95	1.00	24	0.013	22.68	3.14	7.22	4.44	0.7	0.11	808.97	806.76		807.59	805.65		806.65			Connect to Line 4800
Line 5500	5401		0.17			0.90	1.00	5.00		5.41	0.8	Curb Inlet													819.50					811.52	818.17	
		4301			0.17	0.90	1.00	5.00	0.29	5.41	0.8	RCP	62.67	2.00	18	0.013	14.90	1.77	8.43	3.63	0.7	0.01	811.52	810.02		810.51	809.25		810.00			Connect to Line 4300

10 Year Storm

	Structures		Runoff Calculations									Pipe Design								Design Checks										
			Direct	Line	Total																							Downstream	Hydraulic	Hydraulic	
	From	To	Area	In	Area	C	K	Tc	Flow Time	Intensity	Design Q	Description	Pipe length	Pipe Slope	Pipe dia (in)	Manning's	Q full	Pipe	V full	Design V	Hw/D	outlet	HW, Inlet	HW, Outlet	Inlet Top	upstream	downstream	Invert	water	Grade Elev.	Grade	Comments
			(acre)	(acre)	(acre)			(min)	(min)	(in/hr)	(cfs)		(lin ft)	Slope, %		n Value	(cfs)	Area, sf	fps	fps		head, H	Control, (ft)	Control, (ft)	Elevation	flowline	flowline	Drop (ft)	elevation	(Calculated)	(allowable)	
Line 4100	4105		1.06			0.90	1.00	5.00		7.35	7.0	Curb Inlet													819.50					810.85	818.17	
		4104			1.06	0.90	1.00	5.00	0.50	7.35	7.0	RCP	206.90	2.00	24	0.013	32.08	3.14	10.21	6.90	0.8	0.53	810.85	806.94		809.31	805.17		806.41			
	4104		0.00	0.48		0.90	1.00	5.00		7.35	0.0	Junction Box													818.00			0.5		806.41	816.67	Tie in from Line 4200
		4103			1.54	0.90	1.00	5.50	0.20	7.20	9.9	HDPE	110.95	2.00	24	0.01	41.70	3.14	13.27	9.18	0.9	0.66	806.41	804.59		804.67	802.45		803.93			
	4103		0.42			0.90	1.00	5.00		7.35	2.8	Curb Inlet													818.00			0.5		803.93	816.67	
		4102			1.96	0.90	1.00	5.70	0.12	7.14	12.6	HDPE	71.85	2.00	24	0.01	41.70	3.14	13.27	9.76	1.0	0.79	803.93	802.87		801.95	800.52		802.08			
	4102		0.13			0.90	1.00	5.00		7.35	0.9	Curb Inlet													818.00			0.5		802.08	816.67	
		4101			2.09	0.90	1.00	5.82	0.09	7.11	13.4	RCP	42.61	2.00	24	0.013	32.08	3.14	10.21	8.21	1.0	0.67	802.08	801.15		800.02	799.16		800.49			
	4101		0.18	0.84		0.90	1.00	5.00		7.35	1.2	Curb Inlet													818.00			1		800.49	816.67	Tie in from Line 4300
		4100			3.11	0.90	1.00	5.91	0.17	7.08	19.8	HDPE	108.17	2.00	36	0.01	122.95	7.07	17.39	10.92	0.8	0.36	800.49	797.86		798.16	796.00		797.50			
Line 4200	4201		0.48			0.90	1.00	5.00		7.35	3.2	Curb Inlet													818.00					807.76	816.67	
		4104			0.48	0.90	1.00	5.00	0.05	7.35	3.2	RCP	24.11	5.00	24	0.013	50.72	3.14	16.15	7.34	0.7	0.03	807.76	806.20		806.38	805.17		806.17			Connect to Line 4100
Line 4300	4303		0.35			0.90	1.00	5.00		7.35	2.3	Curb Inlet													819.50					814.02	818.17	
		4302			0.35	0.90	1.00	5.00	0.20	7.35	2.3	RCP	62.05	2.00	18	0.013	14.90	1.77	8.43	5.25	0.7	0.10	815.66	814.12		814.59	813.35		814.02			
	4302		0.20			0.90	1.00	5.00		7.35	1.3	Curb Inlet													819.50			0.5		814.02	818.17	
		4301			0.55	0.90	1.00	5.20	0.42	7.29	3.6	HDPE	179.65	2.00	18	0.01	19.36	1.77	10.96	7.11	0.8	0.55	814.02	810.68		812.85	809.25		810.13			
	4301		0.12	0.17		0.90	1.00	5.00		7.35	0.8	Curb Inlet													819.50			0.5		810.13	818.17	Tie in from Line 5500
		4101			0.84	0.90	1.00	5.62	0.35	7.17	5.4	RCP	137.65	2.00	18	0.013	14.90	1.77	8.43	6.51	0.9	0.98	810.13	807.73		808.75	806.00		806.75			Connect to Line 4100
Line 4500	4502		1.07			0.90	1.00	5.00		7.35	7.1	Curb Inlet													814.00					810.43	812.67	
		4501			1.07	0.90	1.00	5.00	1.29	7.35	7.1	RCP	77.11	1.00	24	0.013	22.68	3.14	7.22	1.00	0.8	0.26	810.43	809.70		808.88	808.11		809.44			
	4501		0.44			0.90	1.00	5.00		7.35	2.9	Curb Inlet													814.00			0.5		809.44	812.67	
		4500			1.51	0.90	1.00	6.29	0.41	6.98	9.5	RCP	108.62	0.50	30	0.013	29.08	4.91	5.92	4.44	0.7	0.20	809.44	808.52		807.61	807.07		808.32			
Line 4800	4804		0.89			0.90	1.00	5.00		7.35	5.9	Curb Inlet													819.50					809.39	818.17	
		4803			0.89	0.90	1.00	5.00	0.53	7.35	5.9	HDPE	197.37	1.00	24	0.01	29.49	3.14	9.39	6.19	0.7	0.36	807.68	809.39		806.20	804.22		809.03			
	4803		0.19	0.67		0.90	1.00	5.00		7.35	1.3	Curb Inlet													819.00			0.5		809.03	817.67	Tie in from Line 4900
		4802			1.75	0.90	1.00	5.53	0.29	7.19	11.3	HDPE	127.11	1.00	24	0.01	29.49	3.14	9.39	7.36	0.9	0.95	805.58	809.03		803.72	802.45		808.08			
	4802		0.15			0.90	1.00	5.00		7.35	1.0	Curb Inlet													819.00			0.5		808.08	817.67	
		4801			1.90	0.90	1.00	5.82	0.13	7.11	12.2	RCP	49.19	1.00	24	0.013	22.68	3.14	7.22	6.26	1.0	0.59	808.08	807.49		806.14	805.65		806.90			
	4801		0.14	0.69		0.90	1.00	5.00		7.35	0.9	Curb Inlet													819.00			1		806.90	817.67	Tie in from Line 5400
		4101			2.73	0.90	1.00	5.95	0.16	7.07	17.4	RCP	65.06	1.00	36	0.013	66.88	7.07	9.46	6.72	0.8	0.21	806.90	805.71		804.65	804.00		805.50			
Line 4900	4901		0.67			0.90	1.00	5.00		7.35	4.4	Curb Inlet													818.00					806.87	816.67	Connect to Line 4800
		4803			0.67	0.90	1.00	5.00	0.43	7.35	4.4	RCP	122.54	1.00	24	0.013	22.68	3.14	7.22	4.74	0.7	0.14	806.87	805.36		805.45	804.22		805.22			
Line 5200	5206		0.37			0.90	1.00	5.00		7.35	2.4	Curb Inlet													817.50					812.09	816.17	
		5205			0.37	0.90	1.00	5.00	0.59	7.35	2.4	RCP	187.98	2.00	18	0.013	14.90	1.77	8.43	5.31	0.7	0.26	812.09	808.51		811.01	807.25		808.24			
	5205		0.59			0.90	1.00	5.00		7.35	3.9	Curb Inlet													817.50			0.5		808.24	816.17	
		5204			0.96	0.90	1.00	5.59	0.42	7.18	6.2	HDPE	206.00	2.00	18	0.01	19.36	1.77	10.96	8.18	1.0	1.81	808.24	805.65		806.75	802.63		803.83			
	5204		0.54			0.90	1.00	5.00		7.35	3.6	Curb Inlet													817.50			0.5		803.83	816.17	
		5203			1.50	0.90	1.00	6.01	0.22	7.05	9.5	RCP	96.53	2.00	24	0.013	32.08	3.14	10.21	7.48	0.9	0.55	803.83	801.95		802.13	800.20		801.40			
	5203		0.00			0.90	1.00	5.00		7.35	0.0	Manhole													816.00			0.5		801.40	814.67	
		5202			1.50	0.90	1.00	6.22	0.16	6.99	9.4	RCP	72.80	2.00	24	0.013	32.08	3.14	10.21	7.46	0.8	0.45	801.40	800.36		799.70	798.24		799.91			
	5202		0.10	1.17		0.90	1.00	5.00		7.35	0.7	Curb Inlet													813.50			0.5		799.91	812.17	Tie in from Line 5300
		5201			2.77	0.90	1.00	6.39	0.06	6.95	17.3	RCP	33.00	2.00	30	0.013	58.16	4.91	11.85	8.68	0.9	0.36	799.91	799.21		797.74	797.08		798.85			
	5201		0.09			0.90	1.00	5.00		7.35	0.6	Curb Inlet													813.50			0.5		798.85	812.17	
		5200			2.86	0.90	1.00	6.45	0.06	6.93	17.8	RCP	29.11	2.00	36	0.013	94.58	7.07	13.38	8.70	0.8	0.16	798.85	797.66		796.58	796.00		797.50			
Line 5300	5303		0.54			0.90	1.00	5.00		7.35	3.6	Curb Inlet													813.50					808.55	812.17	
		5302			0.54	0.90	1.00	5.00	0.41	7.35	3.6	RCP	143.04	2.00	18	0.013	14.90	1.77	8.43	5.84	0.8	0.44	808.55	805.97		807.38	804.52		805.53			
	5302		0.43			0.90	1.00	5.00		7.35	2.8	Curb Inlet													815.00			0.5		805.53	813.67	
		5301			0.97	0.90	1.00	5.41	0.13	7.23	6.3	RCP	63.24	3.00	18	0.013	18.24	1.77	10.32	7.86	1.0	0.74	805.53	804.10		804.02	802.12		803.36			
	5301		0.20			0.90	1.00	5.00		7.35	1.3	Curb Inlet													814.00			0.5		803.36	812.67	
		5202			1.17	0.90	1.00	5.54	0.19	7.19	7.6	RCP	95.99	3.00	18	0.013	18.24	1.77	10.32	8.29	1.2	1.44	803.36	800.93		801.62	798.74		799.49			
Line 5400	5402		0.45			0.90	1.00	5.00		7.35	3.0	Curb Inlet													819.50					810.09	818.17	
		5401			0.45	0.90	1.00	5.00	0.24	7.35	3.0	RCP	62.05	1.00	24	0.013	22.68	3.14	7.22	4.29	0.7	0.04	810.09	809.05		808.71	808.09		809.01			
	5401		0.24			0.90	1.00	5.00		7.35	1.6	Curb Inlet													819.50			0.5		809.01	818.17	
		4801			0.69	0.90	1.00	5.24	0.68	7.28	4.5	RCP	193.95	1.00	24	0.013	22.68	3.14	7.22	4.76	0.7	0.21	809.01	806.86		807.59	805.65		806.65			Connect to Line 4800
Line 5500	5401		0.17			0.90	1.00	5.00		7.35	1.1	Curb Inlet													819.50					811.53	818.17	
		4301			0.17	0.90	1.00	5.00	0.25	7.35	1.1	RCP	62.67	2.00	18	0.013	14.90	1.77	8.43	4.13	0.7	0.02	811.53	810.03		810.51	809.25		810.00			Connect to Line 4300

100 Year Storm

	Structures		Runoff Calculations									Pipe Design								Design Checks										
	From	To	Direct Area (acre)	Line In (acre)	Total Area (acre)	C	K	Tc (min)	Flow Time (min)	Intensity (in/hr)	Design Q (cfs)	Description	Pipe length (lin ft)	Pipe Slope Slope, %	Pipe dia (in)	Manning's n Value	Q full (cfs)	Pipe Area, sf	V full fps	Design V fps	Hw/D	outlet head, H	HW, Inlet Control, (ft)	HW, Outlet Control, (ft)	Inlet Top Elevation	upstream flowline	downstream flowline	Invert Drop (ft)	Downstream water elevation	Hydraulic Grade Elev. (Calculated)	Hydraulic Grade (allowable)	Comments
Line 4100	4105		1.06			0.90	1.25	5.00		10.32	12.3	Curb Inlet													819.50					811.26	818.17	
		4104			1.06	0.90	1.25	5.00	0.43	10.32	12.3	RCP	206.90	2.00	24	0.013	32.08	3.14	10.21	8.01	1.0	1.64	811.26	809.75		809.31	805.17		808.11			
	4104		0.00	0.48		0.90	1.25	5.00		10.32	0.0	Junction Box													818.00			0.5		808.11	816.67	Tie in from Line 4200
		4103			1.54	0.90	1.25	5.43	0.17	10.15	17.5	HDPE	110.95	2.00	24	0.01	41.70	3.14	13.27	10.69	1.3	2.04	807.25	808.11		804.67	802.45		806.07			
	4103		0.42			0.90	1.25	5.00		10.32	4.9	Curb Inlet													818.00			0.5		806.07	816.67	
		4102			1.96	0.90	1.25	5.60	0.10	10.08	22.2	HDPE	71.85	2.00	24	0.01	41.70	3.14	13.27	11.49	1.7	2.46	805.29	806.07		801.95	800.52		803.60			
	4102		0.13			0.90	1.25	5.00		10.32	1.5	Curb Inlet													818.00			0.5		803.60	816.67	
		4101			2.09	0.90	1.25	5.71	0.07	10.04	23.6	RCP	42.61	2.00	24	0.013	32.08	3.14	10.21	9.76	1.8	2.08	803.60	803.23		800.02	799.16		801.15			
	4101		0.18	0.84		0.90	1.25	5.00		10.32	2.1	Curb Inlet													818.00			1		801.15	816.67	Tie in from Line 4300
		4100			3.11	0.90	1.25	5.78	0.14	10.01	35.0	HDPE	108.17	2.00	36	0.01	122.95	7.07	17.39	12.61	1.0	1.12	801.15	798.62		798.16	796.00		797.50			
Line 4200	4201		0.48			0.90	1.25	5.00		10.32	5.6	Curb Inlet													818.00					807.84	816.67	
		4104			0.48	0.90	1.25	5.00	0.04	10.32	5.6	RCP	24.11	5.00	24	0.013	50.72	3.14	16.15	8.95	0.7	0.09	807.84	806.26		806.38	805.17		806.17			Connect to Line 4100
Line 4300	4303		0.35			0.90	1.25	5.00		10.32	4.1	Curb Inlet													819.50					814.36	818.17	
		4302			0.35	0.90	1.25	5.00	0.17	10.32	4.1	RCP	62.05	2.00	18	0.013	14.90	1.77	8.43	6.05	0.8	0.30	815.80	814.67		814.59	813.35		814.36			
	4302		0.20			0.90	1.25	5.00		10.32	2.3	Curb Inlet													819.50			0.5		814.36	818.17	
		4301			0.55	0.90	1.25	5.17	0.36	10.25	6.3	HDPE	179.65	2.00	18	0.01	19.36	1.77	10.96	8.22	1.0	1.69	814.36	812.61		812.85	809.25		810.92			
	4301		0.12	0.17		0.90	1.25	5.00		10.32	1.4	Curb Inlet													819.50			0.5		810.92	818.17	Tie in from Line 5500
		4101			0.84	0.90	1.25	5.54	0.30	10.10	9.5	RCP	137.65	2.00	18	0.013	14.90	1.77	8.43	7.72	1.4	3.06	810.92	809.81		808.75	806.00		806.75			Connect to Line 4100
Line 4500	4502		1.07			0.90	1.25	5.00		10.32	12.4	Curb Inlet													814.00					810.85	812.67	
		4501			1.07	0.90	1.25	5.00	1.29	10.32	12.4	RCP	77.11	1.00	24	0.013	22.68	3.14	7.22	1.00	1.0	0.81	810.85	810.55		808.88	808.11		809.75			
	4501		0.44			0.90	1.25	5.00		10.32	5.1	Curb Inlet													814.00			0.5		809.75	812.67	
		4500			1.51	0.90	1.25	6.29	0.34	9.81	16.7	RCP	108.62	0.50	30	0.013	29.08	4.91	5.92	5.25	0.9	0.61	809.75	808.93		807.61	807.07		808.32			
Line 4800	4804		0.89			0.90	1.25	5.00		10.32	10.3	Curb Inlet													819.50					813.39	818.17	
		4803			0.89	0.90	1.25	5.00	0.46	10.32	10.3	HDPE	197.37	1.00	24	0.01	29.49	3.14	9.39	7.17	0.9	1.11	807.97	813.39		806.20	804.22		812.28			
	4803		0.19	0.67		0.90	1.25	5.00		10.32	2.2	Curb Inlet													819.00			0.5		812.28	817.67	Tie in from Line 4900
		4802			1.75	0.90	1.25	5.46	0.24	10.14	20.0	HDPE	127.11	1.00	24	0.01	29.49	3.14	9.39	8.74	1.5	2.94	806.67	812.28		803.72	802.45		809.34			
	4802		0.15			0.90	1.25	5.00		10.32	1.7	Curb Inlet													819.00			0.5		809.34	817.67	
		4801			1.90	0.90	1.25	5.70	0.11	10.04	21.5	RCP	49.19	1.00	24	0.013	22.68	3.14	7.22	7.43	1.6	1.85	809.34	809.26		806.14	805.65		807.41			
	4801		0.14	0.69		0.90	1.25	5.00		10.32	1.6	Curb Inlet													819.00			1		807.41	817.67	Tie in from Line 5400
		4101			2.73	0.90	1.25	5.81	0.14	10.00	30.7	RCP	65.06	1.00	36	0.013	66.88	7.07	9.46	7.82	0.9	0.66	807.41	806.16		804.65	804.00		805.50			
Line 4900	4901		0.67			0.90	1.25	5.00		10.32	7.8	Curb Inlet													818.00					807.03	816.67	Connect to Line 4800
		4803			0.67	0.90	1.25	5.00	0.37	10.32	7.8	RCP	122.54	1.00	24	0.013	22.68	3.14	7.22	5.49	0.8	0.43	807.03	805.66		805.45	804.22		805.22			
Line 5200	5206		0.37			0.90	1.25	5.00		10.32	4.3	Curb Inlet													817.50					812.25	816.17	
		5205			0.37	0.90	1.25	5.00	0.51	10.32	4.3	RCP	187.98	2.00	18	0.013	14.90	1.77	8.43	6.13	0.8	0.80	812.25	811.05		811.01	807.25		810.24			
	5205		0.59			0.90	1.25	5.00		10.32	6.9	Curb Inlet													817.50			0.5		810.24	816.17	
		5204			0.96	0.90	1.25	5.51	0.36	10.11	10.9	HDPE	206.00	2.00	18	0.01	19.36	1.77	10.96	9.66	1.7	5.63	809.28	810.24		806.75	802.63		804.61			
	5204		0.54			0.90	1.25	5.00		10.32	6.3	Curb Inlet													817.50			0.5		804.61	816.17	
		5203			1.50	0.90	1.25	5.87	0.18	9.97	16.8	RCP	96.53	2.00	24	0.013	32.08	3.14	10.21	8.79	1.2	1.71	804.61	804.09		802.13	800.20		802.38			
	5203		0.00			0.90	1.25	5.00		10.32	0.0	Manhole													816.00			0.5		802.38	814.67	
		5202			1.50	0.90	1.25	6.05	0.14	9.90	16.7	RCP	72.80	2.00	24	0.013	32.08	3.14	10.21	8.77	1.2	1.40	802.17	802.38		799.70	798.24		800.98			
	5202		0.10	1.17		0.90	1.25	5.00		10.32	1.2	Curb Inlet													813.50			0.5		800.98	812.17	Tie in from Line 5300
		5201			2.77	0.90	1.25	6.19	0.05	9.85	30.7	RCP	33.00	2.00	30	0.013	58.16	4.91	11.85	10.22	1.3	1.14	800.98	800.53		797.74	797.08		799.39			
	5201		0.09			0.90	1.25	5.00		10.32	1.0	Curb Inlet													813.50			0.5		799.39	812.17	
		5200			2.86	0.90	1.25	6.24	0.05	9.83	31.6	RCP	29.11	2.00	36	0.013	94.58	7.07	13.38	10.10	0.9	0.52	799.39	798.02		796.58	796.00		797.50			
Line 5300	5303		0.54			0.90	1.25	5.00		10.32	6.3	Curb Inlet													813.50					808.88	812.17	
		5302			0.54	0.90	1.25	5.00	0.35	10.32	6.3	RCP	143.04	2.00	18	0.013	14.90	1.77	8.43	6.79	1.0	1.36	808.88	808.55		807.38	804.52		807.19			
	5302		0.43			0.90	1.25	5.00		10.32	5.0	Curb Inlet													815.00			0.5		807.19	813.67	
		5301			0.97	0.90	1.25	5.35	0.11	10.18	11.1	RCP	63.24	3.00	18	0.013	18.24	1.77	10.32	9.31	1.7	2.30	806.60	807.19		804.02	802.12		804.89			
	5301		0.20			0.90	1.25	5.00		10.32	2.3	Curb Inlet													814.00			0.5		804.89	812.67	
		5202			1.17	0.90	1.25	5.46	0.16	10.13	13.3	RCP	95.99	3.00	18	0.013	18.24	1.77	10.32	9.85	2.2	4.48	804.89	803.97		801.62	798.74		799.49			
Line 5400	5402		0.45			0.90	1.25	5.00		10.32	5.2	Curb Inlet													819.50					810.16	818.17	
		5401			0.45	0.90	1.25	5.00	0.21	10.32	5.2	RCP	62.05	1.00	24	0.013	22.68	3.14	7.22	4.95	0.7	0.12	810.16	809.31		808.71	808.09		809.18			
	5401		0.24			0.90	1.25	5.00		10.32	2.8	Curb Inlet													819.50			0.5		809.18	818.17	
		4801			0.69	0.90	1.25	5.21	0.59	10.24	7.9	RCP	193.95	1.00	24	0.013	22.68	3.14	7.22	5.52	0.8	0.65	809.18	807.30		807.59	805.65		806.65			Connect to Line 4800
Line 5500	5401		0.17			0.90	1.25	5.00		10.32	2.0	Curb Inlet													819.50					811.56	818.17	
		4301			0.17	0.90	1.25	5.00	0.21	10.32	2.0	RCP	62.67	2.00	18	0.013	14.90	1.77	8.43	5.02	0.7	0.07	811.56	810.08		810.51	809.25		810.00			Connect to Line 4300



Scale: 1"=800'

GBA architects engineers

PROJECT NUMBER	TITLE	EXHIBIT
12720.00	*Regional Drainage Map*	7
DATE	*Paragon Star MXD*	
2/15/19	*Lee's Summit, MO*	

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, KANSAS CITY DISTRICT
635 FEDERAL BUILDING
601 E. 12TH STREET
KANSAS CITY, MISSOURI 64106-2824

March 3, 2017

Regulatory Branch
(NWK-2013-00408)

Mr. David Flick
Terra Technologies
6240 West 135th Street, Suite 100
Overland Park, Kansas 66223

Dear Mr. Flick:

As requested by the application submitted on behalf of Paragon Star, LLC, received on July 21, 2015, enclosed is a proposed Department of the Army (DA) permit, in duplicate, with drawings attached. When executed, the permit will authorize your plan to permanently grade.and fill 20.61 acres of wetlands and pipe and fill approximately 1,089 linear feet of three ephemeral streams to construct the proposed development. The project will include a soccer complex, commercial and residential development, retail and associated parking, roadways and other amenities. The project is located northeast of the intersection of I-470 and View High Drive in Sections 27 and 34, Township 48 North, Range 32 West, in Jackson County, Missouri.

A copy of the water quality certification issued for your work, by the Missouri Department of Natural Resources has been attached to the enclosed DA permit. As stated in general condition "5" of the enclosed permit document, the conditions presented in the state's water quality certification are incorporated into the special conditions of the permit by reference.

This letter contains an initial proffered permit for your proposed project. If you object to the permit because of certain terms and conditions therein, you may request that the permit be modified accordingly. Enclosed you will find a Notification of Administrative Appeal Options and Process and Request for Appeal (NAO-RFA) form. If you request reconsideration of this decision you must submit a completed NAO-RFA form to the Kansas City District at the following address:

District Commander
ATTN: Mark D. Frazier
Chief, Regulatory Branch
U.S. Army Engineer District, Kansas City
601 East 12th Street, Suite 402
Kansas City, MO 64106-2824
Voice: 816-389-3990 FAX: 816-389-2032

In order for an NAO-RFA to be accepted by the U.S. Army Corps of Engineers (Corps), the Corps must determine that it is complete, that it meets the criteria for reconsideration under 33 C.F.R. Part 331.6.b., and that it has been received by the District Office within 60 days of the date of the NAO-RFA. Should you decide to submit an NAO-RFA form, it must be received at the above address by **May 2, 2017**. It is not necessary to submit an NAO-RFA form to the District Office if you do not object to the provisions of your initial proffered permit.

If you wish to accept the permit in its present form, please sign the original and duplicate copy of the enclosed permit document. Each copy of the permit document should be signed on page 3 above the

word "Permittee," dated, and returned within 30 days from the date of this letter. Also, the application fee of $100 should be paid by check made payable to USAED-KC and remitted with the permit document. A preaddressed envelope is enclosed for your convenience. Upon receipt of the properly signed documents and the application fee, the permit will be executed and returned to you for your files. Your signature on the standard permit means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

Special condition "a" of the permit document requires you to complete and return a "Compliance Certification" upon completion of the authorized work and any required mitigation. The "Compliance Certification" form will be provided to you when your DA permit is executed.

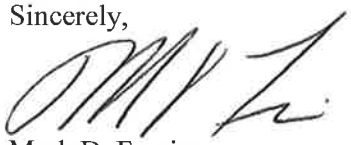
In addition to the general and special conditions of this IP, a special condition has been added in order to replace the lost aquatic resources that result from the authorized project.

You must purchase 20.61 wetland credits and 3,403 stream credits from an approved compensatory mitigation bank in the service area of the project. The current approved mitigation bank available in the service area of your project is the Clear Fork Wetland and Stream Mitigation Bank. The compensatory mitigation credit purchase must be completed prior to the commencement of work within our regulatory jurisdiction. The permittee must submit a receipt of payment from the mitigation bank that includes the amount of credits purchased and the date of credit purchase. Receipts submitted by authorized agents will not be accepted. (If, at time of purchase, the mitigation bank does not have sufficient wetland and stream credit available, you must submit a request to modify this special condition in order to utilize a different compensatory mitigation option such as the purchase of advance credits from an approved in-lieu fee provider. Please note the Corps will require advance credit purchases to be made at a higher ratio.)

We are interested in your thoughts and opinions concerning your experience with the Kansas City District, Corps of Engineers Regulatory Program. Please feel free to complete our Customer Service Survey form on our website at: http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey. You may also call and request a paper copy of the survey which you may complete and return to us by mail or fax.

If you have any questions concerning this matter, please feel free to write me or to contact Mr. Justin Hughes at (816) 389-3211 or via email at justin.w.hughes@usace.army.mil.

Sincerely,



Mark D. Frazier
Chief, Regulatory Branch
Operations Division

Enclosures

DEPARTMENT OF THE ARMY PERMIT

Permittee Paragon Star, LLC

Permit No. NWK-2013-00408

Issuing Office U.S. Army Engineer District, Kansas City

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below, and with the plans and drawings attached hereto which are incorporated in and made a part of this permit.

Project Description: This permit authorizes the permanent grade and fill of 20.61 acres of wetlands and pipe and fill approximately 1,089 linear feet of three ephemeral streams for construction of the Paragon Star Development. The project will include a soccer complex, commercial and residential development, retail and associated parking, roadways and other amenities.

Permit Drawing(s): Location map, plan view and details, four (4) sheets dated March 3, 2017.

Project Location: The project area includes seven streams and eight adjacent wetlands on land located northeast of the intersection of I-470 and View High Drive in Sections 27 and 34, Township 48 North, Range 32 West, in Jackson County, Missouri. USGS Quad: MO-Lees Summit.

(Approximate Center - Latitude: 38.9411803, Longitude: -94.4428408)

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **31 December 2019**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

See continuation sheet(s), page(s) 4 (and 5), of this document.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorization required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition I establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

_____ 3/6/17

(PERMITTEE) (DATE)

Phillip Short

(PRINTED NAME AND TITLE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

_____ _____

(DISTRICT ENGINEER) (DATE)
DOUGLAS B. GUTTORMSEN, COLONEL
BY: Mark D. Frazier, Chief, Regulatory Branch

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

_____ _____

(TRANSFEREE) (DATE)

Special Conditions:

a. You must sign and return a "Compliance Certification" after you complete the authorized work and any required mitigation. Your signature will certify that you completed the work in accordance with this permit, including general and specific conditions, and that any required mitigation was completed in accordance with the permit conditions.

b. You must purchase 20.61 wetland credits and 3,403 stream credits from an approved compensatory mitigation bank in the service area of the project. The current approved mitigation bank available in the service area of your project is the Clear Fork Wetland and Stream Mitigation Bank. The compensatory mitigation credit purchase must be completed prior to the commencement of work within our regulatory jurisdiction. The permittee must submit a receipt of payment from the mitigation bank that includes the amount of credits purchased and the date of credit purchase. Receipts submitted by authorized agents will not be accepted.

c. If any part of the authorized work is performed by a contractor, before starting work you must discuss the terms and conditions of this permit with the contractor; and, you must give a copy of this entire permit to the contractor.

d. You must avoid the remaining 2.13 acres of wetlands and the remaining 6,014 linear feet (LF) of stream located onsite as shown on sheets 2 and 3 of 4. These wetlands and stream segments were avoided as part of the permit application review process and therefore shall not be disturbed by any excavating, filling, mechanized land clearing, agricultural activities, or other construction work whatsoever. The Corps reserves the right to deny review of any requests for future impacts to the remaining wetlands and streams.

e. Any construction impacts to wetlands and/or streams other than those authorized under this permit are strictly prohibited. The project limits as shown on the enclosed drawings (Sheets 1-4) shall be clearly identified in the field (e.g., staking, flagging, silt fencing, etc.) prior to site clearing and construction to ensure avoidance of impacts to waters of the U.S., including wetlands, beyond the project footprint.

f. You must use clean, uncontaminated materials for fill in order to minimize excessive turbidity by leaching of fines, as well as to preclude the entrance of deleterious and/or toxic materials into the waters of the U.S. by natural runoff or by leaching.

g. You must dispose of excess concrete and wash water from concrete trucks and other concrete mixing equipment in a nonwetland area above the ordinary high water mark and at a location where the concrete and wash water cannot enter the water body or an adjacent wetland area.

h. You must excavate, dredge and/or fill in the watercourse in a manner that will minimize increases in suspended solids and turbidity which may degrade water quality and damage aquatic life outside the immediate area of operation.

i. You must immediately remove and properly dispose of all debris during every phase of the project in order to prevent the accumulation of unsightly, deleterious and/or toxic materials in or near the water body.

j. You must not dispose of any construction debris or waste materials below the ordinary high water mark

of any water body, in a wetland area, or at any location where the materials could be introduced into the water body or an adjacent wetland as a result of runoff, flooding, wind, or other natural forces.

k. You must store all construction materials, equipment, and/or petroleum products, when not in use, above anticipated high water levels.

l. Effective erosion control measures (i.e., silt fences) shall be installed and maintained before, during, and after construction to prevent erosion and the introduction of sediments and/or contaminants into adjacent waters of the U.S., including wetlands. These measures shall remain in place until all fills have been permanently stabilized. Active sloughing, increased water turbidity and sediment in drainages, streams, and adjacent wetlands shall be evidence of insufficient stabilization.

m. You must restrict the clearing of timber and other vegetation to the absolute minimum required to accomplish the work. Clearing, grading and replanting should be planned and timed so that only the smallest area necessary is in a disturbed, unstable or unvegetated condition.

n. Upon completion of earthwork activities, the riparian areas damaged during project construction must be re-vegetated as soon as possible, preferably in the same growing season as the disturbance. Re-vegetation techniques shall include, but not be limited to the following: seeding, mulching, planting, and/or fertilizing of re-contoured ground to promote re-establishment of natural plant communities.

o. Within the temporary construction easement for the sewer line, there shall be no permanent change in preconstruction contours and/or stream bed elevations in waters of the U.S. Any exposed slopes and stream banks must be stabilized immediately upon completion of the utility line crossing of each stream.

p. The endangered Indiana bat (*Myotis sodalis*) and threatened northern long-eared bat (*Myotis septentrionalis*) (NLEB) may occur in your project area. To prevent adverse effects to this listed species, you are required to complete any tree removal during the species' hibernation period of November 1 to March 31. If implementation of the seasonal tree cutting restriction is not possible, summer surveys should be conducted to document the presence or likely absence of the listed bat species within the project area. The survey must be conducted by an approved surveyor and be designed and conducted in coordination with the Endangered Species Coordinator for the U.S. Fish and Wildlife Service, Missouri Ecological Services Field Office. If you anticipate timber clearing either beyond the proposed limits or outside these dates, please contact the Corps of Engineers, Regulatory Branch, for further consultation with the U.S. Fish and Wildlife Service.

q. The roadway crossing culvert must be constructed in accordance with the enclosed "General Guidelines for Stream Crossings, Regional Condition 1" (Enclosure 1).

r. The permittee must provide the Corps with documentation of local approval of their conditional letter of map revision (CLOMR) request from the appropriate floodplain manager for both the City of Lee's Summit and the City of Kansas City prior to performing any fill activities within waters of the U.S. The documentation should clearly state that the community has reviewed the CLOMR request and that the project meets all of the community's flood plain management requirements.

PERMIT NO. NWK-2013-00408
PARAGON STAR
GRADING AND FILLING
JACKSON COUNTY, MISSOURI
SHEET 1 OF 4
DATED 3 MARCH 2017

Concept Drawing

PARAGON STAR

VILLAGE NORTH

- A. RESIDENTIAL: 390 UNITS
- B. 390 PARKING STALLS
- C. RESTAURANT/RETAIL: 20,000 SF
  190 PARKING STALLS

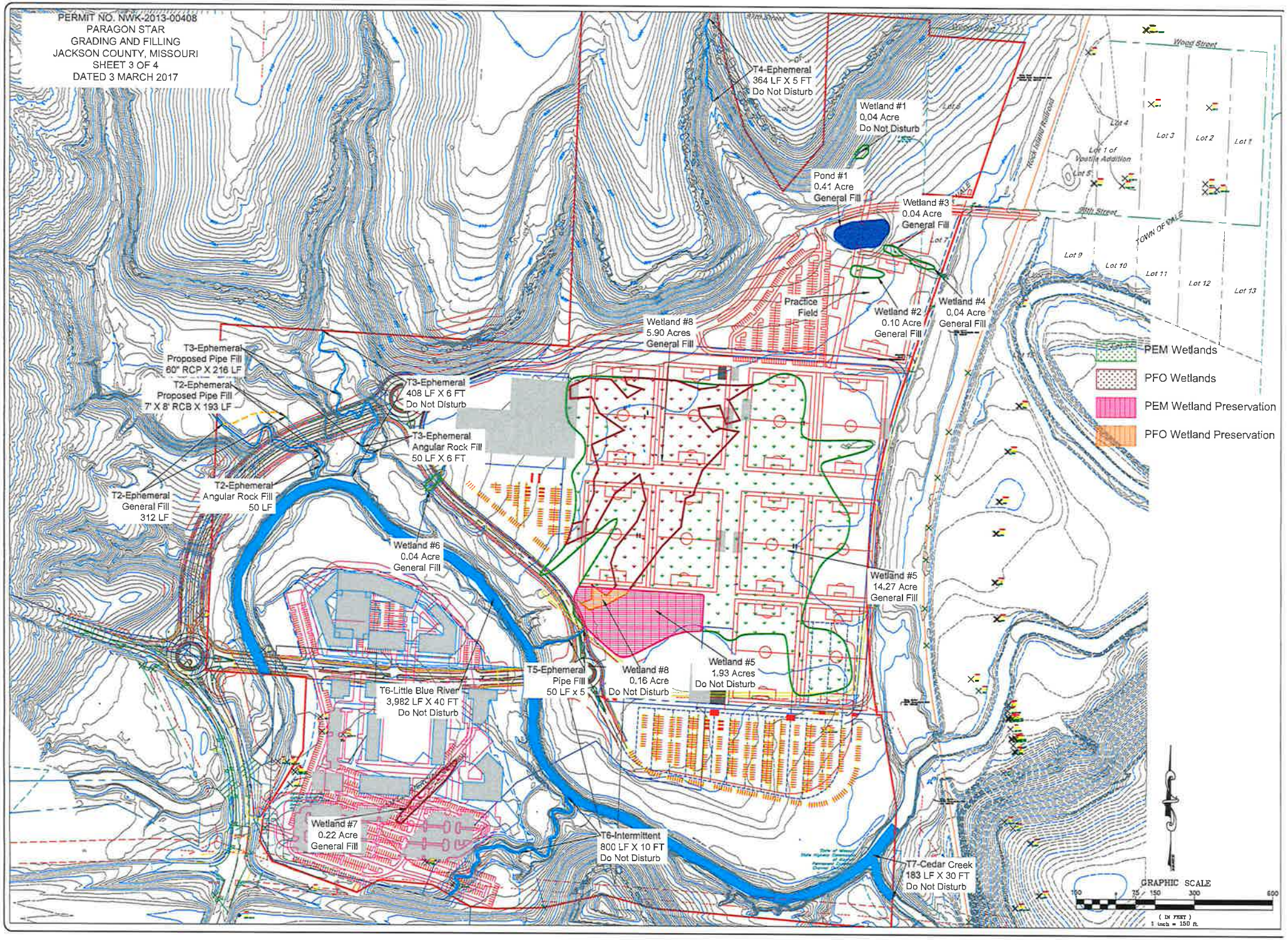
VILLAGE SOUTH

- D. OFFICE: 90,000 SF
- E. 360 PARKING STALLS
- F. RESTAURANT/RETAIL: 70,000 SF
- G. 665 PARKING STALLS
- H. HOTEL 1: 125 ROOMS
- I. 125 PARKING STALLS
- J. HOTEL 2: 125 ROOMS
- K. 125 PARKING STALLS
- L. CENTRAL AMENITY PLAZA

SOCCER PARK

- M. 10 FIELDS
- N. PARKING
- O. CLUBHOUSE CANTINA
- P. TRAILHEAD
- Q. WETLAND: 2.09 ACRES
- R. CELEBRATION PLAZA
- S. CENTRAL PROMENADE
- T. TRAIL SYSTEM
- U. FIELDHOUSE

PERMIT NO. NWK-2013-00408
PARAGON STAR
GRADING AND FILLING
JACKSON COUNTY, MISSOURI
SHEET 2 OF 4
DATED 3 MARCH 2017


PERMIT NO. NWK-2013-00408
PARAGON STAR
GRADING AND FILLING
JACKSON COUNTY, MISSOURI
SHEET 3 OF 4
DATED 3 MARCH 2017
T4-Ephemeral
364 LF X 5 FT
Do Not Disturb
Wetland #1
0.04 Acre
Do Not Disturb
Pond #1
0.41 Acre
General Fill
Wetland #3
0.04 Acre
General Fill
Practice
Field
Wetland #2
0.10 Acre
General Fill
Wetland #4
0.04 Acre
General Fill
Wetland #8
5.90 Acres
General Fill
T3-Ephemeral
Proposed Pipe Fill
60" RCP X 216 LF
T2-Ephemeral
Proposed Pipe Fill
7' X 8' RCB X 193 LF
T3-Ephemeral
408 LF X 6 FT
Do Not Disturb
T3-Ephemeral
Angular Rock Fill
50 LF X 6 FT
T2-Ephemeral
General Fill
312 LF
T2-Ephemeral
Angular Rock Fill
50 LF
Wetland #6
0.04 Acre
General Fill
Wetland #5
14.27 Acre
General Fill
T5-Ephemeral
Pipe Fill
50 LF x 5
Wetland #8
0.16 Acre
Do Not Disturb
Wetland #5
1.93 Acres
Do Not Disturb
T6-Little Blue River
3,982 LF X 40 FT
Do Not Disturb
Wetland #7
0.22 Acre
General Fill
T6-Intermittent
800 LF X 10 FT
Do Not Disturb
T7-Cedar Creek
183 LF X 30 FT
Do Not Disturb
PEM Wetlands
PFO Wetlands
PEM Wetland Preservation
PFO Wetland Preservation
Wood Street
Rock Island Railroad
Lot 4
Lot 3
Lot 2
Lot 1
Lot 1 of
Vostila Addition
Lot 5
Lot 6
Lot 7
Lot 9
Lot 10
Lot 11
Lot 12
Lot 13
28th Street
TOWN OF DALE
GRAPHIC SCALE
100 0 75 150 300 600
(IN FEET)
1 inch = 150 ft.

Jurisdictional Impacts Table

Potential Jurisdictional Feature	Existing Size		General Fill		DO NOT DISTURB		Angular Rock Fill		Pipe Fill		Total Impact	
	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width
Wetland #1	0.04				0.04							
Wetland #2	0.10		0.1								0.1	
Wetland #3	0.04		0.04								0.04	
Wetland #4	0.04		0.04								0.04	
Wetland #5	16.20		14.27		1.93						14.27	
Wetland #6	0.04		0.04								0.04	
Wetland #7	0.22		0.22								0.22	
Wetland #8	6.06		5.90		0.16						5.90	
Pond #1	0.41		0.41								0.41	
T2-Ephemeral	611	6	312	6	56	6	50	6	193	6	555	6
T3-Ephemeral	891	6	217	6	408	6	50	6	216	6	483	6
T4-Ephemeral	364	5			364	5						
T5-Ephemeral	221	5			171	5			50	5	50	5
T6-Intermittent	800	10			800	10						
T7-Cedar Creek	183	30			183	30						
T6-Little Blue River	3,982	40			3,982	40						

Eric R. Greitens, Governor • Carol S. Comer, Acting Director
DEPARTMENT OF NATURAL RESOURCES
dnr.mo.gov

JAN 25 2017

Mr. Phillip Short
Paragon Star, LLC
801 NW Commerce Drive
Lee's Summit, MO 64086

RE: 2013-00408/CEK007097, Jackson County

Dear Mr. Short:

The Missouri Department of Natural Resources' Water Protection Program has reviewed your request for Clean Water Act Section 401 Water Quality Certification (WQC) to accompany the U.S. Army Corps of Engineers' (USACE) Permit 2013-00408 in which you are proposing construction of the "Paragon Star Development."

The purpose of the project, as stated by the applicant, is to provide a large sporting complex and mixed use development. Facilities will include soccer fields, residential and retail development, associated parking, roadways, utilities and other amenities. The development will impact 20.61 wetland acres and 1,089 linear feet (LF) of stream.

Jurisdictional wetlands and streams, wetland and stream types, approximate geographic coordinates, size/length information, impact size/length and impact types are as follows:

Wetland	Latitude (°N)	Longitude (°W)	Size (Acres)	Impact (Acres)	Impact
Wetland 1 - Emergent	38.94438	94.43931	0.04	0	None
Wetland 2 - Emergent	38.94316	94.43928	0.10	0.10	Fill
Wetland 3 - Emergent	38.94338	94.43890	0.04	0.04	Fill
Wetland 4 - Emergent	38.94324	94.43854	0.04	0.04	Fill
Wetland 5 - Emergent	38.94063	94.44139	16.20	14.27	Fill
Wetland 6 - Emergent	38.94101	94.44503	0.04	0.04	Fill
Wetland 7 - Forested	38.93780	94.44515	0.22	0.22	Fill
Wetland 8 - Forested	38.94114	94.44226	6.06	5.90	Fill

Stream	Latitude (°N)	Longitude (°W)	Length (LF)	Impact (LF)	Impact
Little Blue River	38.93895	94.44724	3,982	0	Span Crossing
Cedar Creek	38.93670	94.43895	183	0	None
Tributary 2 - Ephemeral	38.94164	94.44786	611	193	Pipe
				50	Angular Rock
				312	Length Loss
Tributary 3 - Ephemeral	38.94255	94.44648	891	216	Pipe
				50	Angular Rock
				217	Length Loss
Tributary 4 - Ephemeral	38.94590	94.44128	364	0	None
Tributary 5 - Ephemeral	38.93941	94.44306	221	51	Pipe
Tributary 6 - Intermittent	38.93671	94.44488	800	0	Span Crossing

The proposed project is located in Sections 27 and 34, Township 48 North, Range 32 West in Lee's Summit, Jackson County, Missouri.

This WQC is being issued under Section 401 of Public Law 95-217, The Clean Water Act of 1977 and subsequent revisions. This office certifies the proposed project will not cause the general or numeric criteria to be exceeded nor impair beneficial uses established in the Water Quality Standards, 10 CSR 20-7.031, provided the following conditions are met:

1. Paragon Star, LLC shall purchase 20.61 wetland acres as mitigation credit from the Clear Fork Wetland and Stream Mitigation Bank, or other approved mitigation bank or in-lieu fee provider. Copies of the purchase documents shall be provided to the department at the address below prior to the start of work within jurisdictional waters at the site.

2. The 1,089 LF of stream impacts were assessed using the "2013 State of Missouri Stream Mitigation Method" and determined to require 3,403 stream mitigation credits. Compensatory mitigation shall be satisfied by the purchase of 3,403 stream mitigation credits from the Clear Fork Wetland and Stream Mitigation Bank, or other approved mitigation bank or in-lieu fee provider. Copies of the purchase documents shall be provided to the department at the address below prior to the start of work within jurisdictional waters at the site.

3. Culverts shall be sized and placed appropriately and shall not create an impediment to the passage of fish and other aquatic habitat. "General Guidelines for Stream Crossings" can be found in the "2012 Nationwide Permit Regional Conditions for Missouri" and can be found at www.nwk.usace.army.mil/Portals/29/docs/regulatory/nationwidepermits/2012/MORegCon.pdf.

4. Culverts constructed or extended as part of this project shall not exceed the base width of the stable roadbed. Impacts beyond the width of the culvert, including channel modifications, shall not extend beyond 50 feet in length on either side of the culvert.

5. Little Blue River is a metropolitan no-discharge stream. Discharge to metropolitan no-discharge streams is prohibited, except as specifically permitted under the Water Quality Standards 10 CSR 20-7.031 and non-contaminated stormwater flows. No water contaminant except uncontaminated cooling water, permitted stormwater discharges in compliance with permit conditions and excess wet-weather bypass discharges not interfering with beneficial uses shall be discharged to the watersheds of streams listed in Table F.

6. Antidegradation requirements dictate all appropriate and reasonable Best Management Practices related to erosion and sediment control, project stabilization and prevention of water quality degradation are applied and maintained; for example, preserving vegetation, streambank stability and basic drainage. Applicants will be responsible for ensuring permit requirements and relevant WQC conditions are met.

7. Best Management Practices shall be used during all phases of the project to limit the amount of discharge of water contaminants to waters of the state. The project shall not involve more than normal stormwater or incidental loading of sediment caused by construction disturbances.

8. Care shall be taken to keep machinery out of the water way as much as possible. Fuel, oil and other petroleum products, equipment, construction materials and any solid waste shall not be stored below the ordinary high water mark at any time or in the adjacent floodway beyond normal working hours. All precautions shall be taken to avoid the release of wastes or fuel to streams and other adjacent waters as a result of this operation.

9. Petroleum products spilled into any water or on the banks where the material may enter waters of the state shall be immediately cleaned up and disposed of properly. Any such spills of petroleum shall be reported as soon as possible, but no later than 24 hours after discovery to the department's Environmental Emergency Response number at 573-634-2436.

10. Only clean, nonpolluting fill shall be used.

11. With the exception of invasive species, clearing of vegetation/trees shall be the minimum necessary to accomplish the activity.

12. Streambed gradient shall not be adversely altered during project construction.

13. The project shall not accelerate bed or bank erosion.

14. The project shall not fill jurisdictional springs.

15. Conduct project activity at low flows and water levels to limit the amount of sediment disturbance caused by the heavy equipment. Limit the duration and extent that any heavy equipment is required to be instream.

16. The riparian area, banks, etc., shall be restored to a stable condition to protect water quality as soon as possible. Seeding, mulching and needed fertilization should be within three days of final contouring. Onsite inspections of these areas should be conducted as necessary to ensure successful revegetation and stabilization, and to ensure erosion and deposition of soil in waters of the state is not occurring from these projects.

17. Acquisition of a WQC shall not be construed or interpreted to imply the requirements for other permits are replaced or superseded, including Clean Water Act Section 402 National Pollutant Discharge Elimination System Permits. Permits or any other requirements shall remain in effect. Land disturbance activities disturbing one or more acres of total area for the entire project require a stormwater permit. Instructions on how to apply for and receive the online land disturbance permit are located at www.dnr.mo.gov/env/wpp/epermit/help.htm. Questions regarding permit requirements may be directed to department's Kansas City Regional Office at 816-251-0700.

18. The city of Lee's Summit is covered under Municipal Separate Storm Sewer System Permit MO-R040016 with measures to control and possibly treat stormwater. You shall comply with all stormwater requirements of the city's Stormwater Management Plan and any related ordinances.

19. Representatives from the department shall be allowed on the project property to inspect the authorized activity at any time deemed necessary by the department to ensure compliance with the above conditions.

20. The WQC is based on the plans as submitted. Should any plan modifications occur, please contact the department to determine whether the WQC remains valid or needs to be amended or revoked.

Pursuant to Chapter 644, RSMo, commonly referred to as the Missouri Clean Water Law, and fee regulations under 10 CSR 20-6.011(2)(I), this WQC shall be valid only upon payment of a fee of $150.00. The enclosed invoice contains the necessary information on how to submit your fee. Payment must be received within ten business days of receipt of this WQC. Upon receipt of the fee, the applicable office of the USACE will be informed the WQC is now in effect and final.

You may appeal to have the matter heard by the Administrative Hearing Commission (AHC). To appeal, you must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC.

This WQC is part of the USACE's permit. Water Quality Standards must be met during any operations authorized. If you have any questions, please contact Mr. Mike Irwin by phone at 573-522-1131, by email at mike.irwin@dnr.mo.gov, or by mail at the Department of Natural Resources, Water Protection Program, P.O. Box 176, Jefferson City, MO 65102-0176. Thank you for working with the department to protect our environment.

Sincerely,

WATER PROTECTION PROGRAM

Chris Wieberg, Chief
Operating Permits Section

CW:mip

Enclosure

c: Ms. Sherry Bell, Fiscal Management Section, Budget and Fees Unit
Mr. Jesse Cochran, Kansas City Regional Office
Mr. David Flick, Terra Technologies
Mr. John Hoke, Watershed Protection Section
Mr. Justin Hughes, U.S. Army Corps of Engineers, Kansas City District
Ms. Anna Nowack, Watershed Protection Section
Ms. Corinne Rosania, Kansas City Regional Office
Mr. Steve Sturgess, Kansas City Regional Office
Ms. Terrie Williams, Kansas City Regional Office

General Guidelines for Stream Crossings
Regional Condition 1

For all Nationwide Permits that involve the construction/installation of culverts and low water crossings, measures will be included in the construction, design, and installation that will allow for the passage of flows and promote the safe passage of fish and other aquatic organisms. The following General Guidelines are required to supplement General Condition (2) Aquatic Life Movements and General Condition (9) Management of Water Flows.

Culverts:

- Culverts must be designed, sized, and placed correctly. Culverts perched above the grade of the stream are not allowed. This includes other in-stream structures placed at the inlet with the purpose to reduce sedimentation within the stream crossing. Culverts must be the shortest length necessary to meet the project purpose.

- New or replacement culverts must be designed to convey the geomorphic bankfull discharge (return period of 1.01 – 1.7 years) with a similar average velocity as upstream and downstream sections. A single culvert is encouraged. The following basic guidelines shall be used when designing the culvert area for similar average velocity:

Stream Type	Culvert Area
Perennial	Similar to upstream and downstream preconstruction bankfull area (approximate minimum area of 85%)
Intermittent	Similar to upstream and downstream preconstruction bankfull area (approximate minimum area of 50%)
Ephemeral	Sized to convey geomorphic bankfull discharge

- For permanent crossings, the culvert must be embedded and backfilled below the grade of the stream ≥ 1 foot for culverts >48 inches. On culverts ≤ 48 inches the bottom of the culvert must be placed at a depth below or at the natural stream bottom to provide for passage during low flow conditions. Culverts in streams with non-erodible beds (i.e. bedrock or stable clay) must be constructed flush with the stream bed, but do not need to be embedded. Culverts in streams with highly erodible beds must be embedded deeper to lessen the chance of future perching due to downstream degradation and may be accompanied with other grade control measures to prevent erosion.

Low Water Crossings:

- The applicant must notify the District Engineer when repairing, rehabilitating or replacing low water crossings when discharges of dredged or fill material would raise or lower the lowest elevation of the crossing or when removing the structure.

- When replacing or removing low water crossings the applicant must propose and employ measures to mitigate for and minimize the potential of streambed headcutting where channel incision has occurred downstream of the structure and the structure is providing grade control that is preventing channel incision from migrating upstream.

Enclosure 1
NWK-2013-00408

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Paragon Star, Inc.	File Number: NWK-2013-00408	Date: 3 March 2017
Attached is:		See Section below
XX	A. INITIAL PROFFERED PERMIT (Standard Permit or Letter of Permission)	A
	B. PROFFERED PERMIT (Standard Permit or Letter of Permission)	B
	C. PERMIT DENIAL	C
	D. APPROVED JURISDICTIONAL DETERMINATION	D
	E. PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding a modification, reconsideration, or administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/appeals.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or request modification of the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the District Engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- REQUEST MODIFICATION: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the District Engineer. Your objections must be received by the District Engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the District Engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the District Engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the District Engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the Division Engineer (address on page 2). This form must be received by the Division Engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the Division Engineer (address on page 2). This form must be received by the Division Engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept the approved JD, appeal the approved JD, or submit new information and request reconsideration of the approved JD.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the Division Engineer (address on page 2). This form must be received by the Division Engineer within 60 days of the date of this notice.
- RECONSIDERATION BASED ON NEW INFORMATION: You may submit new information to the District Engineer for reconsideration of an approved JD. You must submit the information within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II –Fill out this section and return this form to the appropriate office only if submitting a request for modification or reconsideration to the District Engineer, or if submitting a request for Administrative Appeal to the Division Engineer. All such submittals must be made within 60 days of the date of this notice.

Submit the following requests to the District Engineer

A. Modification of an INITIAL PROFFERED PERMIT (Item A).
D. Reconsideration of an APPROVED JURISDICTIONAL DETERMINATION based on NEW INFORMATION (Item D RECONSIDERATION).

Submit the following requests to the Division Engineer

B. Administrative Appeal of a PROFFERED PERMIT (Item B).
C. Administrative Appeal of a PERMIT DENIAL (Item C).
D. Administrative Appeal of an APPROVED JURISDICTIONAL DETERMINATION (Item D APPEAL) (for reasons other than reconsideration of an approved JD based on new information).

(Note: Preliminary Jurisdictional Determinations (Item E) are not appealable. If you have concerns regarding a preliminary Jurisdictional Determination, you can request an approved Jurisdictional Determination).

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

SUBMITTAL OF NEW OR ADDITIONAL INFORMATION: The District Engineer may accept and consider new information if you request a modification to an initial proffered permit (Part A), or a reconsideration of an approved JD (Part D). An administrative appeal to the Division Engineer is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the administrative record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you wish to submit an appeal or have questions regarding the appeal process you may contact:
DISTRICT ENGINEER **Attn: Mark D. Frazier** **Chief, Regulatory Branch** **U.S. Army Engineer District, Kansas City** **601 Federal Building, Room 402** **Kansas City, MO 64106-2824** **Telephone: 816-389-3990** (Use this address for submittals to the District Engineer)	DIVISION ENGINEER **ATTN: Melinda M. Witgenstein** **Regulatory Appeals Review Officer** **U.S. Army Corps of Engineers** **P.O. Box 2870** **Portland, OR 97208-2870** **Telephone: 503-808-3888**

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

	Date:	Telephone number:
Signature of appellant or agent.		

STATE OF MISSOURI
Eric R. Greitens, Governor • Carol S. Comer, Acting Director
DEPARTMENT OF NATURAL RESOURCES
dnr.mo.gov

JAN 25 2017

Mr. Phillip Short
Paragon Star, LLC
801 NW Commerce Drive
Lee's Summit, MO 64086

RE: 2013-00408/CEK007097, Jackson County

Dear Mr. Short:

The Missouri Department of Natural Resources' Water Protection Program has reviewed your request for Clean Water Act Section 401 Water Quality Certification (WQC) to accompany the U.S. Army Corps of Engineers' (USACE) Permit 2013-00408 in which you are proposing construction of the "Paragon Star Development."

The purpose of the project, as stated by the applicant, is to provide a large sporting complex and mixed use development. Facilities will include soccer fields, residential and retail development, associated parking, roadways, utilities and other amenities. The development will impact 20.61 wetland acres and 1,089 linear feet (LF) of stream.

Jurisdictional wetlands and streams, wetland and stream types, approximate geographic coordinates, size/length information, impact size/length and impact types are as follows:

Wetland	Latitude (°N)	Longitude (°W)	Size (Acres)	Impact (Acres)	Impact
Wetland 1 - Emergent	38.94438	94.43931	0.04	0	None
Wetland 2 - Emergent	38.94316	94.43928	0.10	0.10	Fill
Wetland 3 - Emergent	38.94338	94.43890	0.04	0.04	Fill
Wetland 4 - Emergent	38.94324	94.43854	0.04	0.04	Fill
Wetland 5 - Emergent	38.94063	94.44139	16.20	14.27	Fill
Wetland 6 - Emergent	38.94101	94.44503	0.04	0.04	Fill
Wetland 7 - Forested	38.93780	94.44515	0.22	0.22	Fill
Wetland 8 - Forested	38.94114	94.44226	6.06	5.90	Fill

Stream	Latitude (°N)	Longitude (°W)	Length (LF)	Impact (LF)	Impact
Little Blue River	38.93895	94.44724	3,982	0	Span Crossing
Cedar Creek	38.93670	94.43895	183	0	None
Tributary 2 - Ephemeral	38.94164	94.44786	611	193	Pipe
				50	Angular Rock
				312	Length Loss
Tributary 3 - Ephemeral	38.94255	94.44648	891	216	Pipe
				50	Angular Rock
				217	Length Loss
Tributary 4 - Ephemeral	38.94590	94.44128	364	0	None
Tributary 5 - Ephemeral	38.93941	94.44306	221	51	Pipe
Tributary 6 - Intermittent	38.93671	94.44488	800	0	Span Crossing

The proposed project is located in Sections 27 and 34, Township 48 North, Range 32 West in Lee's Summit, Jackson County, Missouri.

This WQC is being issued under Section 401 of Public Law 95-217, The Clean Water Act of 1977 and subsequent revisions. This office certifies the proposed project will not cause the general or numeric criteria to be exceeded nor impair beneficial uses established in the Water Quality Standards, 10 CSR 20-7.031, provided the following conditions are met:

1. Paragon Star, LLC shall purchase 20.61 wetland acres as mitigation credit from the Clear Fork Wetland and Stream Mitigation Bank, or other approved mitigation bank or in-lieu fee provider. Copies of the purchase documents shall be provided to the department at the address below prior to the start of work within jurisdictional waters at the site.

2. The 1,089 LF of stream impacts were assessed using the "2013 State of Missouri Stream Mitigation Method" and determined to require 3,403 stream mitigation credits. Compensatory mitigation shall be satisfied by the purchase of 3,403 stream mitigation credits from the Clear Fork Wetland and Stream Mitigation Bank, or other approved mitigation bank or in-lieu fee provider. Copies of the purchase documents shall be provided to the department at the address below prior to the start of work within jurisdictional waters at the site.

3. Culverts shall be sized and placed appropriately and shall not create an impediment to the passage of fish and other aquatic habitat. "General Guidelines for Stream Crossings" can be found in the "2012 Nationwide Permit Regional Conditions for Missouri" and can be found at www.nwk.usace.army.mil/Portals/29/docs/regulatory/nationwidepermits/2012/MORegCon.pdf.

4. Culverts constructed or extended as part of this project shall not exceed the base width of the stable roadbed. Impacts beyond the width of the culvert, including channel modifications, shall not extend beyond 50 feet in length on either side of the culvert.

5. Little Blue River is a metropolitan no-discharge stream. Discharge to metropolitan no-discharge streams is prohibited, except as specifically permitted under the Water Quality Standards 10 CSR 20-7.031 and non-contaminated stormwater flows. No water contaminant except uncontaminated cooling water, permitted stormwater discharges in compliance with permit conditions and excess wet-weather bypass discharges not interfering with beneficial uses shall be discharged to the watersheds of streams listed in Table F.

6. Antidegradation requirements dictate all appropriate and reasonable Best Management Practices related to erosion and sediment control, project stabilization and prevention of water quality degradation are applied and maintained; for example, preserving vegetation, streambank stability and basic drainage. Applicants will be responsible for ensuring permit requirements and relevant WQC conditions are met.

7. Best Management Practices shall be used during all phases of the project to limit the amount of discharge of water contaminants to waters of the state. The project shall not involve more than normal stormwater or incidental loading of sediment caused by construction disturbances.

8. Care shall be taken to keep machinery out of the water way as much as possible. Fuel, oil and other petroleum products, equipment, construction materials and any solid waste shall not be stored below the ordinary high water mark at any time or in the adjacent floodway beyond normal working hours. All precautions shall be taken to avoid the release of wastes or fuel to streams and other adjacent waters as a result of this operation.

9. Petroleum products spilled into any water or on the banks where the material may enter waters of the state shall be immediately cleaned up and disposed of properly. Any such spills of petroleum shall be reported as soon as possible, but no later than 24 hours after discovery to the department's Environmental Emergency Response number at 573-634-2436.

10. Only clean, nonpolluting fill shall be used.

11. With the exception of invasive species, clearing of vegetation/trees shall be the minimum necessary to accomplish the activity.

12. Streambed gradient shall not be adversely altered during project construction.

13. The project shall not accelerate bed or bank erosion.

14. The project shall not fill jurisdictional springs.

15. Conduct project activity at low flows and water levels to limit the amount of sediment disturbance caused by the heavy equipment. Limit the duration and extent that any heavy equipment is required to be instream.

16. The riparian area, banks, etc., shall be restored to a stable condition to protect water quality as soon as possible. Seeding, mulching and needed fertilization should be within three days of final contouring. Onsite inspections of these areas should be conducted as necessary to ensure successful revegetation and stabilization, and to ensure erosion and deposition of soil in waters of the state is not occurring from these projects.

17. Acquisition of a WQC shall not be construed or interpreted to imply the requirements for other permits are replaced or superseded, including Clean Water Act Section 402 National Pollutant Discharge Elimination System Permits. Permits or any other requirements shall remain in effect. Land disturbance activities disturbing one or more acres of total area for the entire project require a stormwater permit. Instructions on how to apply for and receive the online land disturbance permit are located at www.dnr.mo.gov/env/wpp/epermit/help.htm. Questions regarding permit requirements may be directed to department's Kansas City Regional Office at 816-251-0700.

18. The city of Lee's Summit is covered under Municipal Separate Storm Sewer System Permit MO-R040016 with measures to control and possibly treat stormwater. You shall comply with all stormwater requirements of the city's Stormwater Management Plan and any related ordinances.

19. Representatives from the department shall be allowed on the project property to inspect the authorized activity at any time deemed necessary by the department to ensure compliance with the above conditions.

20. The WQC is based on the plans as submitted. Should any plan modifications occur, please contact the department to determine whether the WQC remains valid or needs to be amended or revoked.

Pursuant to Chapter 644, RSMo, commonly referred to as the Missouri Clean Water Law, and fee regulations under 10 CSR 20-6.011(2)(I), this WQC shall be valid only upon payment of a fee of $150.00. The enclosed invoice contains the necessary information on how to submit your fee. Payment must be received within ten business days of receipt of this WQC. Upon receipt of the fee, the applicable office of the USACE will be informed the WQC is now in effect and final.

You may appeal to have the matter heard by the Administrative Hearing Commission (AHC). To appeal, you must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC.

This WQC is part of the USACE's permit. Water Quality Standards must be met during any operations authorized. If you have any questions, please contact Mr. Mike Irwin by phone at 573-522-1131, by email at mike.irwin@dnr.mo.gov, or by mail at the Department of Natural Resources, Water Protection Program, P.O. Box 176, Jefferson City, MO 65102-0176. Thank you for working with the department to protect our environment.

Sincerely,

WATER PROTECTION PROGRAM

Chris Wieberg, Chief
Operating Permits Section

CW:mip

Enclosure

c: Ms. Sherry Bell, Fiscal Management Section, Budget and Fees Unit
Mr. Jesse Cochran, Kansas City Regional Office
Mr. David Flick, Terra Technologies
Mr. John Hoke, Watershed Protection Section
Mr. Justin Hughes, U.S. Army Corps of Engineers, Kansas City District
Ms. Anna Nowack, Watershed Protection Section
Ms. Corinne Rosania, Kansas City Regional Office
Mr. Steve Sturgess, Kansas City Regional Office
Ms. Terrie Williams, Kansas City Regional Office

STATE OF MISSOURI
Jeremiah W. (Jay) Nixon, Governor Sara Parker Pauley, Director
DEPARTMENT OF NATURAL RESOURCES
dnr.mo.gov

Paragon Star
MORA08798, Jackson County
Paragon Star
801 NW Commerce Dr
Lee's Summitt, MO 64086

Enclosed please find your Missouri State Operating Permit which authorizes land disturbance activities for MORA08798. This permit has been issued as requested and is based upon application information entered in the Missouri Department of Natural Resources' (Department) ePermitting program. This permit contains several requirements and should be thoroughly read and understood. Please reference General Operating Permit number MORA08798 for future correspondences with the Department with regards to this land disturbance activity.

Acquisition of the permit does not imply that the requirements or ordinances of other local, state or federal permits are replaced or superseded. This permit does not authorize land disturbance activity in jurisdictional waters of the United States as defined by the Army Corps of Engineers (Corps), unless the permittee has obtained the required Clean Water Act Section 404 Permit. Not all land disturbance projects will require a 404 permit; however, if a 404 permit is required, land disturbance activities are not to be conducted in the jurisdictional area of the project until the 404 permit has been obtained. Information for the Missouri Corps offices can be found in the general operating permit's Fact Sheet.

Please contact the applicable Regional Office if you would like to schedule an Environmental Assistance Visit (EAV). Regional Office contact information is contained with the documents issued with the operating permit. During the visit, Department staff will review the requirements of the permit and answer questions pertaining to Land Disturbance activities.

Sincerely,

Water Protection Program

John Madras

John Madras
Director

JM

Paragon Star
MORA08798

ePermitting Certification and Signature Document

Missouri State Operating General Permit number MORA08798 was issued on 10/26/2016 based on information entered into the Missouri Department of Natural Resources' electronic Permitting (ePermitting) system. Missouri Regulation 10 CSR 20-6.010(2)(B) requires that all applications for construction and operating permits be signed. Please print, review, sign, and mail this document to the Missouri Department of Natural Resources (Department) within 30 days of the Issue Date (10/26/2016).

If the Department does not receive this document with signature within 30 days, this general operating permit may be considered not valid and subsequently revoked.

Paragon Star, Jackson County
View High Drive and Interstate 470
LEE'S SUMMIT, MO 64081
Total Permitted Area: 170.37 Acres
Total Number of Permitted Features: 1

The below Certifications were electronically certified in the ePermitting system by:
Name: Andy Keidel
Title:
Date: 10/26/2016

Based upon the selection you made on the 'New Permit' screen; it was indicated that a single polygon was drawn indicating the entire disturbance area.

Is any part of the area that is being disturbed in a jurisdictional water of the United States? If yes, you must also receive a Clean Water Act, Section 404 Permit for this site from the United States Army Corp of Engineers.
Yes

I understand there may be an established Local Authority Erosion Control Plan in the city or the unincorporated area of the county where land disturbance activities covered under this general permit will occur. (Note - you may want to contact your local authority to determine if there are any requirements).
Agreed

A Storm Water Pollution Prevention Plan (SWPPP) must be developed for this site. This plan must be developed in accordance with requirements and guidelines specified within the general permit for storm water discharges from land disturbance activities. The application, as completed in ePermitting is considered incomplete if the SWPPP has not been developed.
Agreed

I certify that I am familiar with the information contained in the application, that to the best of my knowledge and belief such information is true, complete and accurate, and being granted this permit, I agree to abide by the Missouri Clean Water Law and all rules, regulations, orders and decisions, and terms of this permit, subject to any legitimate appeal available to an applicant under the Missouri Clean Water Commission.
Agreed

_____ _____

Signature Date

The above must be signed by the Owner, Continuing Authority, or Main Facility Contact. Please send this document with original signature to the Water Protection Program, PO Box 176, Jefferson City, MO 65102. If you do not agree with the above Certifications, please contact the Department by phone at (573) 751-1300.

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION

MISSOURI STATE OPERATING PERMIT

General Operating Permit

In compliance with the Missouri Clean Water Law, (chapter 644 R.S. Mo as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No.:	MORA08798
Owner Address:	Paragon Star 801 NW Commerce Dr Lee's Summitt, MO 64086
Continuing Authority:	Paragon Star 801 NW Commerce Dr Lee's Summitt, MO 64086
Facility Name: Facility Address:	Paragon Star View High Drive and Interstate 470 LEE'S SUMMIT, MO 64081
Legal Description: UTM Coordinates: Receiving Stream: First Classified Stream - ID#: USGS# and Sub Watershed#:	Sec. 34, T 48N, R 32W, Jackson County 375010.014 / 4311304.140 Tributary to L. Blue R. (U) L. Blue R. (P) 303(d) 422.00 10300101 - 0203

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein.

FACILITY DESCRIPTION All Outfalls SIC # 1629

All Outfalls - Construction or land disturbance activity (e.g., clearing, grubbing, excavating, grading and other activities that result in the destruction of the root zone and/or land disturbance activity that is reasonably certain to cause pollution to waters of the state).

This permit authorizes only wastewater, including storm water, discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System, it does not apply to other regulated areas. This permit may be appealed in accordance with RSMo Section 644.051.6 and 621.250, 10 CSR 20-6.020, and 10 CSR 20-1.020.

Sara Parker Pauley

10/26/2016
Issue date

Sara Parker Pauley, Director
Department of Natural Resources

John Madras

02/07/2017
Expiration date

John Madras
Director, Water Protection Program

A. APPLICABILITY

1. This general permit authorizes the discharge of stormwater and certain non-stormwater discharges from land disturbance sites that disturb one or more acres or disturb less than one acre when part of a larger common plan of development or sale that will disturb a cumulative total of one or more acres over the life of the project. This general permit also authorizes the discharge of stormwater and certain non-stormwater discharges from smaller projects where the Missouri Department of Natural Resources (Department) has exercised its discretion to require a permit [10 CSR 20-6.200 (1)(B)].

   A Missouri State Operating Permit that specifically identifies the project must be issued before any site vegetation is removed or the site disturbed.

   Any site owner/operator subject to these requirements for stormwater discharges and who disturbs land prior to permit issuance from the Department is in violation of both State and Federal Laws.

   The legal owner of the property or the holder of an easement on the property, and operator on which the site is located are responsible for compliance with this permit.

2. This permit authorizes non-stormwater discharges from the following activities provided that these discharges are addressed in the permittee's specific Stormwater Pollution Prevention Plan (SWPPP) required by this general permit:
   a. De-watering activities if there are no contaminants other than sediment present in the discharge, and the discharge is treated as specified in Requirements, Section C.3.m. of this permit;
   b. Flushing water hydrants and potable water lines;
   c. Water only (i.e., without detergents or additives) rinsing of streets and buildings; and
   d. Site watering to establish vegetation.

3. This general permit does not authorize the placement of fill materials in flood plains, the obstruction of stream flow, directing stormwaters across private property not owned or operated by the permittee, or changing the channel of a defined drainage course. This general permit addresses only the quality of the stormwater runoff and the minimization of off-site migration of sediments and other water contaminants.

4. This general permit does not authorize any discharge to waters of the state of sewage or pollutants including but not limited to:
   a. Any hazardous material, oil, lubricant, solid waste or other non-naturally occurring substance from the site, including fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;
   b. Soaps or solvents used in vehicle and equipment washing;
   c. Hazardous substances or petroleum products from an on-site spill or handling and disposal practices,
   d. Wash and/or rinse waters from concrete mixing equipment including ready mix concrete trucks, unless managed by an appropriate control. Any such pollutants must be adequately treated and addressed in the SWPPP, and cannot be discharged to waters of the state;
   e. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
   f. Wastewater generated from air pollution control equipment or the containment of scrubber water in lined ponds;
   g. Domestic wastewaters, including gray waters; or
   h. Industrial stormwater runoff.

A. APPLICABILITY (continued)

5. The Department reserves the right to revoke or deny coverage under this general permit to applicants for stormwater discharges from land disturbance activities at sites that have contaminated soils that will be disturbed by the land disturbance activity or where such materials are brought to the site to use as fill or borrow. A site-specific permit may be required to cover such activities.

6. Discharges shall not cause violations of the Water Quality Standards 10 CSR 20-7.0.031(3). If at any time the Department determines that the quality of waters of the state may be better protected by requiring the owner/operator of the permitted site to apply for a site-specific permit, the Department may require any person to obtain a site-specific operating permit [10 CSR 20-6.010(13)(C)].

   The Department may require the permittee to apply for and obtain a site-specific or different general permit if:
   a. The permittee is not in compliance with the conditions of this general permit;
   b. The discharge no longer qualifies for this general permit due to changed site conditions and/or regulations; or
   c. Information becomes available that indicates water quality standards have been or may be violated.

   The permittee will be notified in writing of the requirement to apply for a site-specific permit or a different general permit. When a site-specific permit or different general permit is issued to the authorized permittee, the applicability of this general permit to the permittee is automatically terminated upon the effective date of the site specific or different general permit.

7. Any owner/operator authorized by a general permit may request to be excluded from the coverage of the general permit and apply for a site-specific permit [10 CSR 20-6.010(13)(D)].

8. This permit does not authorize land disturbance activity in jurisdictional waters of the United States as defined by the Army Corps of Engineers, unless the permittee has obtained the required 404/401 permit. Land disturbance activities may not begin in the affected portions of the site until the required 404/401 permits have been obtained.

9. This permit does not supersede compliance with the Historic Preservation Act or the Endangered Species Act.

10. This permit does not supersede any requirement for obtaining project approval under an established local authority.

11. This permit is not transferable to other owners or operators.

B. EXEMPTIONS FROM PERMIT REQUIREMENTS

1. Facilities that discharge all stormwater runoff directly to a combined sewer system are exempt from stormwater permit requirements.

2. Land disturbance activity as described in [10 CSR 20-6.200(1)(B)] and [10 CSR 20-6.010(1)(B)] where water quality standards are not exceeded.

3. Linear, strip, or ribbon construction (as described in [10 CSR 20-6.200(1)(B)8]) where water quality standards are not exceeded.

4. Sites that disturb less than one acre of total land area as described in [10 CSR20-6.200 (1)(B)7], that are not part of a common plan or sale and that do not cause any violations of water quality standards, and are not otherwise designated by the Department as requiring a permit.

5. Agricultural stormwater discharges and irrigation return flows as described in [10CSR 20-6.200 (1)(B)6].

C. REQUIREMENTS

These requirements do not supersede nor remove any requirement to comply with county or other local ordinances [10 CSR20-6.010(14)(D)]:

1. This permit is to ensure the design, the installation and the maintenance of effective erosion controls and sediment controls to minimize the discharge of pollutants. At minimum, such controls must be designed, installed and maintained to:
   a. Control stormwater volume and velocity within the site to minimize soil erosion;
   b. Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion;
   c. Minimize the amount of soil exposed during construction activity;
   d. Minimize the disturbance of steep slopes;
   e. Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle size expected to be present on the site.;
   f. Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration, unless infeasible; and
   g. Minimize soil compaction and, unless infeasible, preserve topsoil.

2. The primary requirement of this permit is the development and implementation of a SWPPP which incorporates site specific practices to best minimize the soil exposure, soil erosion, and the discharge of pollutants. The permittee shall fully implement the provisions of the SWPPP required under this part as a condition of this general permit throughout the term of the land disturbance project. **The SWPPP must be developed prior to issuance of the permit and must be specific to the land disturbance activities at the site.** A permit must be issued before any disturbance of root zone of the existing vegetation or other land disturbance activities may begin. A copy of the SWPPP must be available on-site when land disturbance operations are in progress, or other operational activities that may affect the maintenance or integrity of the Best Management Practices (BMP) structures and made available made available as specified under Section F. Records of this permit.

C. REQUIREMENTS (continued)

The SWPPP must:

a. List and describe all outfalls;
b. Incorporate required practices identified below;
c. Incorporate erosion control practices specific to site conditions;
d. Provide for maintenance and adherence to the plan;
e. Discuss whether or not a 404/401 Permit is required for the project; and
f. Name the person responsible for inspection, operation and maintenance of BMPs.

The purpose of the SWPPP is to ensure; the design, implementation, management and maintenance of BMPs in order to prevent sediment and other pollutants in stormwater discharges associated with the land disturbance activities; compliance with the Missouri Water Quality Standards; and compliance with the terms and conditions of this general permit.

The permittee shall select, install, use, operate and maintain appropriate BMPs for the permitted site. The following manuals are acceptable resources for the selection of appropriate BMPs. *Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites*, (Document number EPA 833-R-06-004) published by the United States Environmental Protection Agency (USEPA) in May 2007. This manual as well as other information, including examples of construction SWPPPs, is available at the USEPA internet site at http://cfpub1.epa.gov/npdes/stormwater/swppp.cfm; and

The latest version of *Protecting Water Quality: A field guide to erosion, sediment and stormwater best management practices for development sites in Missouri,* published by the Missouri Department of Natural Resources. This manual is available on the Department's internet site at: http://www.dnr.mo.gov/env/wpp/wpcp-guide.htm.

The permittee is not limited to the use of these guidance manuals. Other guidance publications may be used to select appropriate BMPs. However, all BMPs should be described and justified in the SWPPP.

3. SWPPP Requirements: The following information and practices shall be provided for in the SWPPP:
   a. Nature of the Construction Activity: The SWPPP briefly must describe the nature of the construction activity, including:
      1) The function of the project (e.g., low density residential, shopping mall, highway, etc.);
      2) The intended sequence and timing of activities that disturb the soils at the site;
      3) Estimates of the total area expected to be disturbed by excavation, grading, or other construction activities including off-site borrow and fill areas; and
      4) A general map (e.g., United States Geological Survey quadrangle map, a portion of a city of county map, or other map) with enough detail to identify the location of the construction site and waters of the United States within one mile of the site.

C. REQUIREMENTS (continued)

b. Site Map: The SWPPP must contain a legible site map showing the site boundaries and outfalls and identifying:
   1) Direction(s) of stormwater flow and approximate slopes anticipated after grading activities;
   2) Areas of soil disturbance and areas that will not be disturbed (or a statement that all areas of the site will be disturbed unless otherwise noted);
   3) Location of major structural and non-structural BMPs identified in the SWPPP;
   4) Locations where stabilization practices are expected to occur;
   5) Locations of off-site material, waste, borrow or equipment storage areas;
   6) Locations of all waters of the United States (including wetlands);
   7) Locations where stormwater discharges to a surface water; and
   8) Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

c. Site Description: In order to identify the site, the SWPPP shall include facility and outfall information. The SWPPP shall have sufficient information to be of practical use to contractors and site construction workers to guide the installation and maintenance of BMPs.

d. Effluent Limits: The permittee must select control measurements (e.g., BMPs, controls, practices, etc.) to meet effluent limits found in Section E.1. of this permit. All control measures must be properly selected, installed and maintained in accordance with any relevant manufacturer specifications and good engineering practices. The permittee must implement the control measures from commencement of the construction activity until final stabilization is complete unless the exception noted in Section C.3.i. of this permit applies.

e. Selection of Temporary and Permanent Non-Structural BMPs: The permittee shall select appropriate non-structural BMPs for use at the site and list them in the SWPPP. The SWPPP shall require existing vegetation to be preserved where practical. For surface waters located on or immediately adjacent to the site, the permittee must provide at minimum a 25-foot buffer of undisturbed natural vegetation between the disturbed portions of the site and the surface water unless infeasible or where there is a more stringent local requirement. The time period for disturbed areas to be without vegetative cover is to be minimized to the maximum extent practicable.

   Examples of non-structural BMPs which the permittee should consider specifying in the SWPPP include preservation of trees and mature vegetation, protection of existing vegetation for use as buffer strips, mulching, sodding, temporary seeding, final seeding, geotextiles, stabilization of disturbed areas, preserving existing stream channels as overflow areas when channel straightening or shortening is allowed, soil stabilizing emulsions and tackifiers, mulch tackifiers, stabilized site entrances/exits and other appropriate BMPs.

f. Selection of Temporary and Permanent Structural BMPs: The permittee shall select appropriate structural BMPs for use at the site and list them in the SWPPP. Examples of structural BMPs that the permittee should consider specifying in the SWPPP include diverting flows from undisturbed areas away from disturbed areas, silt (filter fabric and/or straw bale) fences, earthen diversion dikes, drainage swales, sediment traps, rock check dams, subsurface drains (to gather or transport water for surface discharge elsewhere), pipe slope drains (to carry concentrated flow down a slope face), level spreaders (to distribute concentrated flow into sheet flow), storm drain inlet protection and outlet protection, reinforced soil retaining systems, gabions, temporary or permanent sediment basins and other appropriate BMPs.

C. REQUIREMENTS (continued)

g. Description of BMPs: The SWPPP shall include a description of both structural and non-structural BMPs that will be used at the site.

The SWPPP shall provide the following general information for each BMP which will be used one or more times at the site:

1) Physical description of the BMP;
2) Site and physical conditions that must be met for effective use of the BMP;
3) BMP installation/construction procedures, including typical drawings; and
4) Operation and maintenance procedures for the BMP.

The SWPPP shall provide the following information for each specific instance where a BMP is to be installed:

1) Whether the BMP is temporary or permanent;
2) Where, in relation to other site features, the BMP is to be located;
3) When the BMP will be installed in relation to each phase of the land disturbance procedures to complete the project; and
4) Site conditions that must be met before removal of the BMP if the BMP is not a permanent BMP.

h. Disturbed Areas: Slopes for disturbed areas must be defined in the SWPPP. A site map or maps defining the sloped areas for all phases of the project must be included in the SWPPP. Stabilization must be initiated immediately and completed within seven (7) calendar days where soil disturbing activities have temporarily ceased on any portion of the site and will not resume for a period exceeding fourteen (14) calendar days the permittee shall construct BMPs to establish interim stabilization. Interim stabilization shall consist of well established and maintained BMPs that are reasonably certain to protect waters of the state from sediment pollution over an extended period of time. This may require adding more BMPs to an area than is normally used during daily operations. These BMPs may include a combination of sediment basins, check dams, sediment fences and mulch. The types of BMPs used must be suited to the area disturbed, taking into account the number of acres exposed and the steepness of the slopes. If the slope of the area is greater than 3:1 (three feet horizontal to one foot vertical) or if the slope is greater than 3% and greater than 150 feet in length, then the permittee shall establish interim stabilization within seven days of ceasing operations on that part of the site. Final stabilization of disturbed areas must be initiated immediately and completed within seven (7) calendar days whenever any clearing, grading, excavating or other earth disturbing activities have permanently ceased on any portion of the site. Allowances to the seven (7) day completion period for temporary and final stabilization may be made due to weather and equipment malfunctions. The use of allowances shall be documented in the SWPPP.

i. Installation: The permittee shall ensure the BMPs are properly installed at the locations and relative times specified in the SWPPP. Peripheral or border BMPs to control runoff from disturbed areas shall be installed or marked for preservation before general site clearing is started. Note that this requirement does not apply to earth disturbances related to initial site clearing and establishing entry, exit and access of the site, which may require that stormwater controls be installed immediately after the earth disturbance. Stormwater discharges from disturbed areas which leave the site shall pass through an appropriate impediment to sediment movement such as a sedimentation basin, sediment traps and silt fences prior to leaving the land disturbance site. A drainage course change shall be clearly marked on a site map and described in the SWPPP. The location of all BMPs must be indicated on a site map, included in the SWPPP.

C. REQUIREMENTS (continued)

j. Sedimentation Basins: The SWPPP shall include a sedimentation basin for each drainage area with ten or more acres disturbed at one time. The sedimentation basin shall be sized to contain a volume of at least 3,600 cubic feet per each disturbed acre draining thereto. Accumulated sediment shall be removed from the basin when basin is 50% full. When discharging from basins and impoundments, utilize outlet structures that withdraw water from the surface unless infeasible. Discharges from the basin shall not cause scouring of the banks or bottom of the receiving stream. The SWPPP shall require the basin be maintained until final stabilization of the disturbed area served by the basin.

Where use of a sediment basin is impractical, the SWPPP shall evaluate and specify other similarly effective BMPs to be employed to control erosion and sediment delivery. These similarly effective BMPs shall be selected from appropriate BMP guidance documents authorized by this permit. The BMPs must provide equivalent water quality protection to achieve compliance with this permit. The SWPPP shall require both temporary and permanent sedimentation basins to have a stabilized spillway to minimize the potential for erosion of the spillway or basin embankment.

k. Pollution Prevention Measures: The SWPPP shall include BMPs for pollution prevention measures. At minimum such measures must be designed, installed, implemented and maintained to:
   1) Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
   2) Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater; and
   3) Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures. Included but not limited to the installation of containment berms and use of drip pans at petroleum product and liquid storage tanks and containers.

l. Roadways: Where applicable, upon installation of or connection to roadways, all efforts should be made to prevent the deposition of earth and sediment onto roadways through the use of proper BMPs. Stormwater inlets susceptible to receiving sediment from the permitted land disturbance site shall have curb inlet protection. Where stormwater will flow off the end of where a roadway terminates, a sediment catching BMP such as gravel berm or silt fence shall be provided. Roadways and curb inlets shall be cleaned weekly or following a rainfall that generates a run-off. Where practicable, construction entrance BMP controls shall be used to prevent sediment trackout.

m. Dewatering: Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless managed by appropriate controls. The SWPPP shall include a description of any anticipated dewatering methods including the anticipated volume of water to be discharged and the anticipated maximum flow discharged from these dewatering activities expressed in gallons per minute. Maximum flow may be stated in the SWPPP as an estimate based on the type and capacity of equipment being used for dewatering. The SWPPP shall call for specific BMPs designed to treat water pumped from trenches and excavations and in no case shall this water be pumped off-site without being treated by the specified BMPs. When discharging from basins and impoundments utilize outlet structures that withdraw water from the surface, unless infeasible.

C. REQUIREMENTS (continued)

4. Good housekeeping practices shall be maintained at all times to keep waste from entering waters of the state. Solid and hazardous waste management include providing trash containers and regular site clean up for proper disposal of solid waste such as scrap building material, product/material shipping waste, food containers and cups, and providing containers and proper disposal of waste paints, solvents and cleaning compounds. The provision of portable toilets for proper disposal of sanitary sewage and the storage of construction materials should be kept away from drainage courses and low areas.

5. All fueling facilities present shall at all times adhere to applicable federal and state regulations concerning underground storage, above ground storage and dispensers.

6. Hazardous wastes that are transported, stored, or used for maintenance, cleaning, or repair shall be managed according to the provisions of the Missouri Hazardous Waste Laws and Regulations.

7. All paint, solvents, petroleum products, petroleum waste products and storage containers such as drums, cans, or cartons shall be stored according to BMPs. The materials exposed to precipitation shall be stored in watertight, structurally sound, closed containers. All containers shall be inspected for leaks or spillage during the once per week inspection of BMPs.

8. Amending/Updating the SWPPP: The permittee shall amend and update the SWPPP as appropriate during the term of the land disturbance activity. The permittee shall amend the SWPPP at a minimum whenever the:
   a. Design, operation, or maintenance of BMPs is changed;
   b. Design of the construction project is changed that could significantly affect the quality of the stormwater discharges;
   c. Permittee's inspections indicate deficiencies in the SWPPP or any BMP;
   d. Department notifies the permittee in writing of deficiencies in the SWPPP;
   e. SWPPP is determined to be ineffective in minimizing or controlling erosion and sedimentation (e.g., there is visual evidence of excessive site erosion or excessive sediment deposits in streams or lakes);
   f. Settleable Solids from a stormwater outfall exceed 2.5 ml/L; and
   g. Department determines violations of water quality standards may occur or have occurred.

9. An individual shall be designated by the permittee as responsible for environmental matters. The individual responsible for environmental matters shall have a thorough and demonstrable knowledge of the site's SWPPP and sediment and erosion control practices in general. The individual responsible for environmental matters or a designated inspector knowledgeable in erosion, sediment and stormwater control principles shall inspect all structures that function to prevent pollution of waters of the state. These inspections shall be conducted in accordance with C.10 of these requirements.

C. REQUIREMENTS (continued

10. Site Inspections Reports: The permittee (or a representative of the permittee) shall conduct regularly scheduled inspections at least once per seven calendar days. These inspections shall be conducted by a qualified person, one who is responsible for environmental matters at the site, or a person trained by and directly supervised by the person responsible for environmental matters at the site. For disturbed areas that have not been finally stabilized, all installed BMPs and other pollution control measures shall be inspected for proper installation, operation and maintenance. All stormwater outfalls shall be inspected for evidence of erosion or sediment deposition. When practicable the receiving stream shall also be inspected for 50 feet downstream of the outfall. Any structural or maintenance problems shall be noted in an inspection report and corrected within seven calendar days of the inspection. If a rainfall causes stormwater runoff to occur on-site, the BMPs must be inspected within a reasonable time period after the rainfall event has ceased. These inspections must occur within 48 hours after the rain event has ceased during a normal work day and within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday.

    The SWPPP must explain how the person responsible for erosion control will be notified when stormwater runoff occurs. If weather conditions prevent correction of BMPs within 7 calendar days, the reasons for the delay must be documented (including pictures) and there must be a narrative explaining why the work cannot be accomplished within the 7 day time period. The documentation must be filed with the regular inspection reports. The permittee shall correct the problem as soon as weather conditions allow. Areas on-site that have been finally stabilized must be inspected at least once per month.

    A log of each inspection and copy of the inspection report shall be kept on-site. The inspection report shall be signed by the permittee or by the person performing the inspection if duly authorized to do so. The inspection report is to include the following minimum information:
    a. Inspector's name;
    b. Date of inspection;
    c. Observations relative to the effectiveness of the BMPs;
    d. Actions taken or necessary to correct the observed problem; and
    e. Listing of areas where land disturbance operations have permanently or temporarily stopped.

11. Proper Operation and Maintenance: The permittee shall at all times maintain all pollution control measures and systems in good order to achieve compliance with the terms of this general permit.

12. Notification to All Contractors: The permittee shall be responsible for notifying each contractor or entity (including utility crews and city employees or their agents) who will perform work at the site of the existence of the SWPPP and what action or precautions shall be taken while on-site to minimize the potential for erosion and the potential for damaging any BMP. The permittee is responsible for any damage a subcontractor may do to established BMPs and any subsequent water quality violation resulting from the damage.

13. Public Notification: The permittee shall post a copy of the public notification sign described by the Department at the main entrance to the site. The public notification sign must be visible from the public road that provides access to the site's main entrance. An alternate location is acceptable provided the public can see it and it is noted in the SWPPP. The public notification sign must remain posted at the site until the permit has been terminated.

D. OTHER DISCHARGES

1. Hazardous Substance and Oil Spill Reporting: Refer to Section B, #14 of Part I of the Standard Conditions that accompany this permit.

2. Removed substances: Refer to Section B, #6 of Part I of the Standard Conditions that accompany this permit.

3. Change in discharge: In the event soil contamination or hazardous substances are discovered at the site during land disturbance activities, the permittee shall notify the Department's regional office by telephone as soon as practicable but no later than 24 hours after discovery. The permittee must also notify the Department's regional office in writing no later than 14 calendar days after discovery.

E. SAMPLING REQUIREMENTS AND EFFLUENT LIMITATIONS

1. The effluent limitation for Settleable Solids from a stormwater outfall discharging shall not exceed 2.5 ml/L per Standard Method 2540 F, except immediately following the local 2-year, 24-hour storm event. The Settleable Solids limit is not enforceable during or greater than the local 2-year, 24-hour storm event.

2. The Department may require sampling and reporting as a result of illegal discharges, compliance issues, complaint investigations, or other such evidence of contamination from activities at the site. If such an action is needed, the Department will specify in writing any sampling requirements, including such information as location, extent and parameters.

F. RECORDS

1. The permittee shall retain copies of this general permit, the SWPPP and all amendments for the site named in the State Operating Permit, results of any monitoring and analysis and all site inspection records required by this general permit. The records shall be accessible during normal business hours. The records shall be retained for a period of at least three years from the date of the Letter of Termination.

2. The permittee shall provide a copy of the SWPPP to the Department, USEPA, or any local agency or government representative if they request a copy in the performance of their official duties.

3. The permittee shall provide a copy of the SWPPP to those who are responsible for installation, operation, or maintenance of any BMP. The permittee, their representative, and/or the contractor(s) responsible for installation, operation and maintenance of the BMPs shall have a current copy of the SWPPP with them when on the project site.

G. LAND PURCHASE AND CHANGE OF OWNERSHIP

1. Federal and Missouri stormwater regulations [10 CSR 20-6.200] require a stormwater permit and erosion control measures for all land disturbances of one or more acres. These regulations also require a permit for less than one acre lots if the lot is part of a common plan of development or sale where that plan is at least one acre in size. If the permittee sells less than one acre of the permitted site to an entity for, commercial, industrial, or residential use, (unless sold to an individual for the purpose of building his/her own private residence and in accordance with G.3 of this section) this land remains a part of the common sale and regulated by this permit. Therefore, the permittee is still responsible for erosion control on the sold property until termination of the permit.

2. If the permittee sells one or more acres of the permitted site to an entity, the new owner of the property must obtain a land disturbance permit for the purchased property. The original permittee must amend the SWPPP to show that the property (one acre or more) has been sold and therefore no longer under the original permit jurisdiction.

3. If the permittee has stabilized the less than one acre lot which is part of a larger common plan of development and the lot is sold to an individual for purposes of building his/her own private residence, the permittee is no longer responsible for erosion control on the lot.

4. Property of any size which is part of a larger common plan of development where the property has been stabilized and the original permit terminated will require application of a new land disturbance permit for any future land disturbance activity.

5. If the entire tract is sold to a single entity, then this permit shall be terminated when the new owner obtains a new land disturbance permit for the site.

H. TERMINATION

This permit may be terminated when the project is stabilized. The project is considered to be stabilized when perennial vegetation, pavement, buildings, or structures using permanent materials cover all areas that have been disturbed. With respect to areas that have been vegetated, vegetation cover shall be at least 70% plant density over 100% of the site. In order to terminate the permit, the permittee shall notify the Department.

The Cover Page (Certificate Page) of the Master General Permit for Land Disturbance specifies the "effective date" and the "expiration date" of the Master General Permit. The "issued date" along with the "expiration date" will appear on the State Operating Permit issued to the applicant. This permit does not continue administratively beyond the expiration date.

If the project or development completion date will be after the expiration date of this general permit, then the permittee must reapply to the Department for a new permit. The applicant must file a request to the Department for a new permit 180 days prior to the expiration of this permit.

If the permittee has not terminated the permit and the permit expires, and the permittee has not applied for a new permit the permittee will be considered "operating without a permit" if the site does not meet the requirements for termination.

I. MODIFICATION, REVOCATION, AND REOPENING

1. The U.S. Environmental Protection Agency (EPA) has proposed stormwater requirements that may direct the State to reopen this permit. The EPA is proposing to change its construction general permit (CGP) with more prescriptive requirements and design standards for buffers to prevent stormwater runoff, increased monitoring requirements and more frequent inspections. While the EPA permit is only effective in areas where EPA has permitting authority these requirements are likely to act as a template, setting a baseline for the EPA approval of state plans for permitting sites.

2. If at any time the Department determines that the quality of waters of the state may be better protected by reopening this permit, or revoking this permit and requiring the owner/operator of the permitted site to apply for a site-specific permit, the Department may revoke a general permit and require any person to obtain such an operating permit as authorized by 10 CSR 20-6.010(13) and 10 CSR 20-6.200(1)(B).

3. If this permit is reopened, modified or revoked pursuant to this Section, the permittee retains all rights under Chapter 536 and 644 Revised Statutes of Missouri upon the Department's reissuance of the permit as well as all other forms of administrative, judicial, and equitable relief available under law.

J. DUTY TO COMPLY

The permittee must comply with all conditions of this general permit. Any noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

STANDARD CONDITIONS FOR NPDES PERMITS
ISSUED BY
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION
Revised
October 1, 1980

PART I - GENERAL CONDITIONS
SECTION A - MONITORING AND REPORTING

1. **Representative Sampling**
   a. Samples and measurements taken as required herein shall be representative of the nature and volume, respectively, of the monitored discharge. All samples shall be taken at the outfall(s), and unless specified, before the effluent joins or is diluted by any other body of water or substance.
   b. Monitoring results shall be recorded and reported on forms provided by the Department, postmarked no later than the 28th day of the month following the completed reporting period. Signed copies of these, and all other reports required herein, shall be submitted to the respective Department Regional Office, the Regional Office address is indicated in the cover letter transmitting the permit.

2. **Schedule of Compliance**
   No later than fourteen (14) calendar days following each date identified in the "Schedule of Compliance", the permittee shall submit to the respective Department Regional Office as required therein, either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements, or if there are no more scheduled requirements, when such noncompliance will be corrected. The Regional Office address is indicated in the cover letter transmitting he permit.

3. **Definitions**
   Definitions as set forth in the Missouri Clean Water Law and Missouri Clean Water Commission Definition Regulation 10 CSR 20-2.010 shall apply to terms used herein.

4. **Test Procedures**
   Test procedures for the analysis of pollutant shall be in accordance with the Missouri Clean Water Commission Effluent Regulation 10 CSR 20-7015.

5. **Recording of Results**
   a. For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:
      (i) the date, exact place, and time of sampling or measurements;
      (ii) the individual(s) who performed the sampling or measurements;
      (iii) the date(s) analyses were performed;
      (iv) the individualts) who performed the analyses;
      (v) the analytical techniques or methods used; and
      (vi) the results of such analyses.
   b. The Federal Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or hy imprisonment for not more than six (6) months per violation, or both.
   c. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

6. **Additional Monitoring by Permittee**
   If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results nf such monitoring shall be included in the calculation and reporting of the values required in the Monitoring Report Form. Such increased frequency shall also be indicated.

7. **Records Retention**
   The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recording for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time.

SECTION B - MANAGEMENT REQUIREMENTS

1. **Change In Discharge**
   a. All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant not authorized by this permit or any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit.
   b. Any facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants shall be reported hy submission of a new NPDES application at least sixty (60) days before each such changes, or, if they will not violate the effluent limitations specified in the permit, by notice to the Department at least thirty (30) days before such changes.

2. **Noncompliance Notification**
   a. If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Department with the following information, in writing within five (5) days of becoming aware of such conditions:
      (i) a description of the discharge and cause of noncompliance, and
      (ii) the period of noncompliance, including exact dates and times or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent 'recurrence of the noncomplying discharge.
   h. Twenty-four hour reporting. The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally with 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided with five (5) days of the time the permittee becomes aware of the circumstances. The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

3. **Facilities Operation**
   Permittees shall operate and maintain facilities to comply with the Missouri Clean Water Law and applicable permit conditions. Operators or supervisors of operations at publicly owned or publicly regulated wastewater treatment facilities shall he certified in accordance with 10 CSR 209.020(2) and any other applicable law or regulation. Operators of other wastewater treatment facilities, water contaminant source or point sources, shall, upon request by the Department, demonstrate that wastewater treatment equipment and facilities are effectively operated and maintained by competent personnel.

4. **Adverse Impact**
   The permittee shall take all necessary steps to minimize any adverse impact to waters of the state resulting from noncompliance with any effluent limitations specified in this permit or set forth in the Missouri Clean Water Law and Regulations (hereinafter the Law and Regulations), including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. **Bypassing**
   a. Any bypass or shut down of a wastewater treatment facility and tributary sewer system or any part of such a facility and sewer system that results in a violation of permit limits or conditions is prohibited except:
      (i) where unavoidable to prevent loss of life, personal injury, or severe property damages; and
      (ii) where unavoidable excessive storm drainage or runoff would catastrophically damage any facilities or processes necessary for compliance with the effluent limitations and conditions of this permit;
      (iii) where maintenance is necessary to ensure efficient operation and alternative measures have been taken to maintain effluent quality during the period of maintenance.
   b. The permittee shall notify the Department in writing of all bypasses or shut down that result in a violation of permit limits or conditions. This section does not excuse any person from liability, unless such relief is otherwise provided by the statute.

6. **Removed Substances**
   Solids, sludges, filter backwash, or any other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutants from entering waters of the state unless permitted by the Law, and a permanent record of the date and time, volume and methods of removal and disposal of such substances shall be maintained by the permittee.

7. **Power Failures**
   In order to maintain compliance with the effluent limitations and other provisions of this permit, the permittee shall either:
   a. in accordance with the "Schedule of Compliance", provide an alternative power source sufficient to operate the wastewater control facilities; or,
   b. if such alternative power source is not in existence, and no date for its implementation appears in the Compliance Schedule, halt or otherwise control production and all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

8. **Right of Entry**
   For the purpose of inspecting, monitoring, or sampling the point source, water contaminant source, or wastewater treatment facility for compliance with the Clean Water Law and these regulations, authorized representatives of the Department, shall be allowed by the permittee, upon presentation of credentials and at reasonable times:
   a. to enter upon permittee's premises in which a point source, water contaminant source, or wastewater treatment facility is located or in which any records are required to be kept under terms and conditions of the permit;
   b. to have access to, or copy, any records required to be kept under terms and conditions of the permit;
   c. to inspect any monitoring equipment or method required in the permit;
   d. to inspect any collection, treatment, or discharge facility covered under the permit; and
   e. to sample any wastewater at any point in the collection system or treatment process.

9. **Permits Transferable**
   a. Subject to Section (3) of 10 CSR 20-6.010 an operating permit may be transferred upon submission to the Department of an application to transfer signed by a new owner. Until such time as the permit is officially transferred, the original permittee remains responsible for complying with the terms and conditions of the existing permit.
   b. The Department, within thirty (30) days of receipt of the application shall notify the new permittee of its intent to revoke and reissue or transfer the permit.

10. **Availability of Reports**
    Except for data determined to be confidential under Section 308 of the Act, and the Law and Missouri Clean Water Commission Regulation for Public Participation, Hearings and Notice to Governmental Agencies 10 CSR 20-6.020, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. As required by statute, effluent data shall not be considered confidential. Knowingly making any false statement on any such report shall be subject to the imposition of criminal penalties as provided in Section 204.076 of the Law.

11. **Permit Modification**
    a. Subject to compliance with statutory requirements of the Law and Regulations and applicable Court Order, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:
       (i) violation of any terms or conditions of this permit or the Law;
       (ii) having obtained this permit by misrepresentation or failure to disclose fully any relevant facts;
       (iii) a change in any circumstances or conditions that requires either a temporary or permanent reduction or elimination of the authorized discharge; or
       (iv) any reason set forth in the Law and Regulations.
    b. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

12. **Permit Modification Less Stringent Requirements**
    If any permit provisions are based on legal requirements which are lessened or removed, and should no other basis exist for such permit provisions, the permit shall be modified after notice and opportunity for a hearing.

13. **Civil and Criminal Liability**
    Except as authorized by statute and provided in permit conditions on "Bypassing" (Standard Condition B-5) and "Power Failures" (Standard Condition B-7) nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

14. **Oil and Hazardous Substance Liability**
    Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act, and the Law and Regulations. Oil and hazardous materials discharges must be reported in compliance with the requirements of the Federal Clean Water Act.

15. **State Laws**
    Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state statute or regulations.

16. **Property Rights**
    The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of or violation of federal, state or local laws or regulations.

17. **Duty to Reapply**
    If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for a new permit 180 days prior to expiration of this permit.

18. **Toxic Pollutants**
    If a toxic effluent standard, prohibition, or schedule of compliance is established under Section 307(a) of the Federal Clean Water Act for a toxic pollutant in the discharge of permittee's facility and such standard is more stringent than the limitations in the permit, then the more stringent standard, prohibition, or schedule shall be incorporated into the permit as one of its conditions, upon notice to the permittee.

19. **Signatory Requirement**
    All reports, or information submitted to the Director shall be signed (see 40 CFR-122.6).

20. **Rights Not Affected**
    Nothing in this permit shall affect the permittee's right to appeal or seek a variance from applicable laws or regulations as allowed by law.

21. **Severability**
    The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

State of Missouri
Missouri Department of Natural Resources

FACT SHEET

MORA00000 LAND DISTURBANCE GENERAL PERMIT
2012 Reissue

The Federal Water Pollution Control Act ("Clean Water Act" Section 402 Public Law 92-500 as amended) established the National Pollution Discharge Elimination System (NPDES) permit program. This program regulates the discharge of pollutants from point sources into the waters of the United States, and the release of stormwater from certain point sources. All such discharges are unlawful without a permit (Section 301 of the "Clean Water Act"). After a permit is obtained, a discharge not in compliance with all permit terms and conditions is unlawful. Missouri State Operating Permits (MSOPs) are issued by the Director of the Missouri Department of Natural Resources (Department) under an approved program, operating in accordance with federal and state laws (Federal "Clean Water Act" and "Missouri Clean Water Law" Section 644 as amended). MSOPs are issued for a period of five (5) years unless otherwise specified.

As per [40 CFR Part 124.8(a)] and [10 CSR 20-6.020(1)2.] a Factsheet shall be prepared to give pertinent information regarding the applicable regulations, rationale for the development of effluent limitations and conditions, and the public participation process for the Missouri State Operating Permit (operating permit) listed below.

A Factsheet is not an enforceable part of an operating permit.

This Factsheet is for a Major ☐, Minor ☐, Industrial Facility ☐; Variance ☐;
Master General Permit ☒; General Permit Covered Facility ☐; and/or permit with widespread public interest ☐.

PART I. NPDES Stormwater General Permit

The vast majority of discharges associated with construction activity are covered under NPDES general permits. General permits cover a group of similar dischargers under one permit. General permits simplify the process for dischargers to obtain authorization to discharge, provide permit requirements for any discharger that applies for coverage, and reduce the administrative workload for NPDES permitting authorities.

This General Permit is for regulating stormwater discharge at land disturbance construction sites in Missouri. This program requires the owner or operator of a construction site disturbing land of one acre or greater, or less than one acre but part of a larger common plan of development, to obtain this permit prior to conducting any land disturbance activity.

PART II. The Need for Stormwater Regulations at Construction Sites

Stormwater runoff is a major source of urban water pollution endangering humans by polluting the water resources used for drinking, household purposes, recreation and fishing. Stormwater discharges often contain pollutants in amounts that could reduce water quality. The primary pollutants of concern from construction activities are silt and sediment, but other pollutants such as oils and grease, vehicle fluids, and debris are present as well.

Stormwater runoff from construction activities can have a significant impact on water quality. As stormwater flows over a construction site, it can pick up pollutants like sediment, debris, and chemicals and transport these to a nearby storm sewer system or directly to a river, lake, or coastal water. Polluted stormwater runoff can harm or kill fish and other wildlife. Sedimentation can destroy aquatic habitat, and high volumes of runoff can cause stream bank erosion. Debris can clog waterways and potentially reach the ocean where it can kill marine wildlife and impact habitat.

Construction activities increase pollutant loads in runoff. The volume and rate of runoff are typically increased, providing a larger capacity to transport pollutants to rivers and lakes. In addition, the removal of vegetation leaves bare soil which is much more vulnerable to erosion, resulting in sediment moving into receiving waters.

Additional stormwater information and requirements including application for a land disturbance permit can be found at http://dnr.mo.gov/env/wpp/stormwater/sw-land-disturb-permits.htm.

PART III. Key Components of this Permit

The key components of this permit are effluent limitations that require the permittee to minimize discharge of pollutants in stormwater by using control measures that reflect best engineering practices base on federal and state government best professional judgment. Dischargers must minimize their discharge of pollutants in stormwater using appropriate erosion and sediment controls and control measures for other pollutants such as litter, construction debris, and construction chemicals that could be exposed to stormwater and other wastewater. This general permit requires dischargers to develop a stormwater pollution prevention plan (SWPPP) to document the steps they will take to comply with the terms, conditions and effluent limitations of the permit. Note that the SWPPP is not an effluent limitation, nor does it include effluent limitations. Information including examples of a SWPPP can be found at the following http://cfpub.epa.gov/npdes/stormwater/swppp.cfm#model. These examples should be used for educational or training purposes only. Construction site SWPPPs must be developed following the requirements of Missouri's land disturbance permit and describe the specific conditions of the site and plans for development.

PART IV. Additional Information for the Purpose of Permit Clarity

Applicability

- **"Industrial stormwater run-off"** are activities that take place at industrial facilities, such as material handling and storage, that are often exposed to the weather. As runoff from rain or snowmelt comes into contact with these activities, it can pick up pollutants and transport them to a nearby storm sewer system or directly to a river, lake, or coastal water. To minimize the impact of stormwater discharges from industrial facilities, the NPDES program includes an industrial stormwater permitting component that covers 10 categories of industrial activity that require authorization under an NPDES industrial stormwater permit for stormwater discharges. More information on industrial permit requirements can be found at http://dnr.mo.gov/env/wpp/stormwater/sw-industrial-permits.htm.

- A **"larger common plan of development or sale"** is a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan. For example, if a developer buys a 20-acre lot and builds roads, installs pipes, and runs electricity with the intention of constructing homes or other structures sometime in the future, this would be considered a larger common plan of development or sale. If the land is parceled off or sold, and construction occurs on plots that are less than one acre by separate, independent builders, this activity still would be subject to stormwater permitting requirements if the smaller plots were included on the original site plan. Other than the less than one acre property sold to the individual for construction of their personal residence, property of any size which is part of a larger common plan of development where the property has been stabilized and the original permit terminated will require application of a new land disturbance permit for any future land disturbance activity. The larger common plan of development or sale also applies to other types of land development such as industrial parks or well fields. A permit is required if one or more acres of land will be disturbed, regardless of the size of any of the individually-owned or developed sites.

- Documentation of Permit Eligibility Related to **Endangered Species:** The SWPPP must include documentation supporting a determination of permit eligibility with regard to Endangered Species.

  For more information please visit the following links:

  For information on understand what critical habitat is, please go to the following link, www.fs.fed.us/r9/wildlife/tes/docs/esa_references/critical_habitat.pdf.

  For information on listed species by State & County, please go to the following link, http://cfpub.epa.gov/npdes/stormwater/esa.cfm.

The Missouri Department of Conservation's internet site for the Natural Heritage Review may be very helpful and can be found at the following link, http://mdcgis.mdc.mo.gov/heritage/newheritage/heritage.htm. Also helpful are the local offices of the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS), these centers often maintain lists of federally listed endangered or threatened species on their internet sites.

If there are listed species in the county or township, check to see if critical habitat has been designated and if that area overlaps or is near the project area. Critical habitat designations and associated requirements may also be found at 50 CFR Parts 17 and 226. For additional information, use the mapview tool at http://criticalhabitat.fws.gov/crithab/ to find data specific to your state and county.

- A Clean Water Act **Section 404 Department of the Army Permit** and the Department's Clean Water Act Section 401 Water Quality Certification (certification) are needed when placing material or fill into jurisdictional waters of the United States. Any impacts to jurisdictional streams or wetlands would require an application to be sent to the appropriate US Army Corps of Engineers District Regulatory Branch. A map of the district offices and contact information can be located online at: http://www.dnr.mo.gov/env/wpp/401/corps-map3.gif). Not all land disturbance projects will require a 404 permit; however, if a 404 permit is required, land disturbance activities are not to be conducted in the jurisdictional area of the project until the 404 permit has been obtained. A discussion on the need for a 404/401 permit as a requirement of this permit and is to be included in the SWPPP.

Exemptions from Permit Requirements

- The USEPA defines **linear projects** to include the construction of roads, bridges, conduits, substructures, pipelines, sewer lines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities in a long, narrow area. Missouri regulation 10 CSR 20-6.200 (1)(B) 8 exempts linear project construction from stormwater permit regulations which meet one of the following: A. Grading of existing dirt or gravel roads which does not increase the runoff coefficient and the addition of an impermeable surface over an existing dirt or gravel road; B. Cleaning or routine maintenance of roadside ditches, sewers, waterlines, pipelines, utility lines or similar facilities; C. Trenches two (2) feet in width or less; or D. Emergency repair or replacement of existing facilities as long as best management practices are employed during the emergency repair.

Permit Requirements

- The permittee is required to conduct inspections of the site. The person(s) inspecting the site may be a staff person or a hired third party to conduct such inspections. The permittee is responsible for ensuring that the person who conducts inspections is a "qualified person or personnel." A **"qualified person"** is a person knowledgeable in the principles and practice of erosion and sediment controls and pollution prevention, who possesses the skills to assess conditions at the construction site that could impact stormwater quality, and the skills to assess the effectiveness of any stormwater controls selected to control the quality of stormwater discharges from the construction activity.

- A sample **inspection report** has been developed as a helpful tool to aid in completing site inspections. This sample inspection report was created consistent with USEPA's Developing Your Stormwater Pollution Prevention Plan and can be found at http://www.epa.gov/npdes/pubs/sw_swppp_inspection_form.doc. Both the guide and the sample inspection report (formatted in Microsoft Word) can be found at http://cfpub.epa.gov/npdes/stormwater/swppp.cfm.

- For common drainage locations that serve an area with 10 or more acres disturbed at one time, a temporary (or permanent) **sediment basin** that provides storage for a calculated volume of runoff from the drainage area from a 2-year, 24-hour storm, or equivalent control measures, must be provided where attainable until final stabilization of the site. Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent control measures, must be provided where attainable until final stabilization of the site. When computing the number of acres draining into a common location, it is not necessary to include flows from offsite areas and flows from on-site areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin. In determining whether installing a sediment basin is attainable, the operator may consider factors such as site soils, slope, available area on-site, etc. In any event, the operator must consider public safety, especially as it relates to children, as a design factor for the sediment basin, and alternative sediment controls must be used where site limitations would preclude a safe design.

- Public Notification: A public notification sign has been added to the permit. If a different sign is to be used it should be one of the same size sign and lettering and containing the same information as that of the one supplied with the permit. The required information includes a statement for those with questions or concerns, the permit number and the Department's toll free phone number. The permittee shall post a copy of the public notification sign described by the Department at the main entrance to the site. An alternate location is acceptable provided the public can see it and it is noted in the SWPPP. The public notification sign must remain posted at the site until the permit has been terminated.

Other Discharges

- Machinery should be kept out of the waterway as much as possible. Fuel, oil and other petroleum products, equipment and any solid waste should not be stored below the ordinary high water mark at any time or in the adjacent floodway beyond normal working hours. All precautions are to be taken to avoid the release of wastes or fuel as a result of this operation. Petroleum products spilled should be immediately cleaned up and disposed of properly. Any such **spills of petroleum or other chemicals** are to be reported as soon as possible to the Department's 24-hour Environmental Emergency Response number at (573) 634-2436.

Sampling Requirements and Other Effluent Limitations

- 40 CFR 450.21 Subpart B - Construction and Development (C&D) Effluent Guidelines are **non-numeric effluent limits** and are structured to require construction operators to first prevent the discharge of sediment and other pollutants through the use of effective planning and erosion control measures; and second, to control discharges that do occur through the use of effective sediment control measures. Permittees are also required to implement a range of pollution prevention measures to limit or prevent discharges of pollutants including those from dry weather discharges. The C&D rule's non-numeric effluent limits are available at the following internet site: http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol29/xml/CFR-2010-title40-vol29-sec450-21.xml. The associated fact sheet can be found at: http://www.epa.gov/npdespub/pubs/cgp_proposedfs.pdf.

- The USEPA has proposed numeric **effluent limitation guidelines** (ELGs) to control the discharge of pollutants from construction sites of a certain size. The Department may modify this permit upon finalization of the USEPA effluent limitation guidelines. The proposed Effluent limitation guidelines can be view at the following website http://water.epa.gov/scitech/wastetech/guide/construction/.

Land Purchase and Change of Ownership

- A person having **operational control over only a portion of a larger project** (e.g., one of four homebuilders in a subdivision), is responsible for compliance with all applicable effluent limits, terms, and conditions of the permit as it relates to the activities on that portion of the construction site, including protection of endangered species, critical habitat, and historic properties, and implementation of control measures described in the SWPPP. This person must ensure either directly or through coordination with other permittees, that these activities do not render another party's pollutant discharge controls ineffective. This person must either implement their own portion of a common SWPPP or develop and implement their own SWPPP. For more effective coordination of BMPs and opportunities for cost sharing, a cooperative effort by the different operators at a site to prepare and participate in a comprehensive SWPPP is encouraged. Individual operators at a site may, but are not required to, develop separate SWPPPs that cover only their portion of the project provided referenced is made to other operators at the site. In instances where there is more than one SWPPP for a site, cooperation between the permittees is encouraged to ensure stormwater discharge control measures are consistent with one another (e.g., provisions to protect listed species and critical habitat).

- The Department does not allow the transfer of a land disturbance permit from one owner to another; however, to facilitate the change in the ownership status of a property the Department developed the "Application for Change of Ownership" form. This form will allow the new owner to receive a new permit and number. The form may also be used to terminate the original permit if all the property included in the original permit is no longer the responsibility of the original owner. The "Application for Change of Ownership" (form MO780-2051) can be found online at http://www.dnr.mo.gov/forms/#StormWater.

Termination

- To begin the process of terminating this permit, the permittee should submit Form H – "Request for Termination" (MO780-1409) to the Department. The form can be found at the following web location: http://www.dnr.mo.gov/forms/#StormWater.

PART V. Addendums to Fact Sheet

Addendum #1

Individual Lot Certification

This form is not a requirement of the permit, but may be used by the permittee when selling individual lots that are part of the property that has been authorized by a Missouri Water Pollution Control General Permit under the NPDES for stormwater discharged associated with construction activity. This is a certification between the purchaser and the seller to cooperatively implement the SWPPP and the conditions of the NPDES permit and does not constitute a transfer of the permit. The permittee shall maintain this form on-site, or in a readily available location. The permittee shall provide individual lot certification forms or a copy of the contract for land sale having the equivalent wording to the Missouri Department of Natural Resources.

Addendum #2

Response to Comments

The public comment period for this permit expired on October 30, 2011. Addendum #2 contains the Missouri Department of Natural Resources' response to comments received during the public comment period.

ADDENDUM #1
INDIVIDUAL LOT CERTIFICATION

For Storm Water Discharges Associated with Construction Activity Authorized by a Missouri Water Pollution Control General Permit under the National Pollutant Discharge Elimination System

TO BE COMPLETED BY THE NEW LOT OWNER

I certify, under penalty of law, that I have received a copy of the general NPDES permit referenced below, which authorized the original lot owner or developer to discharge storm water runoff from construction activities, and the Storm Water Pollution Prevention Plan (SWPPP) prepared by the original lot owner or developer. I have reviewed the terms and conditions of the general permit and the SWPPP. I accept responsibility for erosion and sediment control during construction of the home or building for each of the lot(s) listed below. In the event the Missouri Department of Natural Resources notifies the undersigned of water quality violations due to conditions at any lot listed below and I am unable or unwilling to take action within 30 days to further reduce erosion or control sediment, then I agree to allow the original lot owner or developer to have reasonable access to the site to implement erosion and sediment control measures. I understand this certification is an agreement between the purchaser and seller to cooperatively implement the SWPPP and the conditions of the general NPDES permit.

Facility Name: _____
(as listed on permit)

Permit Number: MOR _____

Lot Number(s): _____

New Owner's Signature: _____

Name (typed or printed): _____

Phone Number: _____

Complete Only if New Owner is a Corporation and not an Individual:

Company Name: _____

Company Address: _____

Company Phone #: _____

TO BE COMPLETED BY THE PERMIT HOLDER

As permittee for the overall tract wherein the above listed lot(s) are located, I certify that I have provided the above named lot purchaser with a copy of the general NPDES permit and the Storm Water Pollution Prevention Plan (SWPPP) for the project, and I have informed the lot purchaser of their responsibility to minimize erosion and control sedimentation. I understand this certification does not constitute a transfer of the permit and understand this certification is an agreement between the purchaser and seller to cooperatively implement the SWPPP and the conditions of the general NPDES permit.

Signature: _____

Name (typed or printed): _____

Phone Number: _____

The permittee shall maintain this form on-site, or in a readily available location. The permittee shall provide individual lot certifications forms or a copy of the contract for land sale having the equivalent wording to the Missouri Department of Natural Resources upon request.

ADDENDUM #2

MORA00000 Land Disturbance Permit
Response to Public Notice Comments

(The Missouri Department of Natural Resources' public notice comment period for this permit expired on October 30, 2011.)

GENERAL COMMENT RESPONSES

LAND DISTURBANCE PERMIT MOR100

The Department received certain comments specifically related to the MOR100 permit (the area-wide permit for state, federal, local government, etc.). These comments may be considered in the development of that permit. The MOR100 permit expires March 2012. There has been no change to the permit as a result of these comments.

FEDERAL REGULATION 40 CFR 450.21

As the NPDES authorized permitting authority, the Department is required to incorporate into the permit the federal regulation 40 CRF 450.21. These are non-numeric effluent limitations reflecting the best practicable technology currently available (BPT). Some limitations come with the words "unless infeasible." The Department received several questions on who determines what is or isn't feasible. The owner or operator is to make the determination for a specific project site if a requirement is infeasible and document in the SWPP as to why it is infeasible. There has been no change to the permit as a result of this comment.

EPERMITING and FEES

The Department received a few comments regarding electronic permitting (epermitting) and permit fees. These comments have been relayed to the respective workgroups. The first phase of epermitting is expected to be completed mid-year 2012 and will include the issuance of new land disturbance permits. At this time, all renewals will be processed without epermitting. More information regarding electronic permitting will be placed on the Department's webpage in the very near future. There has been no change to the permit as a result of these comments.

TYPOS/RENUMBERING/DEFINITIONS

The Department received comments regarding typos, renumbering and similar items in the proposed permit. These entries have been corrected in the final permit.
The Department received comments suggesting definition and clarification to several areas of the proposed permit. All suggestions were considered and many have been added to the permit Fact Sheet.

SPECIFIC COMMENT RESPONSES

SECTION A. APPLICABILITY

OWNER/OPERATOR

Section A.1. - The Department received comments regarding the owner/operator statement asking for clarification of primary responsibility for compliance with the permit and to expand the responsibility to include the holder of an easement on the property as an alternative to the property owner. If there are enforcement actions the Department has the authority to involve all parties as necessary and to the extent possible. The Department has revised the applicability language to include easement in lieu of property owners where appropriate.

The Department received a comment requesting there be a differentiating permit between land development and vertical house construction. With exception to lots that are part of a larger common plan of development or sale, this permit is required for land disturbances for any reason based on the size (the acreage) of the disturbance. There has been no change to the permit as a result of this comment.

The Department received comments requesting the inclusion of other areas (borrow pits) which are outside the permitted area as well as an allowance for a specific activity (portable concrete and asphalt plants) to be listed in the permit. The Department believes that the permitted areas should be sufficiently stated in the application and the SWPPP to include all areas where land disturbance activities are planned to take place. There has been no change to the permit as a result of these comments.

DISCHARGES

Section A.2. - The Department received a comment asking to identify non-stormwater discharges. For the purposes of this rule, non-stormwater discharges are identified in this section of the permit. There has been no change to the permit as a result of this comment.

Section A.2. - The Department received comments requesting we add "flushing fire hydrants and potable water lines" back to the list of authorized non-stormwater discharges. Current regulation (10CSR 20.6.010 (1) (B)7) exempts these discharges from all general permitting. However, the Department has added these items back to the permit.

Section A.4. - The Department has clarified, in the permit Fact Sheet, what is meant by "industrial stormwater runoff ".

OTHER FEDERAL REGULATION

Section A.8. - A Clean Water Act Section 404 Department of the Army Permit and the Department's Clean Water Act Section 401 Water Quality Certification (certification) are needed when placing material or fill into jurisdictional waters of the United States. Any impacts to jurisdictional streams or wetlands would require an application to be sent to the appropriate US Army Corps of Engineers District Regulatory Branch. Contact information can be found at http://www.dnr.mo.gov/env/wpp/401/corps-map3.gif. Not all land disturbance projects will require a 404 permit; however, if a 404 permit is required then land disturbance activities are not to be conducted in the jurisdictional area of the project until the 404 permit has been obtained. Language in the permit has been reworded and additional information added to the permit Fact Sheet to help better clarify this concern.

Section A.9. - Compliance with the Historic Preservation Act and the Endangered Species Act is not a requirement to obtain a land disturbance permit. However, NPDES permittees must be in compliance with these federal regulations. The Department has added a statement to the permit Fact Sheet, that this permit does not supersede compliance with other federal requirements.

Section A.10. – The Department added language to the permit that the permit does not superseded any local authority requirement to obtain approval for a land disturbance project.

SECTION B. EXEMPTIONS FROM PERMIT REQUIREMENTS

Section B.2. – The Department received a comment requesting that we list the general permit exemptions outlined in the cited regulations. Missouri State Regulations 10CSR 20-6.200 (1) (B) and 10 CSR 20.6.010 (1) (B) outline exemptions from NPDES stormwater permits and all NPDES general permits, respectively. There has been no change to the permit as a result of this comment.

Section B.3. – The Department received comments requesting we include the words "maintenance operations" in this sentence. The permit language has been updated with this inclusion. A discussion on linear, strip, and ribbon construction and maintenance exemptions can be found in the permit Fact Sheet.

Section B.5. – The Department received a comment recommending the inclusion of CAFOs in the Agriculture Exemption. The Department removed the second sentence from the draft permit so that this section continues to read as it did in the previous permit.

SECTION C. REQUIREMENTS

Section C.1. a-g. – This section of the permit outlines verbatim the federal requirements of 40 CFR 450.21 effluent limitations reflecting the best practicable technology currently available (BPT). These are non-numeric effluent limits which the NPDES permitting authority must include in the permit. The Department received several comments regarding this section of the permit; it was recommended that we remove this section of the permit, it was recommended that we delete some of the wording, and there were comments which questioned the practicality of some items. When the Department does not have design guidelines for federal requirements, it is left to the discretion of the stormwater professional as to the proper design protocol. There were no changes to the permit as a result of these comments.

Section C.2.e. – The Department received comments regarding the need to comply with 404/401 permitting versus the requirement to comply in order to obtain a stormwater permit and identifying this in the SWPPP. The Department has added language to the permit Fact Sheet which describes the SWPPP requirement regarding 404/401permitting is only to verify that the need for a 404/401 permit was addressed. For additional discussion on the 404/401 requirement, please refer to the Department's response to Section A.8. of this document.

SELECTION OF TEMPORARY AND PERMANENT NON-STRUCTURAL BMPS

Section C.3.e. – The Department received several comments regarding this section of the permit. The requirement of a buffer is part of federal regulation 40 CFR 450.21. This is the federal requirement which covers the non-numeric effluent limits which the permitting authority must include in the permit.

The regulation states, "The permittee is to provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration, unless infeasible.." The permit requires a 25-foot buffer at minimum. The Department has added language to the permit which will allow for a more stringent local government buffer requirement.

For additional related discussion please refer to the earlier section of this document titled "General Comment Responses"

DISTURBED AREAS

Section C.3.h. - The Department received several comments regarding this section of the permit. Stabilization is addressed in federal regulation 40 CFR 450.21. This is the federal requirement which covers the non-numeric effluent limits which the permitting authority must include in the permit. The regulation states - "Stabilization of disturbed areas must, at minimum, be initiated immediately whenever any clearing, grading, excavating or other earth disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site

and will not resume for a period exceeding 14 calendar days. Stabilization must be completed within a period of time determined by the permitting authority." The Department has included the exact federal language into the permit and has designated a period of 7 days to complete stabilization activities. Temporary (interim) stabilization clarification: Stabilization is to begin as soon as the operator knows an area will need interim stabilization. The Department has also included, in the permit, allowances for weather and equipment malfunctions. For additional related discussion please refer to the earlier section of this document titled "General Comment Responses"

BMP INSTALLATION

Section C.3.i. – The Department received one comment regarding the installation of BMPs and another comment recommending the words "not to exceed 24 hours" be added after the word "immediately". The permit will continue to allow for certain BMP installations to occur after initial site clearing to establish entry, exit and access and to require that stormwater controls be installed immediately after the earth disturbance. There were no changes to the permit as a result of this comment.

SEDIMENT BASINS

Section C.3.j. – The Department received two comments regarding the removal of sediments from sediment basins. The Department additionally received suggested wording when the use of sediment basin is impracticable. The Department has made changes to the permit to address these comments. The Department also received a comment regarding the feasibility of the use of outlet structures that withdraw water from the surface. Withdrawing water from the surface is a requirement of federal regulation 40 CFR 450.21. This is the federal requirement which covers the non-numeric effluent limits which the permitting authority must include in the permit. For additional related discussion please refer to the earlier section of this document titled "General Comment Responses".

ROADWAYS

Section C.3.m. – The Department received several similar comments on this section of the permit and has responded with rewording the second sentence of this paragraph. The new sentence reads, "Stormwater inlets susceptible to receiving sediment from the permitted land disturbance site shall have curb inlet protection." In addition, the Department has reworded the last sentence of this paragraph. The new sentence reads; "Where practicable, construction entrance BMP controls shall be used to prevent sediment track-out".

Section C.6. - This section has to do with the individual designated by the permittee as responsible for environmental matters. This section has been moved so that it precedes Section C.9. Site Inspection Reports.

AMENDING AND UPDATING THE SWPPP

Section C.8.e. - The proposed permit states, "SWPPP is determined to be ineffective in preventing or controlling erosion and sedimentation (e.g., there is visual evidence of excessive site erosion or excessive sediment deposits in streams or lakes). The Department received two comments recommending a change to this sentence. The Department has replaced the word "preventing" with the word "minimizing" in the final permit.

Section C.8.g. - The Department changed this line to read "Exceedances of effluent limitations for new source performance standards for construction activities in accordance with 40 CFR Part 450.21." This is the federal requirement which covers the non-numeric effluent limits which the permitting authority must include in the permit. For additional related discussion please refer to the earlier section of this document titled "General Comment Responses".

INSPECTION REPORTS

Section C.9. - The Department received several comments regarding site inspection reports. The Department has made changes to this section of the permit to address most of the comments received. The Department added the words "When practicable" to the middle sentence of the first paragraph so that it reads, "When practicable the receiving stream shall also be inspected for 50 feet downstream of the outfall." The Department has made changes to the last sentence of the first paragraph so that it now reads, "If rainfall causes stormwater runoff to occur on-site, the BMPs must be inspected within a reasonable time period after the rainfall event has ceased. Inspections must occur within 48 hours during normal work days, plus an additional 24 hours for each non-workday for weekends and holidays."

PUBLIC NOTIFICATION

Section C.12. - The Public Notification sign is included with the issued permit. The Department has added language to the permit Fact Sheet to describe what is acceptable should a different sign be posted. An alternate location is acceptable provided the public can see it and it is noted in the SWPPP.

SECTION E. SAMPLING REQUIREMENTS AND EFFLUENT LIMITATIONS

Section E.2. - The Department received several comments regarding the proposed effluent limitations. Commenters have requested that the settleable solid limit remain at 2.5 ml/L just as it was in the previous standard land disturbance permit. The permit has been revised to a seattleable solid (SS) limit of 2.5 ml/L per Standard Methods 2540 F and includes a local 2-year 24-hour storm event. Runoff and peak discharge information can be found online at ftp://ftp-fc.sc.egov.usda.gov/MO/eng/EFH/EFH_MO_Sup_Chap_02-1.pdf.

SECTION G. LAND PURCHASE AND CHANGE OF OWNERSHIP

The Department received four comments related to this section of the permit. In addition to recommendations received from commenters, the Department has also looked at how other states address this area of their permit. To better clarify the Department's intent with regard to property belonging to "a larger common plan of development or sale" a new statement has been added to the permit. This statement as well as language in the permit Fact Sheet clarifies that any property which was once permitted as "a larger common plan of development or sale" will require and an application for a new permit for any future land disturbance on that property.

The Department received a request that there be a differentiating permit between land development and vertical house construction. The Department would need more discussion and justification to fully explore and respond to this request. There has been no change to the permit as a result of this comment.

SECTION H. TERMINATION

The Department received a few comments regarding permit transfer and permit coverage continuance. The Department does not allow the transfer of a land disturbance permit from one owner to another; however, to facilitate the change in the ownership status of a property the Department developed the "Change of Ownership" form. This is an application that will allow the new owner to receive a new permit and number. The form may also be used to terminate the original permit if all the property included in the original permit is no longer the responsibility of the original owner. The "Change of Ownership" application form can be found online at http://dnr.mo.gov/forms/index.html#WaterPollution. This web location has been added to the permit Fact Sheet.

The Department received a comment regarding the administrative continuance of an issued permit. This permit does not continue administratively. The permit is not valid after the expiration date. A new permit would need to be issued for the site where work has not been completed and the property has not been stabilized in accordance with the termination requirements. Language has been added to the permit in order to better clarify this issue.

MoDNR Geographic Information System Editor

- Land Disturbance Point
- Land Disturbance Area
- 12 Digit Watershed Boundaries
- Impaired Streams - 303(d)
- Impaired Lakes - 303(d)
- Stream Classifications and Use Designations
- Lake Classifications and Use Designations
- Public Land Survey System
- Interstates and U.S. highways
- State numbered routes
- State letttered routes
- ramps
- Major roads
- Minor roads
- Railroads
- County Boundaries
- Lake or Pond
- Lake or Pond / Intermittent
- Lake or Pond / Perennial
- Reservoir
- Swamp or Marsh
- Other; Artificial Path
- Canal or Ditch
- Stream or River
- Stream or River / Intermittent
- Stream or River / Perennial
- Municipalities Boundary
- Municipalities Fill

Missouri Department of Natural Resources

Missouri
Department of
Natural Resources

STORMWATER DISCHARGES FROM THIS LAND DISTURBANCE SITE ARE AUTHORIZED BY THE MISSOURI STATE OPERATING PERMIT NUMBER:

ANYONE WITH QUESTIONS OR CONCERNS ABOUT STORMWATER DISCHARGES FROM THIS SITE, PLEASE CONTACT THE MISSOURI DEPARTMENT OF NATURAL RESOURCES AT

1-800-361-4827

MISSOURI DEPARTMENT OF NATURAL RESOURCES
REGIONAL AND SATELLITE OFFICES

Kansas City Area

Kansas City Regional Office
500 NE Colbern Rd.
Lee's Summit, MO 64086-4710
816-251-0700
FAX: 816-622-7044

Northwest Missouri Satellite Office
Northwest Missouri State University
Environmental Services Building,
800 University Dr.
Maryville, MO 64468-6015
660-562-1876 or 660-562-1877
FAX: 660-562-1878

Truman Lake Satellite Office
Harry S Truman State Park
28761 State Park Road West
Warsaw, MO 65355
660-438-3039
FAX: 660-438-5271

Southwest Area

Southwest Regional Office
2040 W. Woodland
Springfield, MO 65807-5912
417-891-4300
FAX: 417-891-4399

Lake of the Ozarks Satellite Office
Lake of the Ozarks Satellite Office
5570 Osage Beach Parkway
Osage Beach, MO 65065
573-348-2442
FAX: 573-348-2568

Newton County Satellite Office
Crowder College
601 Laclede, Smith Hall, Room 201
Neosho, MO 64850
417-455-5180 or 417-455-5158
FAX: 417-455-5157

Northeast Area

Northeast Regional Office
1709 Prospect Drive
Macon, MO 63552-2602
660-385-8000
FAX: 660-385-8090

Kirksville Satellite Office
Truman State University
Magruder Hall, Room 3068
100 E. Normal St.
Kirksville, MO 63501
660-785-4610

Department Central Offices
P.O. Box 176
Jefferson City, MO 65102-0176
573-751-3443
www.dnr.mo.gov/shared/map-jeffcity.htm

St. Louis Area

St. Louis Regional Office
7545 S. Lindbergh, Ste 210
St. Louis, MO 63125
314-416-2960
FAX: 314-416-2970

Franklin County Satellite Office
Meramec State Park
Hwy. 185 S./115 Meramec Park Drive
Sullivan, MO 63080
573-860-4308
FAX: 573-468-5051

Jefferson County Satellite Office
Eastern District Parks Office
2901 Hwy. 61
Festus, MO 63028
636-931-5200
FAX: 636-931-5204

Lincoln County Satellite Office
Cuivre River State Park
678 State Rt. 147
Troy, MO 63379
636-528-4779
FAX: 636-528-8362

Southeast Area

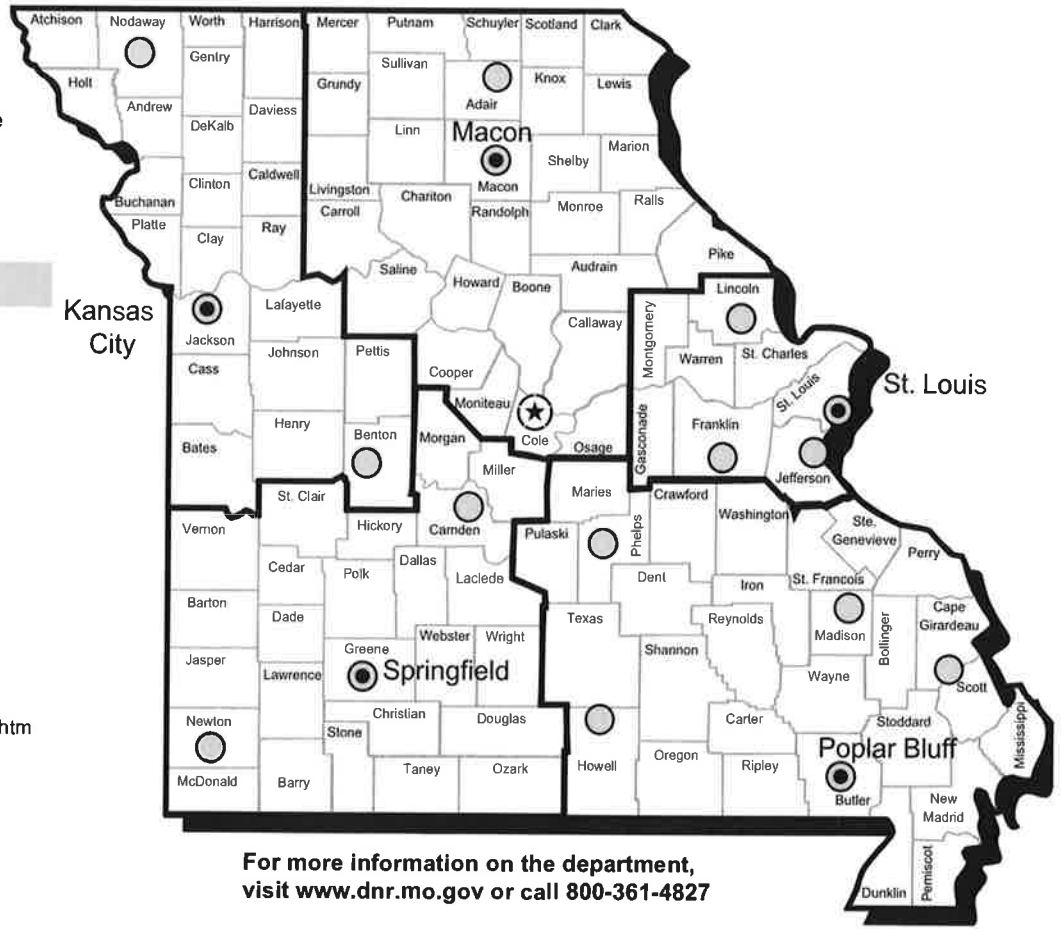
Southeast Regional Office
2155 North Westwood Blvd.
Poplar Bluff, MO 63901
573-840-9750
FAX: 573-840-9754

Cape Girardeau County Satellite Office
2007 Southern Expressway
Cape Girardeau, MO 63701
573-651-3008 (phone and FAX)

Howell County Satellite Office
700 W. Main St.
Willow Springs, MO 65793
417-469-0025 (phone and FAX)

Madison County Satellite Office
120 W. Main St.
Fredericktown, MO 63645
573-783-2385
FAX: 573-783-6294

Rolla Satellite Office
111 Fairgrounds Rd.
Rolla, MO 65402
573-368-3625
FAX: 573-368-3912



For more information on the department, visit www.dnr.mo.gov or call 800-361-4827

APPENDIX D – WETLAND DELINEATION

CLEAN WATER ACT SECTION 404
PRELIMINARY JURISDICTIONAL WETLAND DELINEATION

FOR

VIEW HIGH DRIVE
LEE'S SUMMIT, JACKSON COUNTY, MISSOURI

Prepared For:

GBA and Happy Valley Properties
Lee's Summit, Jackson County, Missouri

Prepared By:

Acer Environmental, LLC
7172 Mize Road
Shawnee, KS 66227
acerburton@kc.rr.com
(913) 645-9290

May 4, 2013

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 DESCRIPTION OF PROJECT SITE 1

3.0 PRELIMINARY DATA GATHERING 1

3.1 USGS Topographic Map 2
3.2 National Wetlands Inventory Map 2
3.3 Soil Survey of Jackson County, Missouri 2

4.0 ON-SITE ROUTINE WETLAND DELINEATION 2

4.1 Plant Communities 3
4.2 Hydrology 3
4.3 Identified Stream Channels 3
4.4 Identified Potential Wetlands 4

5.0 CONCLUSIONS 5

List of Figures

Figure 1 Location Map
Figure 2 USGS Topographic Map
Figure 3 Aerial Photograph
Figure 4 National Wetlands Inventory Map
Figure 5 Soil Map
Figure 6A Identified Potential Waters of the U.S.
Figure 6B Identified Potential Waters of the U.S.

List of Appendices

Appendix A Figures
Appendix B Photographic Log
Appendix C Routine Wetland Determination Data Forms
Appendix D Resumes

1.0 INTRODUCTION

Acer Environmental, LLC has been retained by GBA and Happy Valley Properties to conduct a Clean Water Act Section 404 Preliminary Jurisdictional Wetland Delineation on an approximately 158-acre site located northeast of the View High Drive and Interstate 470 intersection in Lee's Summit, Jackson County, Missouri (**Appendix A – Figure 1**). The project is situated in the SW1/4 of Section 27 and NW1/4 of Section 34, Township 48N, Range 32W of the U.S. Geological Survey (USGS) 7.5 minute topographic quadrangle –Lee's Summit, MO (**Appendix A - Figure 2**). Land use within the project area primarily consists of open fields and wooded areas. The open field areas appear to have been used for agricultural use (grazing and hay) in the past (**Appendix – Figure 3**).

The purpose of the investigation is to provide data in support of a Clean Water Act Section 404 Preliminary Jurisdictional Wetland Delineation as required by the U.S. Army Corps of Engineers (Corps). The onsite wetland delineation was performed in accordance with the *U.S. Army Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi and Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0).

According to the on-site Preliminary Jurisdictional Wetland Delineations conducted on January 19, January 28, February 4, February 7, and April 10, 2013, seven (7) channels (approximately 4,165 total linear feet of perennial; 800 total linear feet of intermittent; and 2,087 total linear feet of ephemeral), five (5) herbaceous wetlands (approximately 19.58 acres), three (3) wooded wetlands (approximately 2.50 acres), and one (1) pond (approximately 0.44-acre) were identified within the approximately 135-acre project site. The Little Blue River flows through the southern section of the site.

This report does not constitute a jurisdictional determination of waters of the U.S. Any such determination must be made by the Corps, which is the lead agency regarding Clean Water Act Section 404 waters of the U.S. including jurisdictional wetlands.

2.0 DESCRIPTION OF PROJECT SITE

The total area of the project site is approximately 158 acres. Land use within the project area consists of open fields, residential, old pastures, and wooded areas. (**Appendix A – Figure 3**).

The project site is located in the Lee's Summit, Jackson County, Missouri. The site ranges in elevation from approximately 920 feet in the northern section to 796 feet along the Little Blue River channel in the southern section of the site.

3.0 PRELIMINARY DATA GATHERING

Prior to performing the onsite assessment, available documentation containing site condition information was reviewed. The information reviewed included the following:

3.1 USGS Topographic Maps

According to the USGS 7.5 minute topographic quadrangle Lee's Summit, MO (**Appendix A - Figure 2**), the Little Blue River, five (5) unnamed tributaries to the Little Blue River, and one (1) pond were identified within the project site.

3.2 National Wetlands Inventory Maps

According to the National Wetlands Inventory (NWI) 7.5 minute quadrangle Lee's Summit, MO (**Appendix A - Figure 4**), two (2) potential waters of the U.S. were identified within the project site and are listed below.

- Palustrine, Unconsolidated Bottom, Intermittently Exposed, Excavated (PUBGx)
- Riverine, Lower Perennial, Unconsolidated Bottom, Intermittently Exposed (RU2BG)

3.3 Soils Map 2012 Missouri Cares

The Soil Survey Map of Jackson County, MO, identified six (6) soil map units within the project site. The units are listed in the table below and shown on **Figure 5** in **Appendix A.**

Table 1. Project Site Soils per Soil Map.

Soil Unit	Soil Name and Information	Hydric/Non-Hydric
10113	Oska silty clay loam, 5-9% slopes, eroded	Non-hydric
10120	Sharpsburg silt loam, 2-5% slopes	Non-hydric
10141	Snead-Rock outcrop complex, 14-30% slopes	Non-hydric
36007	Bremer silt loam, 0-2% slopes, occasionally flooded	Bremer with Colo inclusion
36020	Kennebec silt loam, 0-2% slopes, occasionally flooded	Colo and Nodaway inclusions
99033	Uddrents-Urban land complex, 2-9% slopes	Non-hydric

4.0 ON-SITE ROUTINE WETLAND DELINEATION

The on-site wetland delineation was performed in accordance with the *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi and Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0).

The Preliminary Jurisdictional Wetland Delineation was conducted on January 19, January 28, February 4, February 7, and April 10, 2013. The wetland delineation began with an overall assessment of onsite plant communities, hydrology, and topographic features.

4.1 Plant Communities

The site was dominated by open fields and wooded areas. The open fields appear to be used for pasture and hay in the past. Dominate species within the open fields include fescue (*Festuca arundinacea*) and Reed's canary grass (*Phalaris arundinacea*). The Reed's canary grass is located in the herbaceous wetlands. The fescue in the wetland areas has developed a morphologic adaptation referred to as tufting in this document. It is tufting to adapt to the wet hydrologic conditions. Other species included in the wetlands, open fields, and wooded areas are rough-leaf dogwood (*Cornus drummondii*), eastern red cedar (*Juniperus virginiana*), eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), black willow (*Salix nigra*), oaks (*Quercus* sp.), osage orange (*Maclura pomifera*), poison ivy (*Toxicodendron radicans*), and coralberry (*Symphoricarpos orbiculatus*). Species are listed on the data sheets.

4.2 Hydrology

Based on field observations, it appears that the main sources of hydrological support for the identified wetlands is direct precipitation, sheet flow from adjacent upland areas, over flow from the Little Blue River, and ground water.

The hydrologic support for the channels appears to be direct precipitation, sheet flow from adjacent upland areas, and ground water.

4.3 Identified Stream Channels

During the field investigation, 7 (seven) channels (C1 through C7) were identified. A detailed description of each channel is provided in **Table 2** below. Locations of each identified potential waters of the U.S. are depicted in **Appendix A - Figures 6A and 6B**.

Table 2. Description of Identified Channels

Identifier Code (see **Figures 6A and 6B**)	Type of System	Average Width (Feet)	Estimated OHWM (inches)	Estimated On-site Quantity	Dominant Adjacent Vegetation
C1	Little Blue River Perennial	20 feet	30	3,982 LF	Oaks (*Quercus* sps.), silver maple (*Acer saccharinum*), Cottonwood (*Populus deltoids*), Poison Ivy (*Toxicodendron radicans*), Coralberry (*Symphoricarpos orbiculatus*), and Wildrye (*Elymus* sp.)
C2	Unnamed channel to Little Blue River ephemeral	5	6	611 LF	Oaks, Hackberry (*Celtis occidentalis*), and coralberry.
C3	Unnamed channel to Little Blue River ephemeral	4	6	891 LF	Oaks, Hackberry, Poison Ivy, and Coralberry

Identifier Code (see **Figures 6A and 6B**)	Type of System	Average Width (Feet)	Estimated OHWM (inches)	Estimated On-site Quantity	Dominant Adjacent Vegetation
C4	Not connected to another channel or wetland	2	4	364 LF	Oaks, Hackberry, Poison Ivy, and Coralberry
C5	Unnamed channel to Little Blue River ephemeral	2	6	221	Fescue, osage orange, and oaks
C6	Unnamed channel to Little Blue River intermittent	5	12	800	Oaks, Hackberry, Poison Ivy, and Coralberry
C7	Unnamed channel to Little Blue River perennial	15	30	183	Oaks (*Quercus* sps.), silver maple (*Acer saccharinum*), Cottonwood (*Populus deltoids*), Poison Ivy (*Toxicodendron radicans*), Coralberry (*Symphoricarpos orbiculatus*), and Wildrye (*Elymus* sp.)

OHWM – Ordinary High Water Mark

LF – Linear Feet

4.4 Identified Potential Wetlands

During the field investigation, eight (8) herbaceous/wooded wetlands were identified on-site. The wetlands include open field and wooded areas. A pond is located in the northeastern section of the site. Wetlands are not adjacent to the pond. The wetlands and pond are located in the natural floodplain of the Little Blue River.

A large 21.60-acre wetland system (herbaceous and wooded) is in an open field. The wetland is primarily herbaceous with a small section of trees and is low quality. The herbaceous section is dominated by Reed's canary grass and fescue. The fescue has developed a morphological adaptation referred to in this document as tufting. The adaptation is due to the wet conditions at the site. Past land use appears to be agricultural (pasture and hay) as observed in the Natural Resource Conservation Service aerial photographs (1979 and 1981). According to the 1993 aerial photograph the wetland site is no longer beginning used for an agricultural purposes. The remaining wetlands are also considered low quality.

A detailed description of the identified wetlands is provided in **Table 3** below and on the data sheets in Appendix C. Location of the identified potential waters of the U.S. is depicted in **Appendix A - Figures 6A and 6B**.

Table 3. Description of Potential Wetlands and Pond

Potential Wetland/ Pond	Type of System	Estimated On-site Quantity	Dominant Vegetation
Wetland 1	herbaceous - not connected to tributary	0.04-acre	Cattail (Typha sp.)
Wetland 2	herbaceous - not connected to tributary	0.10-acre	Cattail and fescue (tufting)
Wetland 3	herbaceous - not connected to tributary	0.04-acre	Black willow (*Salix nigra)* – no herbaceous veg., willows along edges
Wetland 4	herbaceous - not connected to tributary	0.04-acre	Cattail and smartweed (*Persicaria pensylvanica*)
Wetland 5	herbaceous - not connected to tributary	19.36 acres	Reed's canary grass *(Phalaris arundinacea)* and fescue (tufting)
Wetland 6	wooded - not connected to tributary	0.04-acre	No vegetation – distinct topographic changes trees at top of slope
Wetland 7	wooded - not connected to tributary	0.22-acre	Black willow and fescue (tufting)
Wetland 8	wooded - not connected to tributary	2.24 acres	Black willow, cottonwood (*Populus deltoides*), and fescue (tufting)
Pond	open water	0.41-acre	----

Representative photographs of the on-site Preliminary Jurisdictional Wetland Delineation are provided in **Appendix B**. Routine Wetland Determination Data Forms completed during the wetland delineation are provided in **Appendix C**.

5.0 CONCLUSIONS

According to the on-site Preliminary Jurisdictional Wetland Delineations conducted on January 19, January 28, February 4, February 7, and April 10, 2013, seven (7) channels (approximately 4,165 total linear feet of perennial; 800 total linear feet of intermittent; and 2,087 total linear feet of ephemeral), five (5) herbaceous wetlands (approximately 19.58 acres), three (3) wooded wetlands (approximately 2.50 acres) , and one (1) pond (approximately 0.44-acre) were identified within the approximately 158-acre project site. The Little Blue River flows through the southern section of the site.

The identified wetlands and pond are located within the natural floodplain of the Little Blue River. The intermittent channel (C6); perennial channel (C7); and three (3) of the ephemeral

channels are connected to the Little Blue River. The fourth ephemeral channel (C4) is ended by disturbance, fill, and topography and not connected to a channel or wetland.

This report does not constitute a jurisdictional determination of waters of the U.S. Any such determination must be made by the Corps, which is the lead agency regarding Clean Water Act Section 404 waters of the U.S. including jurisdictional wetlands.

APPENDIX A

Figures

LEGEND

Project Area

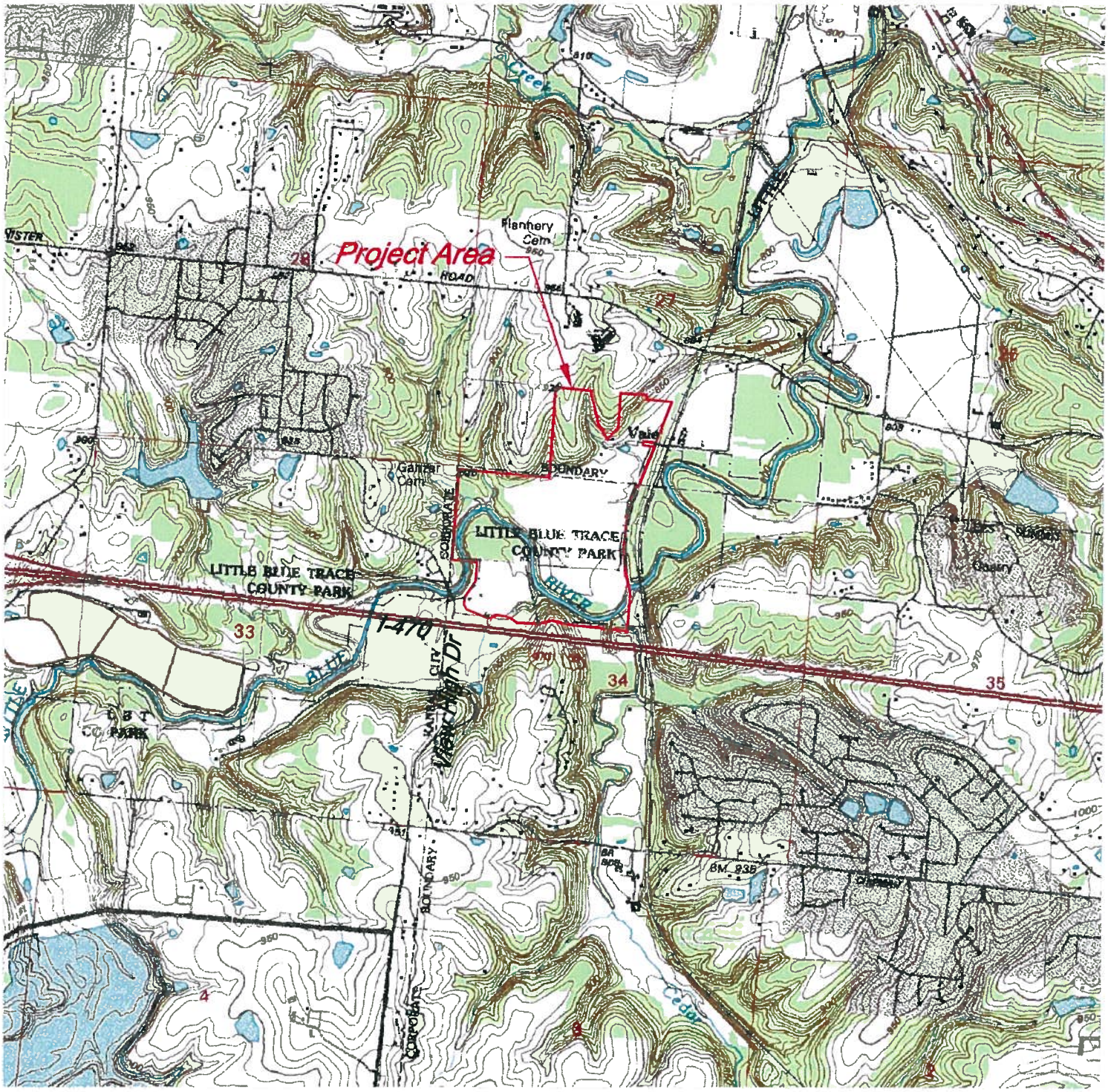
1"=2000'

Source: 2013 Google Maps – www.google.com/maps

Project Location: NW¼ of Section 34 and SW ¼ of Section 27, Township 48N, Range 32W

GBA architects engineers

PROJECT NUMBER	LOCATION MAP	FIGURE
12720.00	View High Project View High Drive and Interstate 470 Kansas City/Lee's Summit, Jackson Co., MO.	1
DATE 4-12-2013		



Source: USGS 7.5 Minute Quadrangle – Lee's Summit, MO 1990

Project Location: NW¼ of Section 34 and SW ¼ of Section 27, Township 48N, Range 32W

LEGEND

Project Area

1"=2000'

GBA architects engineers

PROJECT NUMBER	TOPOGRAPHIC MAP	FIGURE
12720.00	View High Project View High Drive and Interstate 470 Kansas City/Lee's Summit, Jackson Co., MO.	2
DATE 4-12-2013		

LEGEND

Project Area

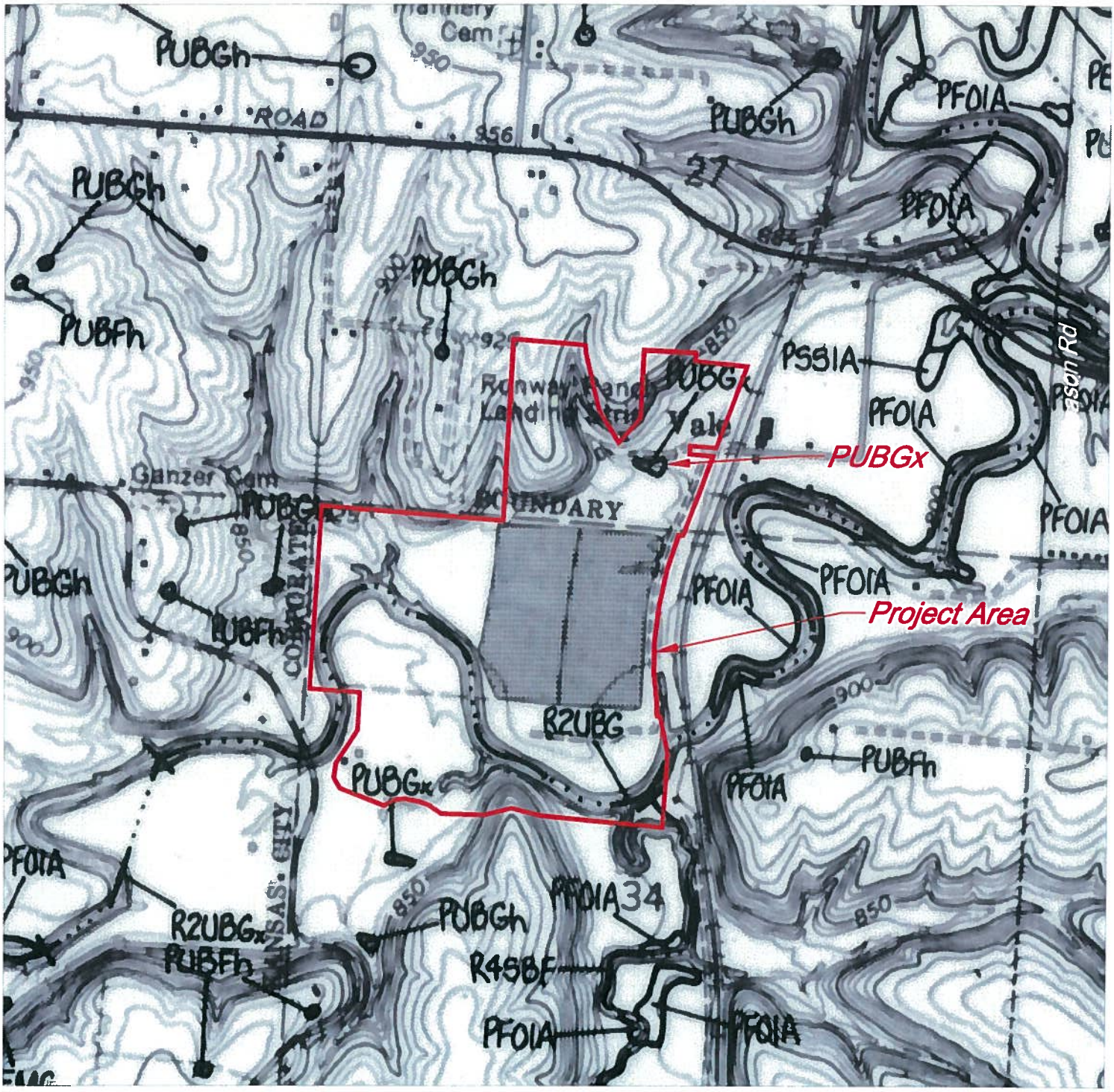
Source: 2012 Missouri CARES – cares.missouri.edu
2010 National Agriculturol Imagery Program

Project Location: NW¼ of Section 34 and SW ¼ of Section 27, Township 48N, Ronge 32W

1"=500'

GBA architects engineers

PROJECT NUMBER	AERIAL PHOTOGRAPH	FIGURE
12720.00	View High Project View High Drive and Interstate 470 Kansas City/Lee's Summit, Jackson Co., MO.	3
DATE 4-12-2013		



LEGEND

Project Area

PUBGx – Palustrine, Unconsolidoted Bottom, Intermittently Exposed, Excavated

R2UBG – Riverine, Lower Perennial, Unconsolidated Bottom, Intermittently Exposed

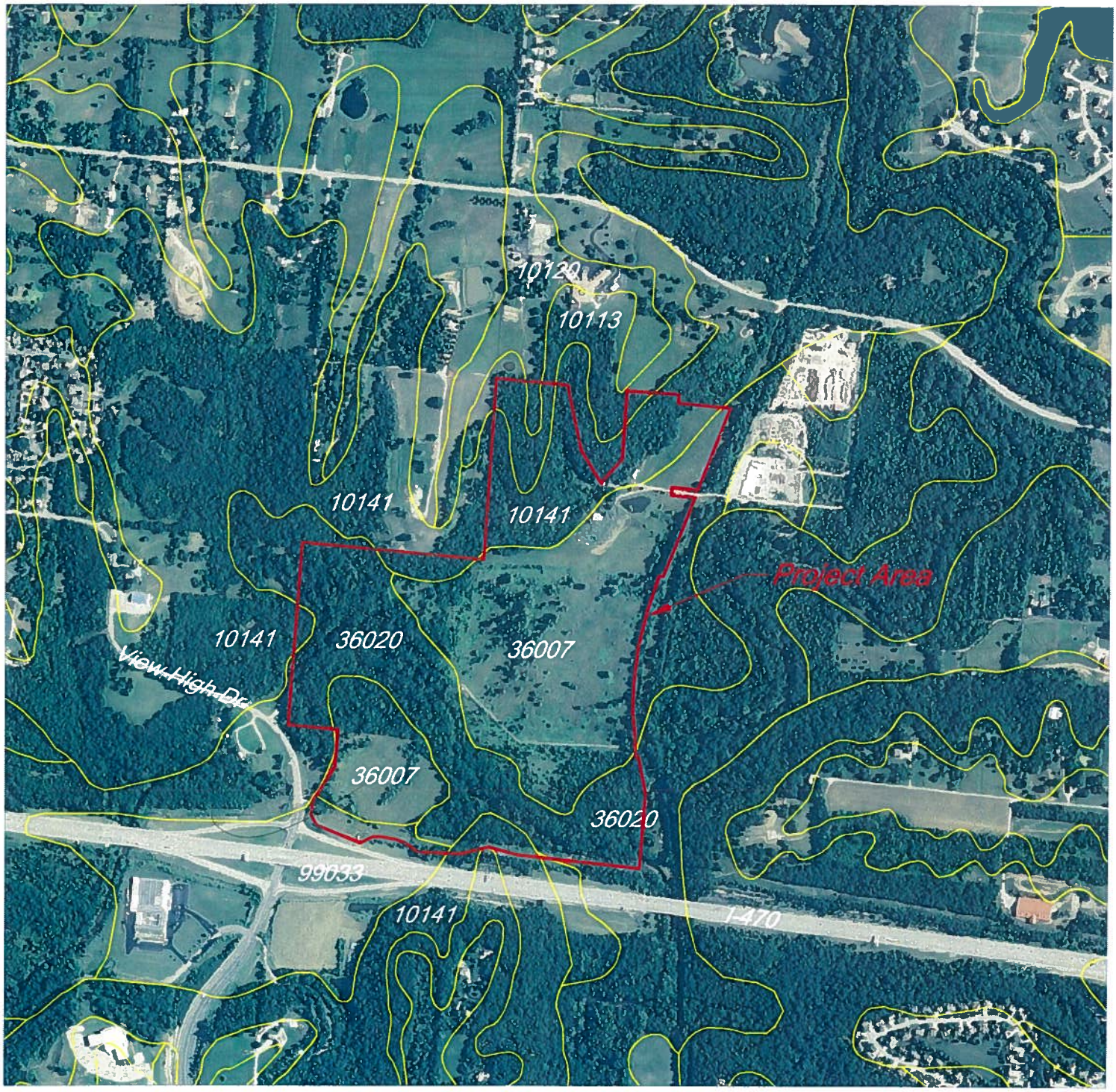
1"=1000'

Source: U.S. Fish and Wildlife National Wetland Inventory, Lee's Summit, MO. 1994

Project Location: NW¼ of Section 34 and SW ¼ of Section 27, Township 48N, Range 32W

GBA architects engineers

PROJECT NUMBER	NWI MAP	FIGURE
12720.00	View High Project View High Drive and Interstate 470 Kansas City/Lee's Summit, Jackson Co., MO.	4
DATE 4-12-2013		



LEGEND

Project Areo
Soil Boundories

Source: 2012 Missouri CARES - cores.missouri.edu 2008 SSURGO Soil Outlines

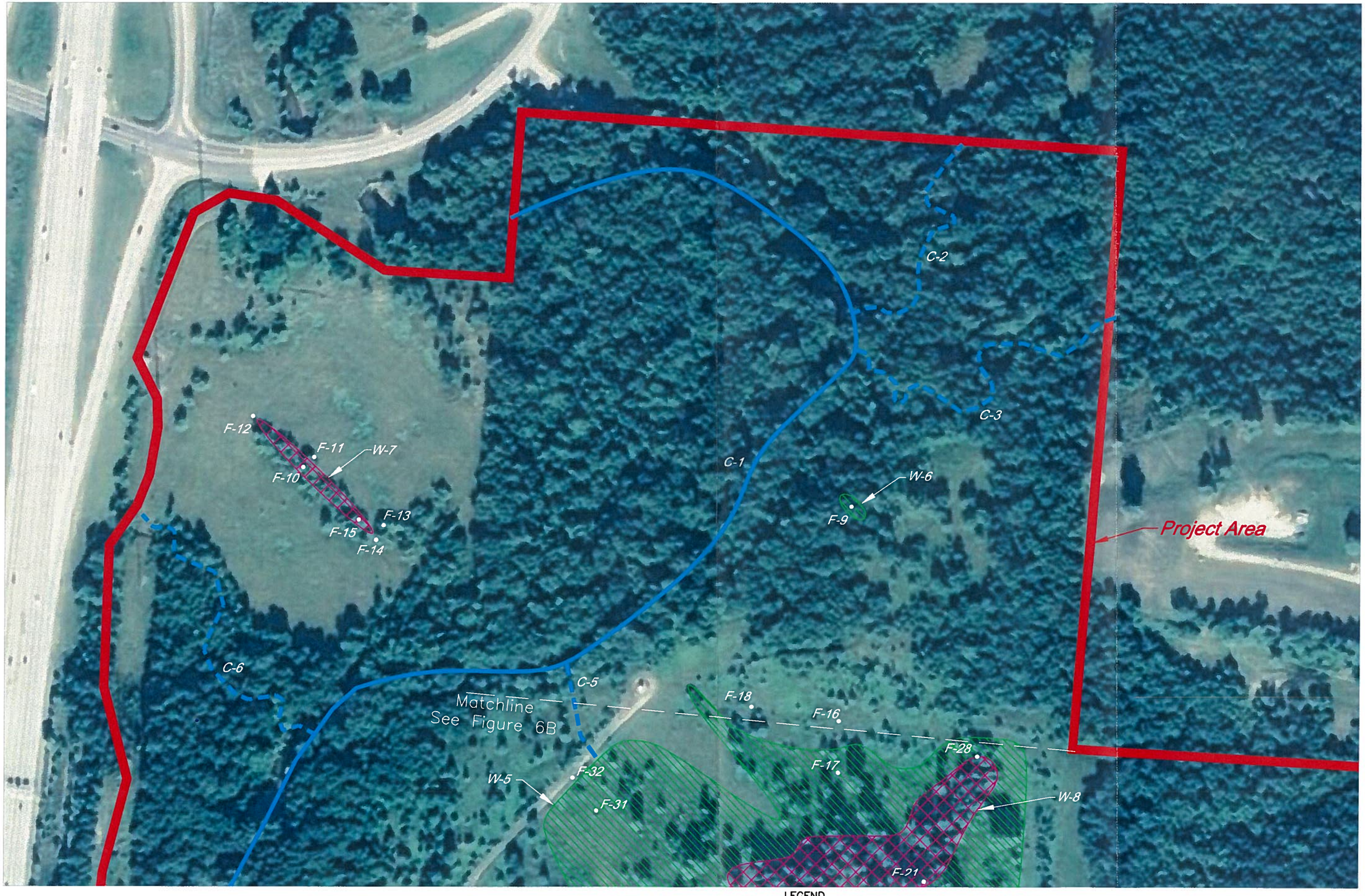
Project Locotion: NW¼ of Section 34 ond SW ¼ of Section 27, Township 48N, Ronge 32W

1"=1000'

10113 - Osko silty cloy loom, 5-9% Slopes, Eroded
10120 - Shorpsburg silt loom, 2-5% Slopes
10141 - Sneod-Rock outcrop complex, 14-30% Slopes
36007 - Bremer silt loom, 0-2% Slopes, Occosionolly Flooded
36020 - Kennebec silt loom, 0-2% Slopes, Occosionolly Flooded
99033 - Udarents-Urbon lond complex, 2-9% Slopes

GBA architects engineers

PROJECT NUMBER	SOILS MAP	FIGURE
12720.00	View High Project View High Drive ond Interstate 470 Kansos City/Lee's Summit, Jackson Co., MO.	5
DATE 4-12-2013		



Source: 2012 Missouri CARES – cares.missouri.edu
2010 National Agricultural Imagery Program

Project Location: NW¼ of Section 34 and SW ¼ of Section 27, Township 48N, Range 32W

LEGEND

- Project Area
- Emergent Wetland
- Wooded Wetland
- Pond Open Water
- F# • Sampling Point
- Perennial Channel
- Ephemeral Channel

1"=200'

GBA
architects
engineers
9801 Renner Boulevard
Lenexa, Kansas 66219
913.492.0400
www.gbateam.com

IDENTIFIED FEATURES MAP

View High Green
View High Drive and Interstate 470
Kansas City/Lee's Summit, Jackson Co., MO.

PROJECT NUMBER
12720.00

DATE
4/12/13

FIGURE
6A

F-18
F-16
C-5
F-17
F-32
F-31
F-21
W-8
Matchline
See Figure 6A
W-5
C-4
F-26
F-30
F-29
See Extra
Window for
Southeast
Corner of
Property
F-24
F-25
F-22
F-20
F-23
F-27
F-19
Project Area
Pond
F-7
F-5
F-4
F-6
F-1
W-2
W-1
F-8
F-2
W-3
W-4
F-3
C-6
C-7

Source: 2012 Missouri CARES – cares.missouri.edu
2010 National Agricultural Imagery Program

Project Location: NW¼ of Section 34 and SW ¼ of Section 27, Township 48N, Range 32W

LEGEND

- Project Area
- Emergent Wetland
- Wooded Wetland
- Pond Open Water
- F# • Sampling Point
- Perennial Channel
- Ephemeral Channel

1"=200'

GBA
architects
engineers
9801 Renner Boulevard
Lenexa, Kansas 66219
913 492 0400
www.gbateam.com

IDENTIFIED FEATURES MAP

View High Green
View High Drive and Interstate 470
Kansas City/Lee's Summit, Jackson Co., MO.

PROJECT NUMBER
12720.00

DATE
4/12/13

FIGURE
6B

APPENDIX B

Photographic Log

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 01

Direction: Southwest

Comments:
View of Wetland W-1 and Plot F-1. Note distinct topographic change at edges.

Frame No.: 02

Direction: East

Comments:
View of Wetland W-2 and Plots F-4, F-5, and F-7. Note fescue morphological adaptation – "tufting".

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 03

Direction: West

Comments:
View of Wetland W-2 and Plot F-8.

Frame No.: 04

Direction: East

Comments:
View of Wetland W-3 and Plot F-2. Wetland spillway of pond.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 05

Direction: East

Comments:
View of Wetland W-4 and Plot F-3. Wetland part of pond spillway.

Frame No.: 06

Direction: West

Comments:
View of Wetland W-5 and Plot F-16.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 07

Direction: Northwest

Comments:
View of Wetland W-5 and
Plot F-17.

Frame No.: 08

Direction: Southeast

Comments:
View of Wetland W-5 and
Plot F-18.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 09

Direction: Southeast

Comments:
View of Wetland W-5 and
Plot F-19.

Frame No.: 10

Direction: Southeast

Comments:
View of Wetland W-5 and
Plot F-20.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 11

Direction: Southeast

Comments:
View of wooded Wetland W-8 and Plot F-21.

Frame No.: 12

Direction: Southeast

Comments:
View of Wetland W-5 and Plot F-22.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 13

Direction: ----

Comments:
View of Wetland W-5 and
Plot F-23.

Frame No.: 14

Direction: North

Comments:
View of Wetland W-5 and
Plot F-24.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 15

Direction: Northeast

Comments:
View of Wetland W-5 and
Plot F-25.

Frame No.: 16

Direction: ----

Comments:
View of Wetland W-5 and
Plot F-26.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 17

Direction: Southwest

Comments:
View of Wetland W-5 and
Plot F-27.

Frame No.: 18

Direction: South

Comments:
View of Wetland W-5 and
Plot F-28.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 19

Direction: East

Comments:
View of Wetland W-5 and
Plot F-29.

Frame No.: 20

Direction: South

Comments:
View of Wetland W-5 and
Plot F-30.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 21

Direction: North

Comments:
View of Wetland W-6 and Plot F-9.

Frame No.: 22

Direction: ----

Comments:
View of wooded Wetland W-7 and Plot F-10.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 23

Direction: Southeast

Comments:
View of wooded Wetland W-7 and Plot F-11.

Frame No.: 24

Direction: Northeast

Comments:
View of wooded Wetland W-7 and Plot F-12.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 25

Direction: North

Comments:
View of wooded Wetland W-7 and Plot F-13.

Frame No.: 26

Direction: North

Comments:
View of wooded Wetland W-7 and Plots F-14 and F-15. Note tufting fescue (F-15) and color change to brome and fescue mix (F-14).

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 27

Direction: Northwest

Comments:
View of Little Blue River (C-1).

Frame No.: 28

Direction: Northeast

Comments:
View of Little Blue River (C-1).

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 29

Direction: West

Comments:
View of C-2 (ephemeral channel).

Frame No.: 30

Direction: West

Comments:
View of Little Blue River and C-2 entering river.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 31

Direction: South

Comments:
View of C-3 (ephemeral channel).

Frame No.: 32

Direction: East

Comments:
View of C-3.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 33

Direction: North

Comments:
View of C-4 (ephemeral channel).

Frame No.: 34

Direction: ----

Comments:
View of end of C-4, south of photo 33.

PHOTOGRAPHIC LOG

B. Burton

Preliminary Jurisdictional Wetland Delineation
View High Development
Lee's Summit, Jackson County, Missouri

January and February 2013

Happy Valley Properties

Frame No.: 35

Direction: Southeast

Comments:
View of pond in northern section of site.

Frame No.: 36

Direction: ----

Comments:
Typical view of fescue with morphological adaptation – "tufting".

APPENDIX C

Routine Wetland Determination Data Forms

Provided Upon Request

APPENDIX E – FLOOD STUDY EXHIBITS

Project Area

Little Blue River
Below Longview Dam
7.5 Square Miles

I-470

VIEW
HIGH
DRIVE

Cedar Creek
9.6 Square Miles

Little Blue River
Above Longview Dam
49.3 Square Miles

Exhibit A: Flood Study Drainage Area Map

Legend

Contributing Drainage Areas

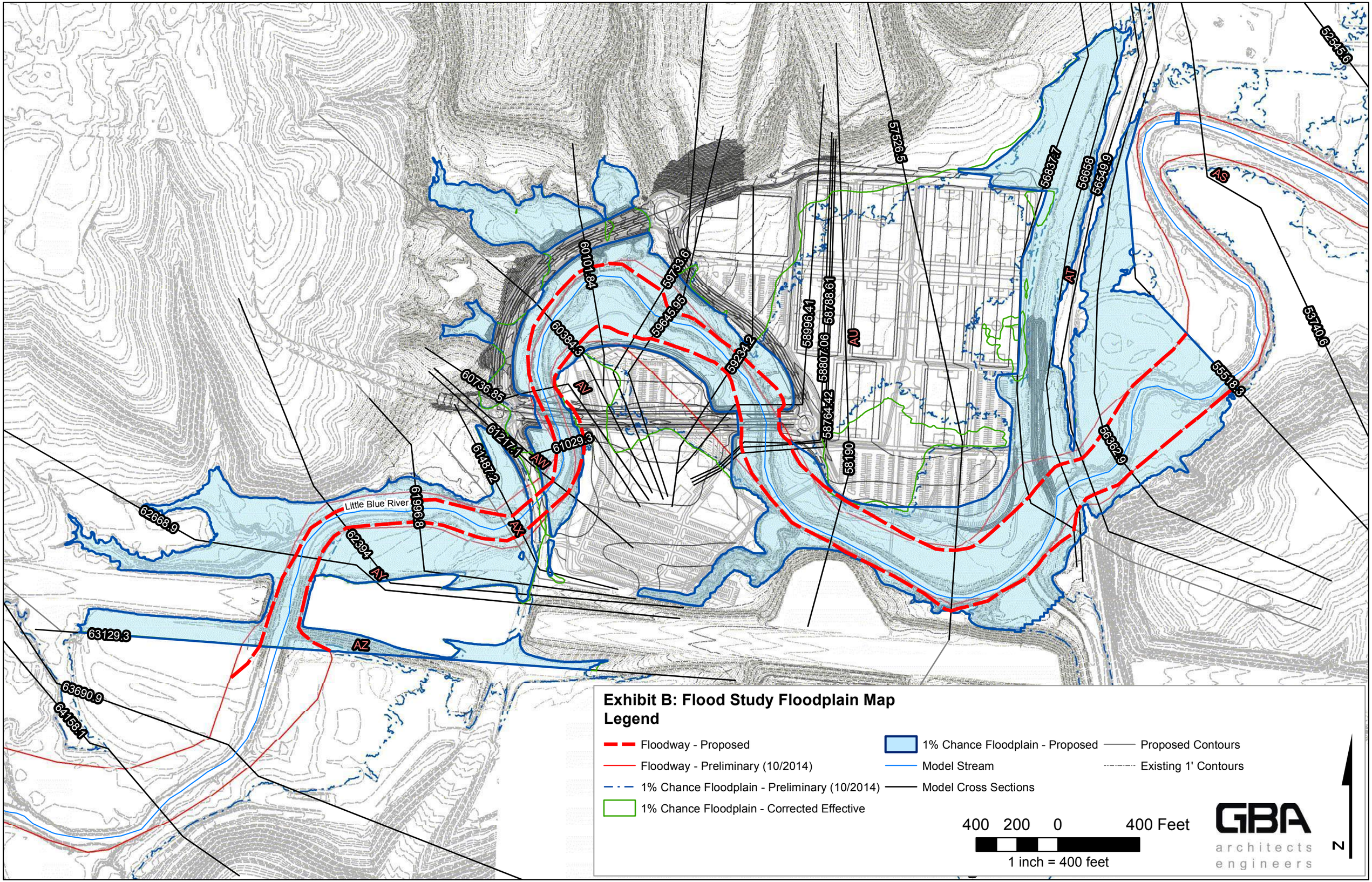
Little Blue River

6,000 3,000 0 6,000 Feet

1 inch = 6,000 feet

GBA
architects
engineers

N


Little Blue River
AS
AT
AU
AV
AW
AX
AY
AZ
52345.6
57526.5
56837.7
56658
56549.9
60101.84
59733.6
59645.95
60384.3
59234.2
58996.41
58788.61
58807.06
58764.42
58190
55518.3
56362.9
53740.6
60736.85
61217.1
61029.3
61487.2
61996.8
62668.9
62394
63129.3
63690.9
64158.1
Exhibit B: Flood Study Floodplain Map
Legend
Floodway - Proposed
Floodway - Preliminary (10/2014)
1% Chance Floodplain - Preliminary (10/2014)
1% Chance Floodplain - Corrected Effective
1% Chance Floodplain - Proposed
Model Stream
Model Cross Sections
Proposed Contours
Existing 1' Contours
400 200 0 400 Feet
1 inch = 400 feet
GBA
architects
engineers
N

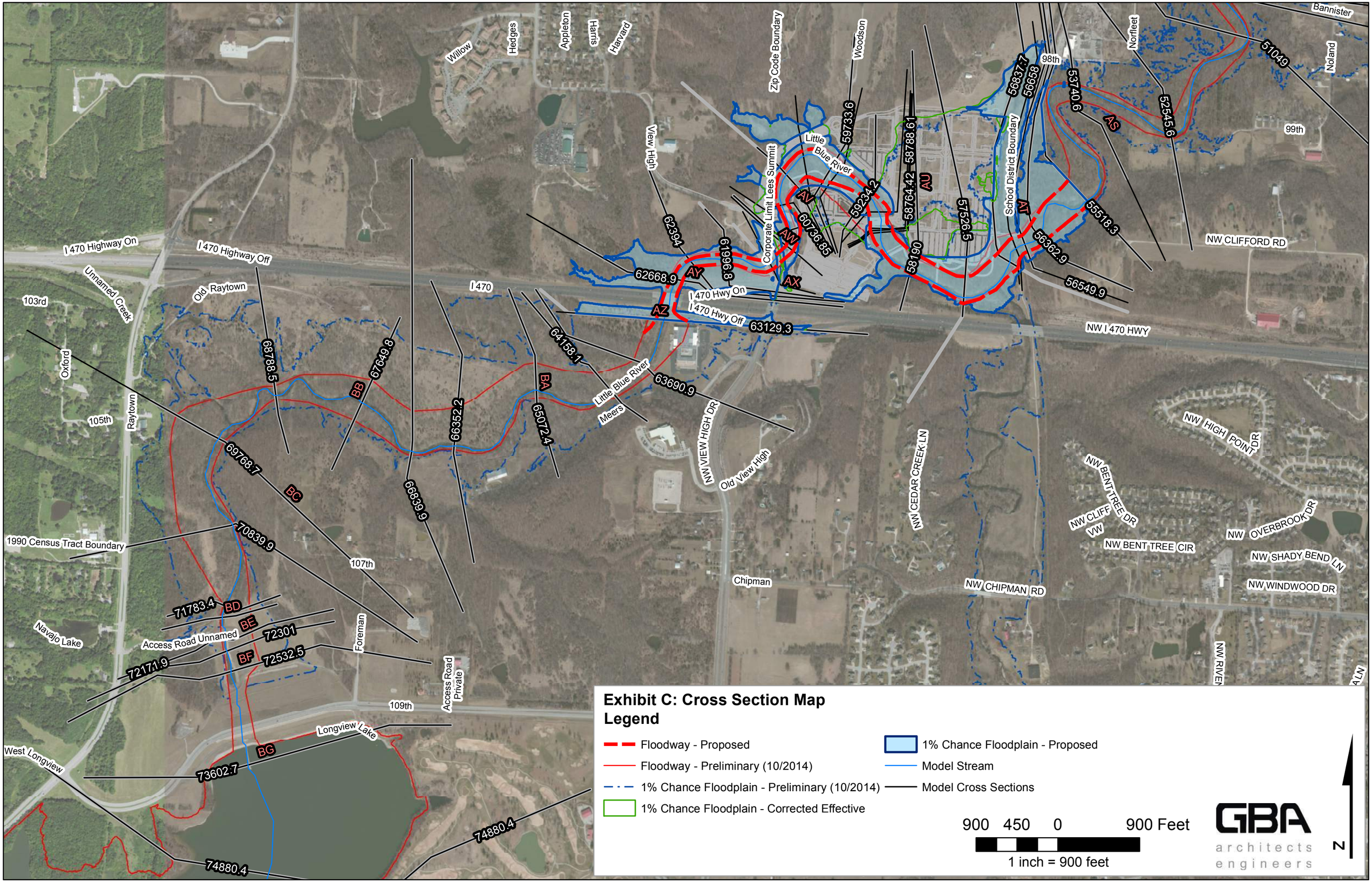


Exhibit C: Cross Section Map Legend

- Floodway - Proposed
- Floodway - Preliminary (10/2014)
- 1% Chance Floodplain - Preliminary (10/2014)
- 1% Chance Floodplain - Corrected Effective
- 1% Chance Floodplain - Proposed
- Model Stream
- Model Cross Sections

900 450 0 900 Feet

1 inch = 900 feet

GBA architects engineers

N

Table 2: Water surface elevation results for the Duplicate Effective, Corrected Effective and Proposed Conditions models (Little Blue River)

Cross Section			Duplicate Effective Model Water Surface Elevation	Corrected Effective Model Water Surface Elevation	Proposed Conditions Water Surface Elevation	Difference (Proposed - Duplicate Effective) Water Surface Elevation	Difference (Proposed - Corrected Effective) Water Surface Elevation
	Station	Flow Profile	FT	FT	FT	FT	FT
	55518.3	100YR	809.4	809.4	809.4	0.0	0.0
	56362.9	100YR	809.7	809.6	809.6	-0.1	0.0
AT	56549.9	100YR	809.7	809.7	809.7	0.0	0.0
	56658	100YR	*	810.2	810.2	*	0.0
	56837.7	100YR	810.0	810.4	810.4	0.4	0.0
	57526.5	100YR	810.2	810.7	810.7	0.5	0.0
AU	58190	100YR	810.2	810.7	810.7	0.5	0.0
	58764.42	100YR	*	810.8	810.8	*	0.0
	58788.61	100YR	*	810.8	810.8	*	0.0
	58807.06	100YR	*	810.8	810.8	*	0.0
	58996.41	100YR	*	810.9	810.8	*	-0.1
	59234.2	100YR	810.4	810.9	810.9	0.5	0.0
	59645.95	100YR	*	811.0	811.0	*	0.0
	59733.6	100YR	810.5	811.0	811.1	0.6	0.1
	60101.84	100YR	*	811.0	811.1	*	0.1
	60384.3	100YR	810.5	811.0	811.1	0.6	0.1
AV	60736.85	100YR	*	811.1	811.1	*	0.1
	61029.3	100YR	810.6	811.1	811.2	0.6	0.2
AW	61217.1	100YR	810.9	811.2	811.3	0.5	0.2
AX	61487.2	100YR	*	811.8	811.9	*	0.2
	61996.8	100YR	811.7	811.9	812.1	0.4	0.1
	62394	100YR	811.8	812.0	812.2	0.3	0.1
AY	62668.9	100YR	812.1	812.3	812.4	0.3	0.1
AZ	63129.3	100YR	815.0	815.2	815.3	0.3	0.1
	63690.9	100YR	815.2	815.4	815.5	0.3	0.1
	64158.1	100YR	815.3	815.5	815.6	0.3	0.1
BA	65072.4	100YR	815.5	815.7	815.8	0.3	0.1
	66352.2	100YR	815.7	815.9	816.0	0.3	0.1
	66839.9	100YR	815.8	815.9	816.0	0.2	0.1
BB	67649.8	100YR	815.9	816.0	816.1	0.2	0.1
	68788.5	100YR	816.0	816.1	816.2	0.2	0.1
BC	69768.7	100YR	816.3	816.4	816.5	0.2	0.1
	70839.9	100YR	816.3	816.5	816.6	0.2	0.1
BD	71783.4	100YR	816.4	816.5	816.6	0.2	0.1
	71913.7	100YR	816.4	816.5	816.6	0.2	0.1
BE	72171.9	100YR	816.4	816.5	816.6	0.2	0.1
	72301	100YR	816.4	816.5	816.6	0.2	0.1
BF	72532.5	100YR	816.5	816.6	816.7	0.2	0.1
BG	73602.7	100YR	904.2	904.2	904.2	0.0	0.0

* Cross section was added to Proposed Conditions model to account for proposed structure and is not part of the Duplicate Effective model

APPENDIX F – MASS GRADING CULVERT ANALYSIS & STREAM ASSESSMENT

9801 Renner Boulevard
Lenexa, KS 66219

MEMORANDUM

To: Sue Pyles, P.E. – City of Lee's Summit
From: Beth Fry, P.E., CFM - GBA
Date: July 10, 2018
Subject: Paragon Star – Culvert Analysis, Stream Assessment

Culvert Analysis

A culvert analysis for storm sewer Lines 100, 300, 500, 700, and 1200 were completed using the Federal Highway Administration's HY-8 modeling program. The model inputs and results are provided at Table 1.

The procedures outlined in HEC 14 – Hydraulic Design of Energy Dissipators for Culverts and Channels were used to determine the D50 of the rock lining for all energy dissipators. For the partially lined scour holes at the outlets of Lines 300 and 500, a composite riprap material was specified so the lining would be well graded and contain large boulders that can withstand the high outlet velocities.

Stream Assessment

An unnamed tributary of Little Blue River will be realigned upstream of and through the proposed Line 300 culvert. Approximately 550-feet of stream channel will be impacted by the proposed project. The following stream assessment was completed based on the guidelines provided in APWA 5600 Section 5605.5.

GBA conducted a visual survey of the stream reach to identify bankfull characteristics and a reference cross section for the realignment. A photo log has been included. The entire reached displayed on Exhibit 1 was assessed, and the reference reach was identified between stations 496.8 and 651.8. Downstream of 496.8, the characteristics of the stream changed, becoming steeper and more entrenched (bankfull elevation is lower than the top of the channel bank). Therefore, the channel characteristics between stations 496.8 and 651.8 were used as the reference reach for the channel realignment.

A cross section was surveyed at a riffle, at station 582.9, and was selected because it was representative of the stream channel. The bankfull depth was identified in the field and a pebble count was conducted to determine the median particle size, or D50. Measured pool depths within this reference reach were 1-foot. The bankfull dimensions, flow, results of the materials analysis, and shear stress analysis are all provided on Exhibit 2.

The bankfull characteristics of this section were used as the basis for design of the realigned channel reach. The proposed channel was designed to carry the calculated bankfull flow, maintain a similar threshold grain size, entrenchment ratio, and mean depth of flow. The design cross section and its bankfull characteristics has been provided with Exhibit 3 and is also shown on Sheet 8 of the mass grading plans (attached).

Table 1. Culvert Analysis for Paragon Star Development

		Model Inputs										Model Results		
Culvert	Segment	Design Event	Discharge, cfs	Tailwater Method	Tailwater Depth, ft	Culvert Material	Diameter, in	FL, in	FL, out	Length, ft	Inlet Control Depth, ft	Outlet Control Depth, ft	Headwater Elevation	Outlet velocity, fps
	103-102	100-year	106	Manning's Equation	5.5	RCP	42	798.5	797.2	128.77	7.12	7.94	806.47	11.02
100	102-101	100-year	106	DS Headwater	N/A*	RCP	48	796.9	796.4	58.42	5.49	4.9	802.42	11.65
	101-100	100-year	106	Manning's Equation	4.25	RCP	48	789.2	788.6	58.69	5.49	5.49	794.7	8.44
300	302-300	100-year	991	Manning's Equation	N/A*	RCB	8x8	795.9	795.1	157.45	14.49	13.43	810.43	15.87
500	501-500	100-year	308	Manning's Equation	5.9	RCP	72	797.8	794.7	204	6.07	11.67	810.45	12.29
	703-702	100-year	265	Manning's Equation	3.78	RCP	60	797.1	796.9	34	10.53	9.2	807.66	14.21
700	702-701	100-year	265	DS Headwater	N/A*	RCP	60	796	796.6	69.47	8.57	3.22	805.13	13.74
	701-700	100-year	265	Manning's Equation	3.78	RCP	60	787.4	786.8	56.7	10.52	8.93	797.9	14.88
	1203-1202	100-year	23	DS Headwater	N/A*	RCP	30	807.5	806.9	20.19	2.52	1.58	810.02	9.74
1200	1202-1201	100-year	23	Manning's Equation	2.52	RCP	30	801.3	800.8	43.11	2.55	3.49	804.75	4.69
	1201-1200	100-year	23	Manning's Equation	1.22	RCP	30	800.5	800	53.25	2.55	1.75	803.08	8.31

*Headwater at downstream structure is lower than flowline of structure being analyzed.

PHOTOGRAPHIC RECORD

GBA Job No.: 12720.05

Photographer: BEF

Project: Paragon Star Development Mass Grading Channel (Line 300) Realignment

Date: 2/9/2017

Frame No.: 1

Direction: Southeast

Comments:
Surveyed cross section (582.9) looking downstream.

Frame No.: 2

Direction: Northwest

Comments:
Surveyed cross section (582.9) looking upstream.

Proposed Thalweg

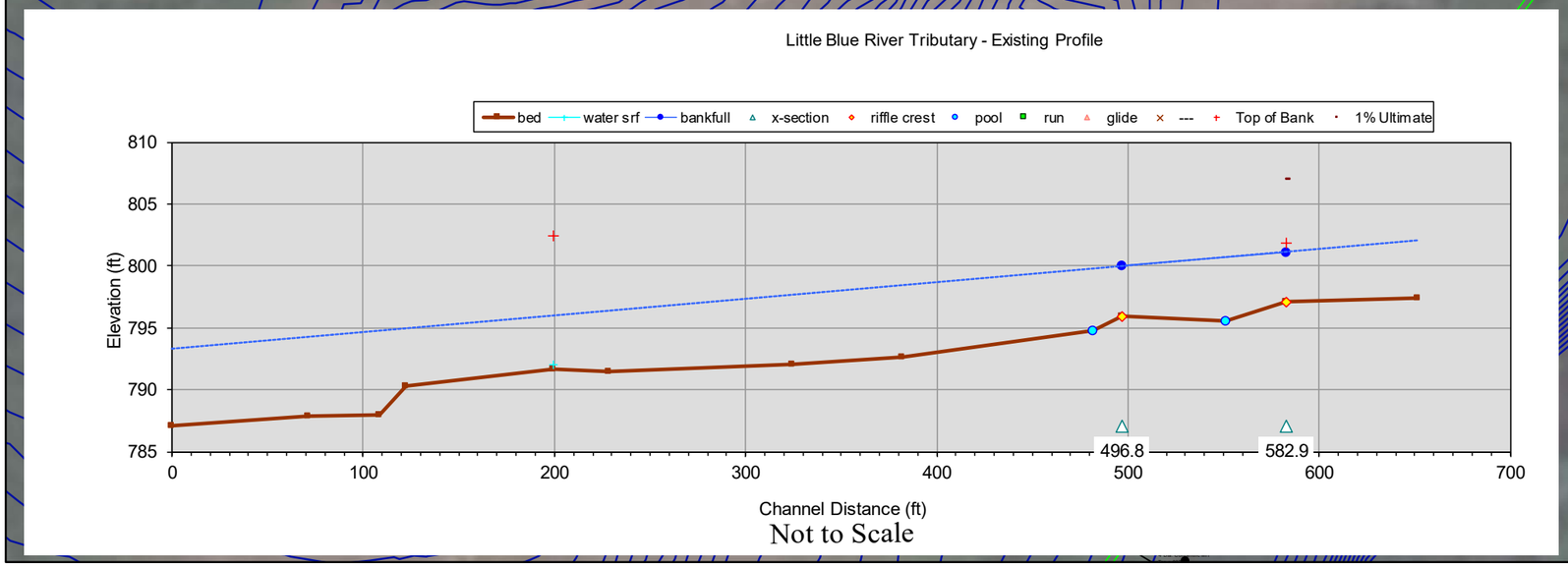
Existing Thalweg

Station 651.8

Station 582.9
Reference XS (Exhibit 2)

Station 496.8

Station 0



Not to Scale

Exhibit 1: Line 300/Little Blue River Tributary Existing Plan and Profile

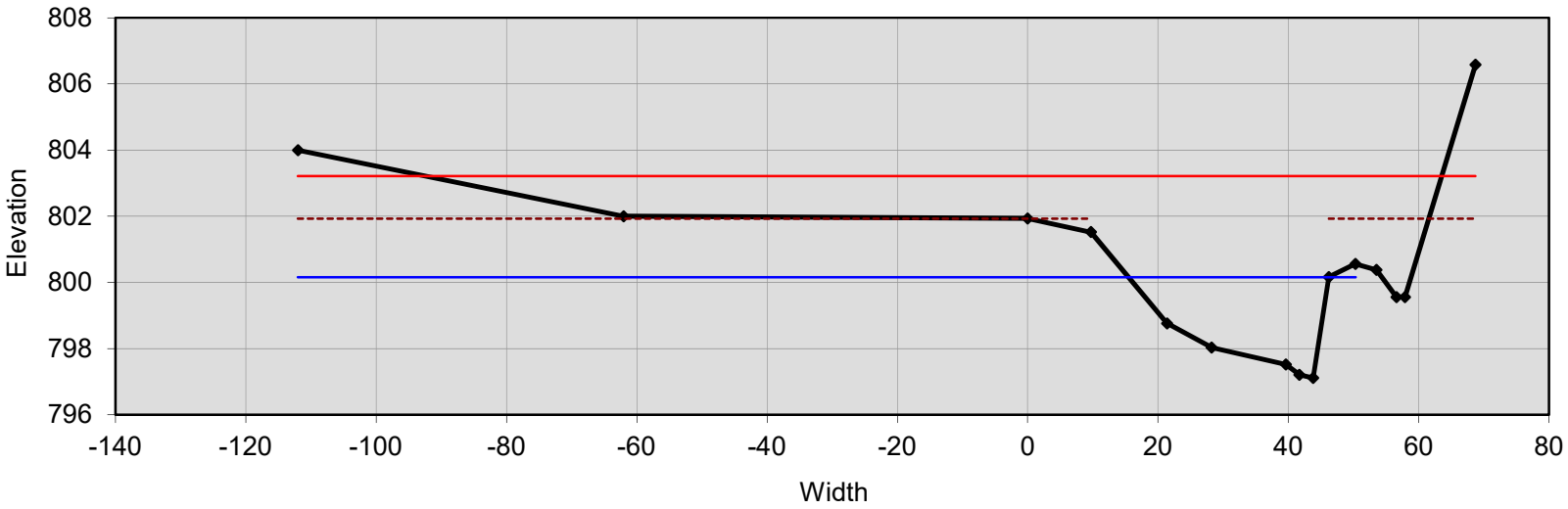
N

0 25 50 100 150 200 Feet

1 inch = 40 feet

Cross Section 1

5 + 82.9 Little Blue River Tributary - Reference Section, Riffle

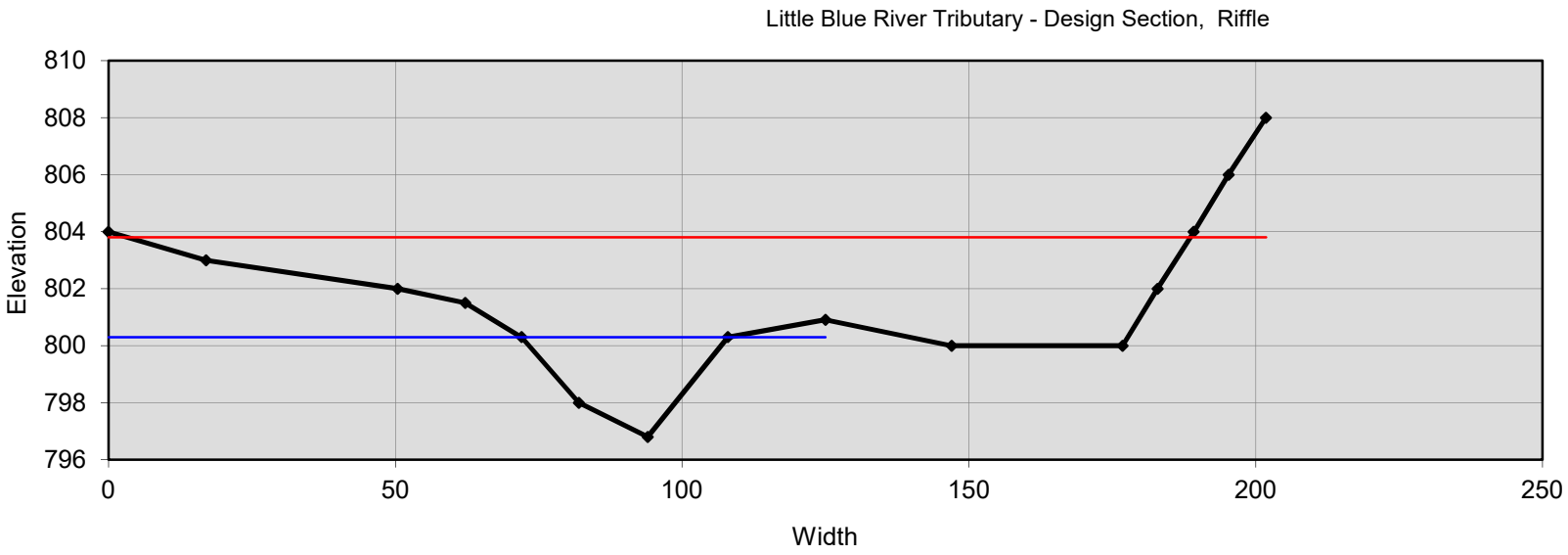


Bankfull Dimensions		Flood Dimensions		Materials	
59.2	x-section area (ft.sq.)	155.8	W flood prone area (ft)	38	D50 Riffle (mm)
30.7	width (ft)	5.1	entrenchment ratio	90	D84 Riffle (mm)
1.9	mean depth (ft)	4.8	low bank height (ft)	48	threshold grain size (mm):
3.0	max depth (ft)	1.6	low bank height ratio		
32.5	wetted parimeter (ft)				
1.8	hyd radi (ft)				
16.0	width-depth ratio				

Bankfull Flow		Flow Resistance		Forces & Power	
5.5	velocity (ft/s)	0.037	Manning's roughness	0.85	channel slope (%)
327.3	discharge rate (cfs)	0.13	D'Arcy-Weisbach fric.	0.97	shear stress (lb/sq.ft.)
0.72	Froude number	7.8	resistance factor u/u*	0.71	shear velocity (ft/s)
		6.5	relative roughness	5.6	unit strm power (lb/ft/s)

Exhibit 2: Bankfull Characteristics of Reference Cross Section (582.9)

Cross Section 4



Bankfull Dimensions	
70.8	x-section area (ft.sq.)
36.0	width (ft)
2.0	mean depth (ft)
3.5	max depth (ft)
36.8	wetted parimeter (ft)
1.9	hyd radi (ft)
18.3	width-depth ratio

Flood Dimensions	
185.2	W flood prone area (ft)
5.1	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

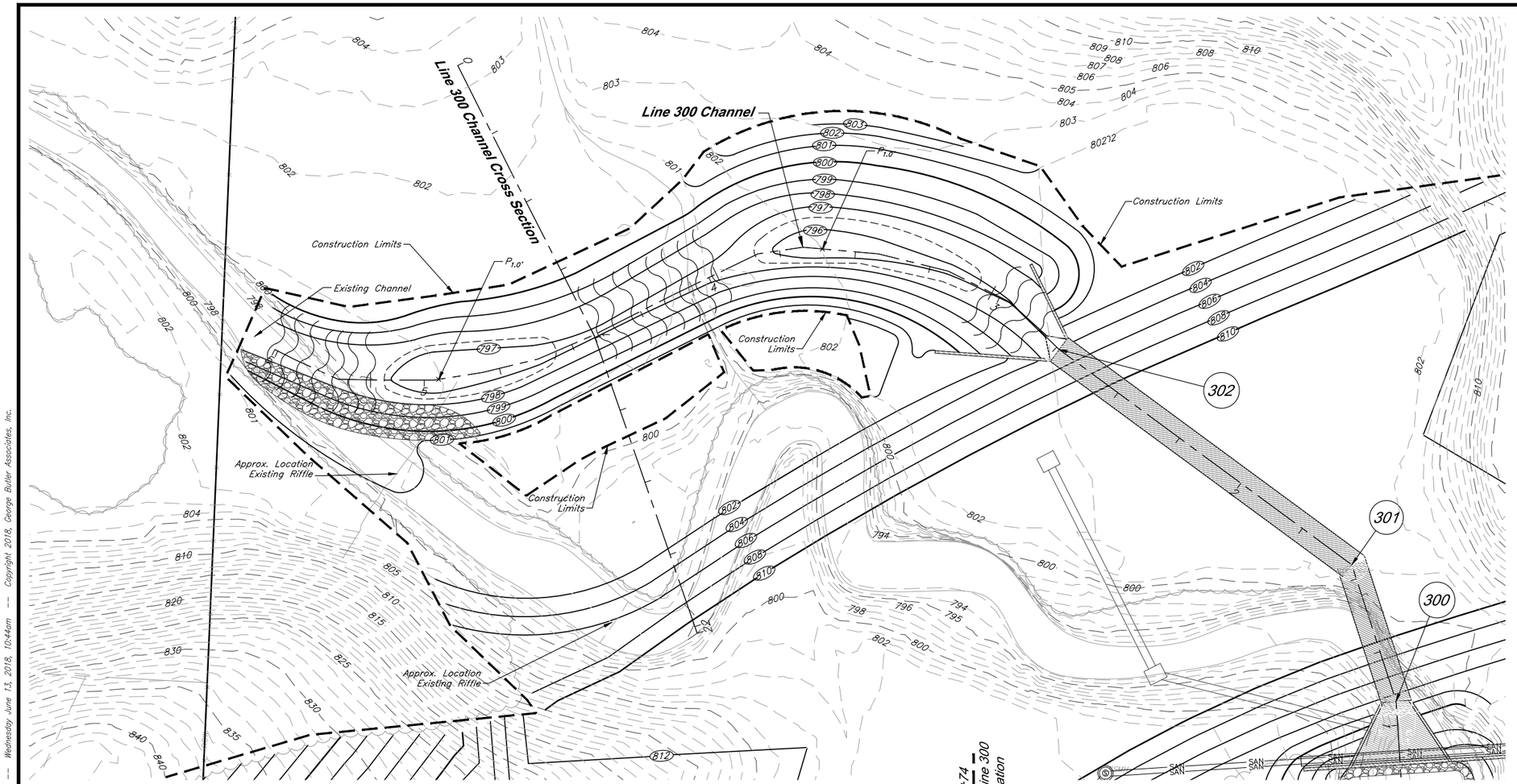
Materials	
38	D50 Riffle (mm)
90	D84 Riffle (mm)
32	threshold grain size (mm):

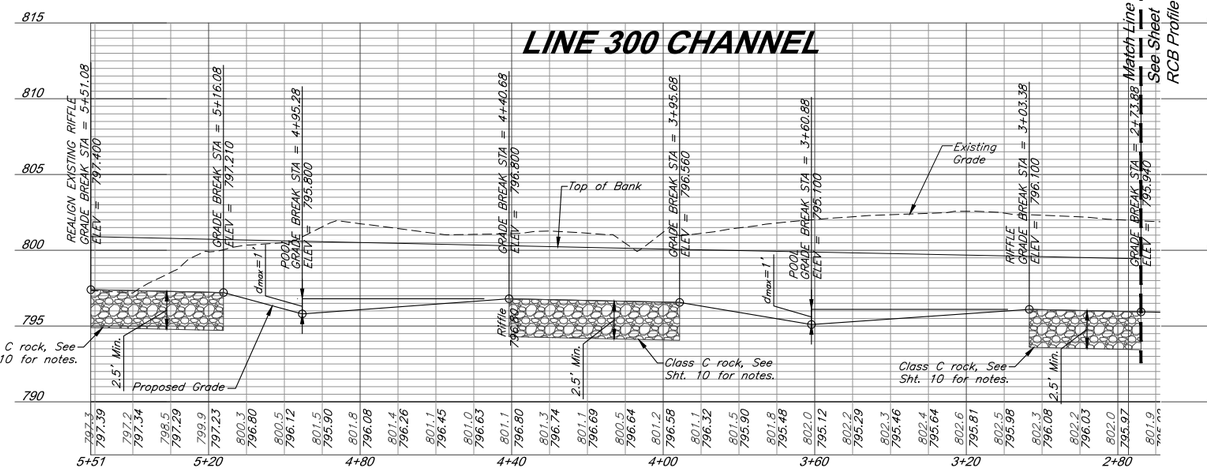
Bankfull Flow	
4.6	velocity (ft/s)
329.1	discharge rate (cfs)
0.59	Froude number

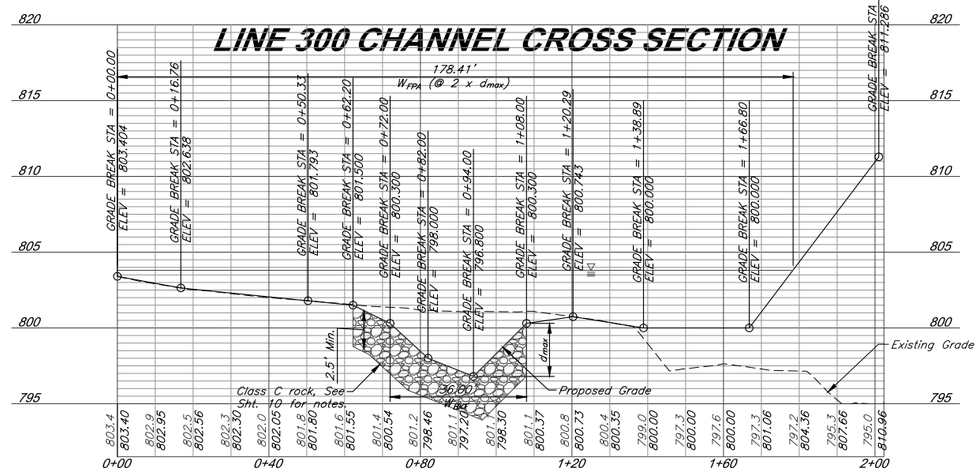
Flow Resistance	
0.036	Manning's roughness
0.12	D'Arcy-Weisbach fric.
8.0	resistance factor u/u*
6.7	relative roughness

Forces & Power	
0.54	channel slope (%)
0.65	shear stress (lb/sq.ft.)
0.58	shear velocity (ft/s)
3.1	unit strm power (lb/ft/s)

Exhibit 3: Bankfull Characteristics of Design Cross Section







STATE OF MISSOURI
BRADLEY D. BURTON
NUMBER 25862
REGISTERED PROFESSIONAL ENGINEER
5/31/18

GBA
architects
engineers
9801 Renner Boulevard
Lenexa, Kansas 66219
913.492.0400
www.gbateam.com

DATE:	1/10/17
DESIGN BY:	CEL
DRAWN BY:	DRV
PROJECT NO.:	12720
SHEET NO.:	8
TOTAL SHEETS	33

Bradley D. Burton
Professional Engineer
License No. 25862

Mass Grading Plans

Paragon Star Development

Lee's Summit, Missouri

NO.	DATE	REVISIONS	BY	APPROVED
	5/15/18	Revised Field Elevations		

Legend

- 810 — Proposed Contour (within Floodway)
- 810 — Proposed Contour
- 810 — Existing Contour
- Riffle
- P_{dmax} — Pool
- Construction Limtis

Channel Design Parameters:
Area = 71 SF
d_{mean} (d_{max}) = 2.0' (3.5')
W_{BKF} = 36'
ER (W_{FPA}/W_{BKF}) = 5.0 (min.=2.2)
S = 0.5%
W/d_{mean} = 18.3

Horizontal Scale: 1" = 20'
Vertical Scale: 1" = 5'
0' 20' 40' 5' 0'

Line 300 Channel Grading Plan